

The removal of urban litter from stormwater conduits and streams: Paper 1 - The quantities involved and catchment litter management options

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Abstract

A large quantity of urban litter is finding its way into the drainage systems from where it is potentially able to travel via the stormwater conduits, streams, rivers, lakes and estuaries until it eventually reaches the open sea. Along the way items are entangled amongst the vegetation along the banks or strewn along the beaches to become an eyesore and a potential health hazard. The potential annual cost of cleaning South Africa's waterways of urban litter assuming current practices is conservatively estimated to be in the order of R2 bn. at current prices. The main factors influencing the quantity of litter finding its way into the waterways are identified, and suggestions are made for reducing this quantity through catchment litter management. Data from Australia and New Zealand are also reported to illustrate the potential for major reductions in the quantity of litter entering South Africa's waterways. On the assumption that it will take a while for effective catchment litter management to be implemented, some South African data on current urban litter loading rates related to land use, vegetation, the level of street cleaning and the type of rainfall are presented. The influence of these factors is then summarised in the form of simple equations to assist designers in the sizing of litter traps.

Introduction

In years to come, archaeologists sifting through the remains of late 20th century civilisation might well come to identify this period of history as one of waste - "the throw-away society". In South Africa this is most clearly demonstrated by the large quantities of urban litter (alternatively called trash, debris, flotsam, jetsam, rubbish or solid waste) that is so often to be seen strewn about in public places.

The litter, consisting mainly of manufactured materials such as bottles, cans, plastic and paper wrappings, newspapers, shopping bags, and cigarette packets - but also including items such as used car parts, rubble from construction sites, and old mattresses - accumulates in the vicinity of shopping centres, car parks, fast food outlets, railway and bus stations, roads, schools, public parks and gardens, garbage bins, landfill sites and recycling depots. There it remains until it is either removed by the local authority, or it is transported by the wind and/or stormwater runoff into the drainage system.

Once in the drainage system, the litter is potentially able to travel via the stormwater conduits, streams, rivers, lakes and estuaries until it eventually reaches the open sea. Along the way, however, items are frequently entangled amongst the vegetation along the banks of the streams, rivers or lakes, or strewn along the beaches. Some of this debris is picked up - often at great expense. Most of it is probably buried in the river, lake or beach sediments (Hall, 1996).

The existence of such litter in the waterways and on the beaches has a number of impacts:

- Litter is aesthetically unattractive.
- There is a potential health hazard to humans associated with, for example, the putrefying contents of bottles and tins, or pathogenic organisms attached to discarded hypodermic needles.
- Aquatic fauna are at risk of becoming entangled in, or suffocating from, litter ingested in the course of their search for food.
- Pathogenic organisms or toxins, for example heavy metals, may be taken into the food chain poisoning aquatic life and possibly later impacting on humans.
- significant costs are incurred by local authorities in conducting clean-up operations.

According to a President's Council Report of 1991, South Africa was at that stage producing some 40 m. t of solid waste annually - mostly of domestic origin. A large portion of this amount was street litter, much of it packing material (President's Council Report, 1991).

Nearly all solid waste pollution in the river systems of South Africa is derived from the urban areas although they comprise only 5.6% (6 m. ha) of the land area (President's Council Report, 1991). According to the CSIR (1991), some 780 000 t of waste was then entering the drainage system every year, of which about 195 000 t reached the sea. By way of comparison, at the time of above studies, the recycling of glass, paper and tins only accounted for 23 000 t. Fortunately this amount is increasing.

Armitage et al. (1998) has shown that, even with the most efficient litter traps, it typically costs between R1 500 and R2 500/t at 1997 prices to trap and remove litter from the aquatic environment. Therefore, unless steps are taken to reduce the amount of litter entering the drainage system, **the potential cost of keeping South Africa's waterways clean is in the order of R2bn. (R2 000 m.) per year.**

South Africa is not the only country with this sort of problem.

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