

The measurement and reduction of urban litter entering stormwater drainage systems: Paper 1 – Quantifying the problem using the City of Cape Town as a case study

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Abstract

The wash-off of solid waste into the drainage systems of urban areas is not only unsightly; it seriously interferes with aquatic life in the receiving streams, rivers, lakes and oceans. Litter management in South Africa is currently, however, severely hindered by the lack of good quality data on the quantities and types of urban litter emanating from different types of land-use. This paper describes a monitoring programme that was implemented between 2000 and 2002 in nine subcatchments representing various land uses and demographic profiles located within the boundaries of the City of Cape Town. Measured quantities of urban litter, vegetation, and building debris are given for each of the nine subcatchments. These data are then used as input to a GIS-based model of the City of Cape Town in order to estimate the quantity of urban litter that is currently entering the drainage systems of that city.

Keywords: litter management, stormwater drainage systems, water quality management, quantity of litter

Introduction

Much attention has been given to the problem of eradicating what the South African Minister for Environmental Affairs, Valli Moosa (Nedlac Executive Council, 2001), has termed South Africa's new "national flower", the ubiquitous plastic bag. Although highly visible, festooning fences and thorn trees, and clogging drainage systems and waterways, the plastic bag is only one of many items that contribute to the litter stream. It has, however, served to capture the imagination of the South African public and focus the attention of increasing numbers of South Africans on the problem of litter. One aspect of the litter problem (here defined as visible solid waste in the public domain) is its impact on urban stormwater runoff. While it may appear to be mainly of visual and aesthetic importance, litter also seriously interferes with aquatic life in the receiving streams, rivers, lakes and oceans (Victoria Stormwater Committee, 1999). This makes it imperative that the amount of urban litter finding its way into the drainage catchments be severely reduced through proper catchment litter management strategies. Key to the success of such strategies is the quantification of the scale of the problem. However, as Armitage et al. (1998) noted, there are currently few scientifically verified data available on the nature and quantities of the litter that finds its way into stormwater systems. This is despite the CSIR (1991) estimating in 1991 that 780 000t of waste a year was entering the drainage systems of South Africa representing a potential removal cost in excess of two billion Rand per annum (Armitage and Rooseboom, 2000a).

In 1999, the Water Research Commission (WRC) of South Africa appointed the Department of Civil Engineering at the

University of Cape Town (UCT) to carry out a study into the measurement and reduction of urban litter entering stormwater drainage systems. Part of this study involved the implementation of a monitoring programme between 2000 and 2002 in nine pilot catchments in the Cape Metropolitan Area (now all part of the City of Cape Town, hereinafter simply called "Cape Town") representing a range of different land uses, socio-economic levels and population densities. The study was co-funded by the then Cape Metropolitan Council who paid for the installation of traps and assisted with the collection of data. One of the aims of this monitoring programme was to improve the knowledge of the source, type and amount of litter reaching the drainage systems from different types of urban catchments. To achieve this aim:

- A number of urban catchments representing a spread of land uses, income levels, densities and service levels were selected
- Litter traps and nets were installed in the catch-pits and stormwater outlet pipes
- A monitoring programme was instituted to record the types and amounts of litter trapped
- The data obtained from the monitoring were analysed to arrive at a litter profile for each of the study catchments
- The litter profile was then considered in tandem with the land-use and socio-economic characteristics for each catchment.

This paper summarises the data obtained, and uses these to estimate the total quantity of urban litter reaching the drainage systems of Cape Town under various operational scenarios.

Over the course of the monitoring programme, the greater Cape Town area underwent a series of profound administrative changes. The six local municipalities and the metropolitan authority providing joint and bulk services to these local municipalities, in existence at the commencement of the monitoring programme at the end of 1999, were merged into one Unicity at the end of 2000. However,

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