

Waste management for sustainable development in industrial parks. A case study of Wadesville industrial area, Johannesburg

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Abstract— This research was done at Wadeville industrial park, located in Johannesburg, basically the area is still in progress of eco-industrialisation and much waste is being lost. Waste is one of the major environmental factors affecting sustainability. South Africa produces millions of tons of waste per year. The main aim of the study was to identify the nature and quantity the waste and identify most effective ways of disposal. The study was conducted using both the qualitative and quantitative research. The overall number of the industries that were given survey questionnaires and 19 responded and some are on the waiting list. The idea behind interviews was to find out what managers and supervisors of industries think about EIP, looking at the managers' perceptions and attitudes towards the idea. It was noted that Waste reduction and minimization efforts need to be increased and the problem clearly calls for going a step further by initiating an industrial ecology approach. Waste management is critical and pivotal in creating or establishing industrial symbiosis hence leading to sustainability. The development of industrial parks embodies momentary benefits, environmental benefits and societal benefits.

Keywords—Waste, sustainability, industrial parks

I. INTRODUCTION, BACKGROUND AND JUSTIFICATION.

Wadeville industrial park is located in Johannesburg, basically the area is still in progress of eco-industrialisation and much waste is being lost. Waste is one of the major environmental factors affecting sustainability. South Africa produces millions of tons of waste per year. This is mostly industrial waste from the processing of natural resources into industrial products, and the rest is municipal waste. A huge percentage of this waste is either incinerated or dumped in landfills. Municipalities and industry are thus in a difficult position, challenging them to find waste management practices alternative to incineration.

Due to limited resources some companies are pushing to build in prohibited areas and when advised not to do so they might not understand because of lack of awareness. South Africa currently consumes million tons of natural resources every year and imports million tons from overseas. As such there is a general growing concern that as resources and space for landfill become more scarce and waste disposal costs increase, further economic growth may be hampered by growing resource inefficiencies.



Fig 1. Industrial waste.

South Africa generated approximately 108 million tons of waste in 2011, of which 97 million was disposed of at landfill. In the order of 59 million tons is general waste and 49 million tons is unclassified and hazardous waste. In the order of 10% of all waste generated in South Africa was recycled in 2011 [2]. This is mostly industrial waste from the processing of natural resources into industrial products, and the rest is municipal waste. A huge percentage of this waste is either incinerated or dumped in landfills. Municipalities and industries are thus in a difficult position, challenging them to find waste management practices alternative to incineration. Waste reduction and minimization efforts need to be increased and the problem clearly calls for going a step further by initiating an industrial ecology approach.

Currently in South Africa, environmental protection is ignored at the expense of economic development [4]. With sustainable development and design this does not have to be the case. Sustainable development looks to lower costs and improve the environment simultaneously. Therefore, it can be concluded that sustainable development isn't just a concept that should be pushed by environmentalists and policy makers, but should be embraced by industries, the business community, and society as well [4]

As depicted by figure 1 some waste are still a problem and workers are finding it difficult to dispose. This shows a zinc company and the scrap is just put at a side which might cause harm to workers.



Fig 2. Waste

Unsustainable economic activities in recent decades, which caused environmental degradation and resource exhaustion, an eco-industrial approach as a way to realize sustainable development

A. Aims and Objective

The main aim of the study was to identify the nature and quantity the waste and identify ways most effective ways of disposal

B. Literature review.

Eco-industrialism is a voluntary, market-driven approach that uses the discipline of internal and external markets to assure price, performance and quality. Eco-industrialism supports the end results of profit enhancement and frugal use of resources, but it asks us to rethink our relationships, the effect of our products on ecosystems and the impact of the processes of production on employees and affected communities. Figure 8 actually shows how as we reduce waste and unnecessary in the business increase profit to the business [1].



Fig 3. Reducing waste and increasing economy [1]

South Africa’s future should be more focused on industrial symbiosis as China is emphasising on currently. With regard to political support, China’s central government has played a key role in encouraging EID. As the national agency on environmental protection, the State Environmental Protection Administration (SEPA) led the first eco-industrial park (EIP) project in Guigang, Guangxi Zhuang Autonomous Region, in 2000. The site is a sugar complex formed in 1954 and is one of the largest sugar refineries, employing over 3800 workers [3]. Figure 9 shows the empirical analysis of eco-industrial development in China.

C. Waste Management Legislation

The passage of tighter government regulations concerning waste disposal and recycling practices has been an important driving factor encouraging business and industry to find innovative “waste” management practices.

Methodology and Scope



Wadeville is an industrial suburb of Germiston in the Ekurhuleni Metro.

Fig 3. Area of study, Wadeville [5]

The study was conducted using both the qualitative and quantitative research. The overall number of the industries that were given survey questionnaires and 19 responded and some are on the waiting list. Researchers are still flying out more questionnaires to other companies within the park hoping to get more responses.

The idea behind interviews was to find out what managers and supervisors of industries think about EIP, looking at the managers' perceptions and attitudes towards the idea..

The survey questionnaire were analysed using the excel spreadsheet, the observations and interviews are used mostly on the recommendations. The questionnaires were given to a number of industries in Wadeville Industrial Park (AIP) In this Industrial Park 19 companies responded to the survey.) , also a number of managers were interviewed, and then observation done on a certain number of selected industries. The primary data was connected in a form of dropping questionnaires, for those industries that look interested, where further interview and the observations were done within their industries.

II. RESULTS AND ANALYSIS.

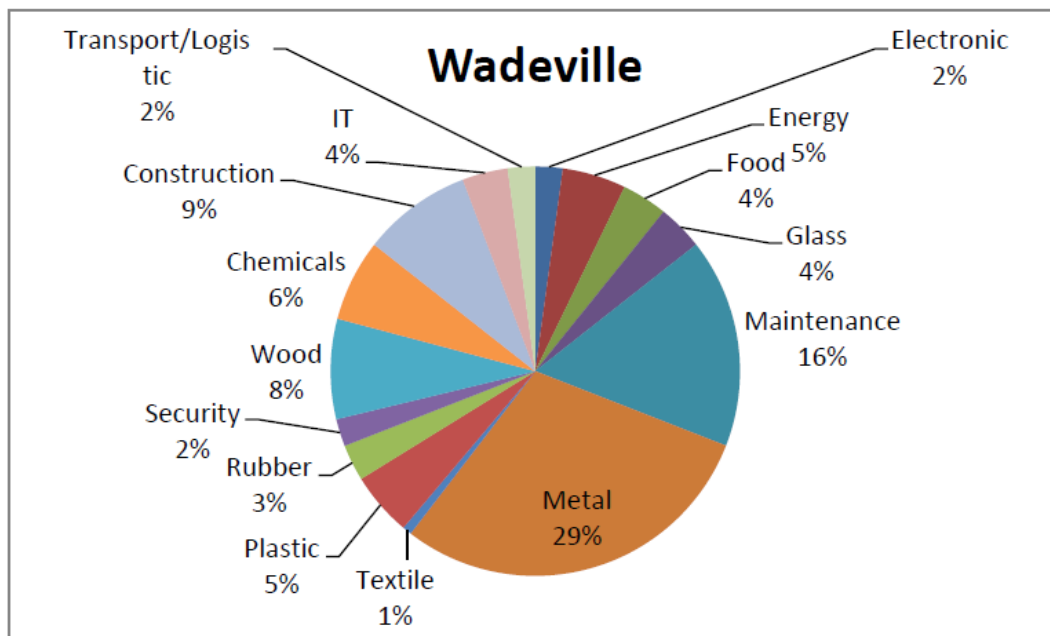


Fig 4, A pie chart showing Wadeville industrial Park sectors.

Metal industries are dominating in the WIP and hence control of waste metals need to be attended to. Maintenance industries are following up and hence analysis of the products they do should also be found out in terms of the harm in environment since it involves maintenance of cars, refrigeration mechanics, etc. which have some gases that are exposed to the environment. Car maintenance disposes carbon monoxide (CO) and panel beating disrupts environment indeed.

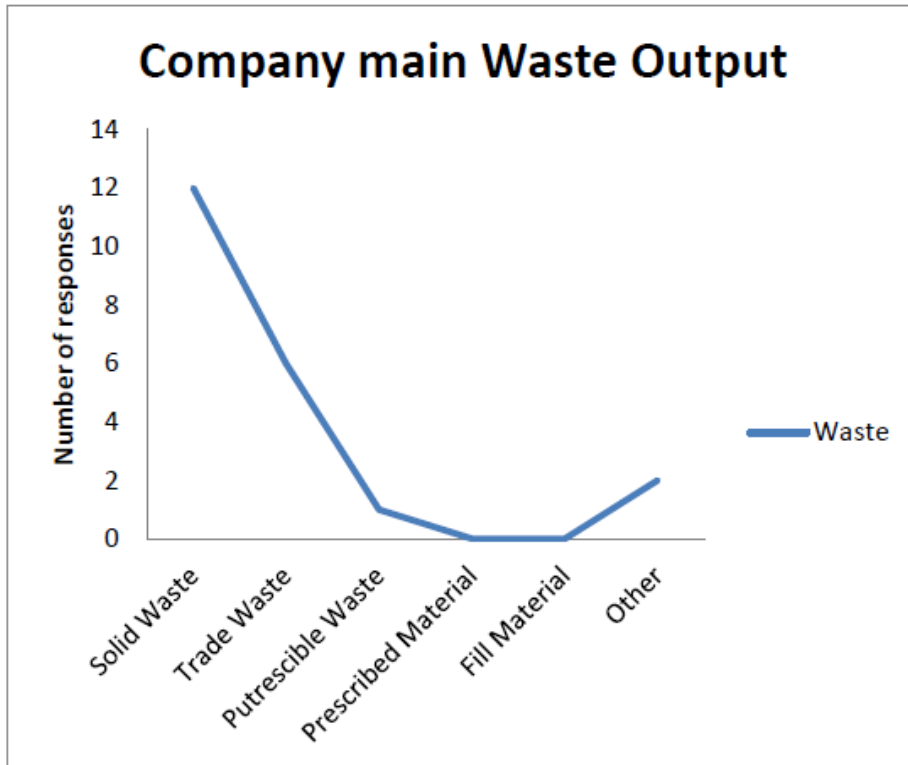


Fig 5. Companies main waste outputs.

The main waste output experiences by most in Wadeville industries is the solid waste followed by the trade waste then the Putrescible waste. The rest of the wastes according to the industries are not that experienced, but this could simply be because they are not taken into the consideration.

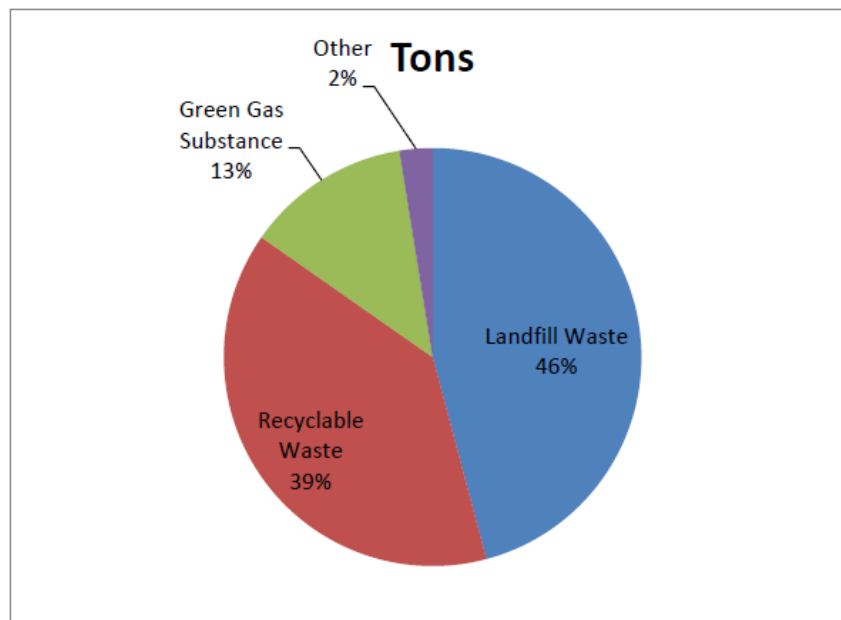


Fig 6. Tons produced.

The most generated waste per tons in the Wadeville industries, landfill waste is the highest with 46% followed by the recyclable waste with 39% , the green Gas Substance waste receive few response with the 13% on the graph. These could be perhaps more companies are not ignorance towards it, or those that are generating lots of Green Gas Substance were not that willing to respond to this question.

A. Management of Waste

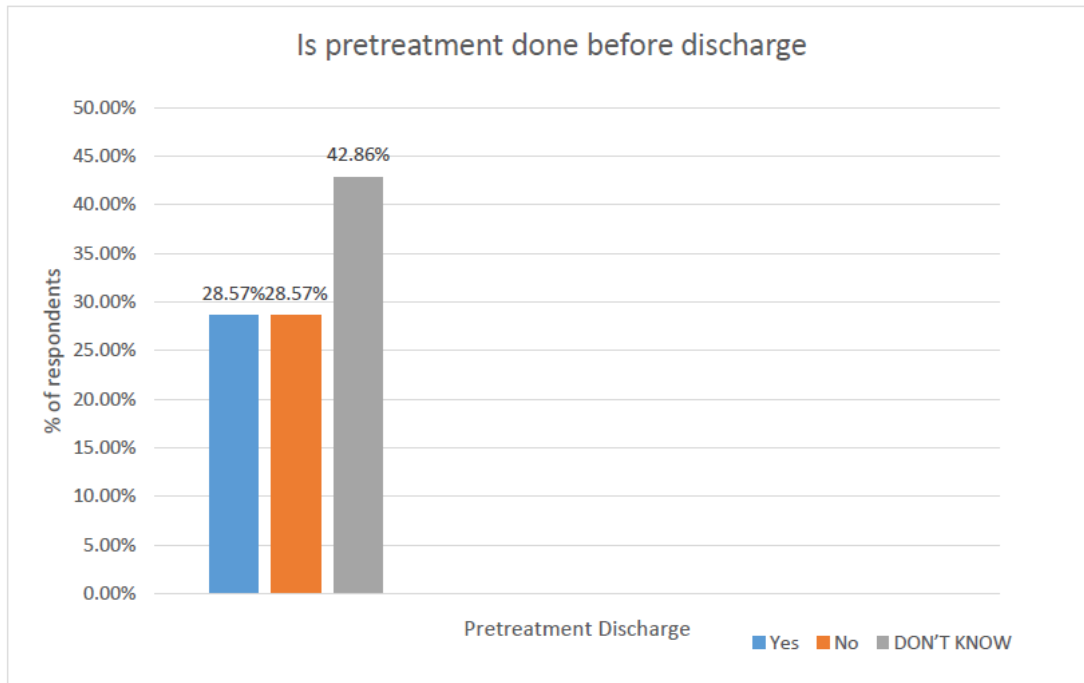


Fig 7. Pre-treatment of waste water and effluents before discharge

28.57% of the industrial parks interviewed stated that pre-treatment of waste water of effluent occurred before it was discharged (figure 7). It was however also found that 42.86% of the industrial parks interviewed did not know if any treatment was conducted to the waste water and effluents prior to discharge. The lack of knowledge in this area indicates a lack of education and training with regards to waste management.

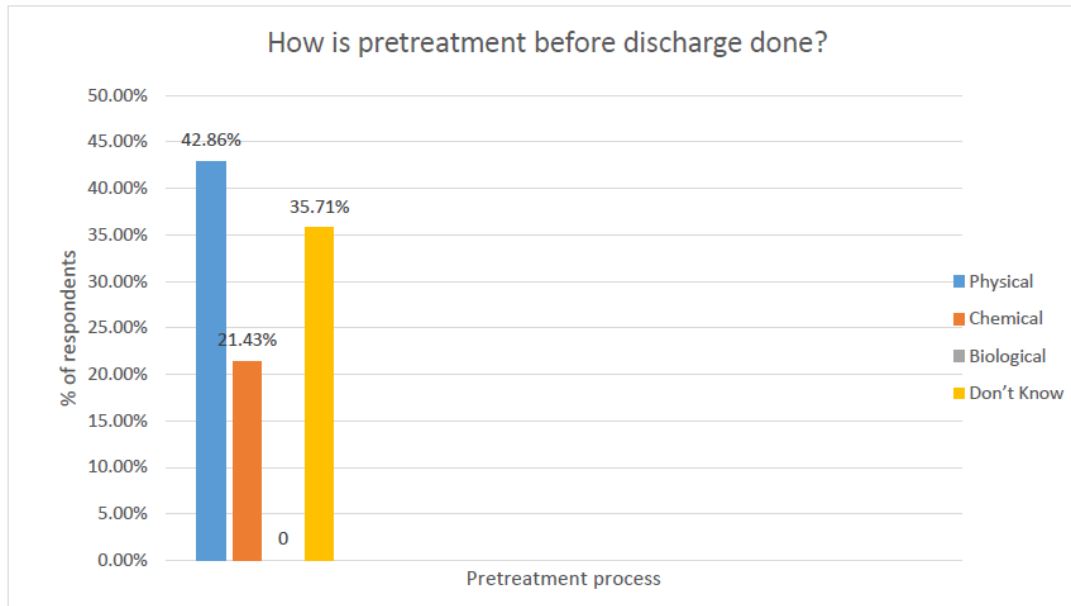


Fig 8. Pre-treatment processes used before discharge

Based on the 15.79% (figure 8) of the industrial parks that conduct pre-treatment of waste and effluents produced, further analysis was conducted to analyse the process category used in the pre-treatment process. Figure 24, illustrates that 21.05% of the industrial parks that conduct pretreatment before waste water and effluents discharge use the physical processes such as Screening, Flootation and Skimming. As indicated in figure 24, 73.68% are unaware of the pretreatment process used, while 15.79% use the chemical process known as neutralization. It was further found that none of the industrial parks use any of the biological process, including Trickling, Filtration, Anaerobic Digestion or septic tanks.

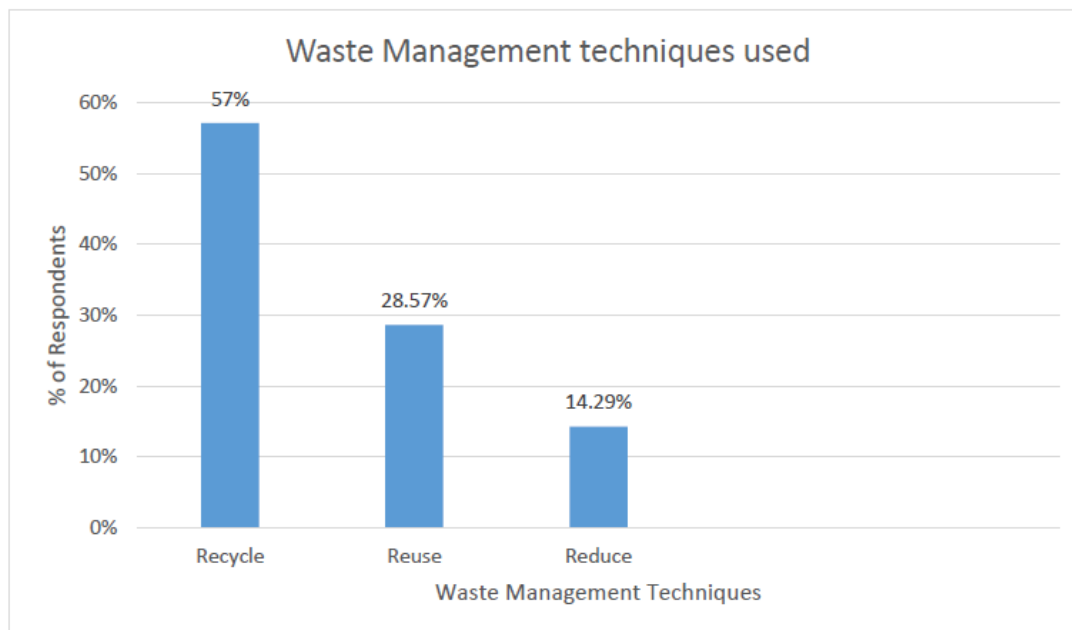


Fig 9. Waste Management techniques currently used.

It was generally found that the industrial parks are aware of the various techniques that can be used to manage waste. 57% of the industrial parks suggested that recycling the waste produced would be a viable strategy, it was however identified that the industrial parks are not knowledgeable on the process of recycling, whereas 28.57% suggested reusing and 14.29% suggested

reducing the waste produced, this is indicated in figure 9 . None of the industrial parks suggested burning or burying of the waste produced

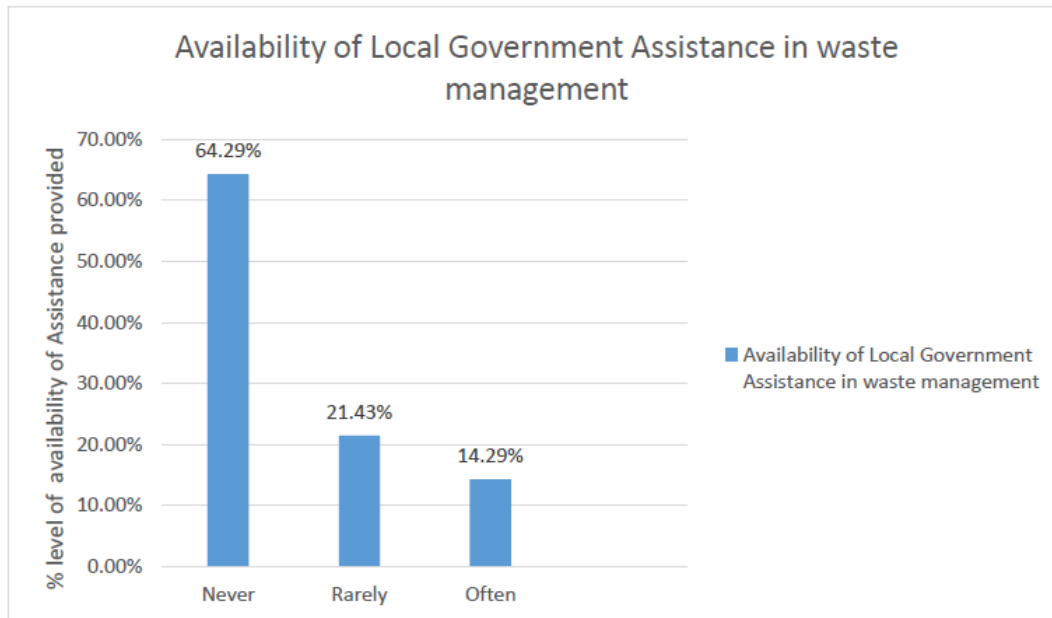


Fig 10. Government assistance in waste management.

It was found that the local government does not offer enough support to industrial parks with relation to the waste management in industrial parks. 64.29% of the interviewed industrial parks stated that they have never been assistance from the local government in dealing with their waste. 21.43% indicated that local government had rarely assisted in the management of waste, while only 14.29% had often received assistance from local government in the management of their waste. These figures, in figure 23, indicate that government interventions have not been recognised and thus industrial parks rely on the business capabilities in handling waste produced

III. CONCLUSION

IV.

Waste reduction and minimization efforts need to be increased and the problem clearly calls for going a step further by initiating an industrial ecology approach. Waste management is critical and pivotal in creating or establishing industrial symbiosis hence leading to sustainability. The development of industrial parks embodies momentary benefits, environmental benefits and societal benefits:

1. Monetary benefits to companies: Decreased production costs due to the purchasing of unwanted by-products from other businesses at bargain prices and selling of by-products produced. Reduced energy consumption in relation to less transportation used. Decreased waste management based on on-site businesses being able to sell what would be regarded as waste. Decreases Costs of compliance and Cost of Research & Development as these costs would be shared with other companies.
2. Environmental benefits: Decrease demand on natural resources, decreased waste in forms of solid waste, air emissions, wastewater, and reduced chances of accidents in transportation as pipes would be used instead of trucks.
3. Societal benefits: The social benefits of eco-industrial parks are Cleaner air and cleaner water which would lead to better health. Furthermore the development of eco-industrial parks would lead to a decreased demand on the sewer system and less waste disposed to landfills.

The answers given in the survey are more similar in a way that the study concludes that the managers need more knowledge through trainings and workshops on EIPs to realize the win-win situation for both the environment and their own industries

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BIOGRAPHY

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