

CHAPTER 28

SOLID WASTE REUSE AND RECYCLING

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Introduction

The aim of this chapter is to examine the current status of solid waste reuse and recycling and to examine the advantages and disadvantages of these activities in economic, public health, social and environmental terms (with particular reference to Botswana). Having outlined these aspects, the role of government, industry and non-governmental organizations is explored and the framework for a strategy to increase reuse and recycling is outlined.

The need for increased recycling and reuse in Botswana is obvious. Indiscriminate dumping of waste and widespread littering have become serious environmental problems in recent years. In Botswana and many other African countries millions of cans, broken bottles, plastic bags, old tyres, building rubble and waste oil are despoiling towns, villages and once pristine countryside. Not only is such waste unsightly but it is also dangerous to wildlife, livestock and humans. Young children are especially vulnerable sometimes drinking the remaining contents of discarded cans or bottles. Injuries and accidents caused by broken bottles are also a problem.

Economically, these waste management practices are damaging. Not only does widespread litter discourage the development of a young and growing tourist sector, but local town Councils spend millions on potentially unnecessary litter picking and waste management activities. The consumer also pays a high price, P100 million every year in Botswana alone, just for the importation of non-returnable beverage containers.

From an environmental perspective some of the damage done by indiscriminate waste disposal are relatively superficial and short lived, but some are much more serious; for example, the *long term contamination of scarce groundwater supplies from waste oil and toxic materials. Leachate from landfill sites also pose a potential long term threat.* Despite the scale of the problem, the solutions are extremely simple. *Most of what people perceive as wastes are in fact valuable resources and can be reused or recycled.* Although some reuse and recycling of materials is taking place, the extent is limited and enormous potential for expanding these activities exists.

Waste Reduction, Reuse and Recycling the 3R's of environmental conservation represent an important component of any serious attempt to address the waste management problem in Africa. An important first step towards realising this will involve the introduction of appropriate legislation and economic instruments with respect to encouraging recycling activities. Hopefully the

implementation of the National Waste Management Strategy and enforcement of the Waste Management Act in Botswana will go some way to promoting more recycling activities at least in this country.

Overview

The world's population continues to grow rapidly and by the year 2000 it is anticipated to have surpassed 6 billion (four times its size in 1900). It is unlikely to stabilise until at least 2100 and then at somewhere between 8 and 12 billion. However, it is not sheer numbers alone that should concern us with respect to the impact on the planets environment and resource base, but more *per capita* levels of consumption and the way we manage the planets resource base and environment. Today for example, an individual human uses several magnitudes more energy and mineral resources compared with an average individual one hundred years ago. It is accordingly estimated to be perhaps not surprising that we are generating more waste than ever before and to date the waste management problems have become a major environment issue.

Certain societies consume more and create more waste than others. An average American for example consumes about 50 times more than an average Bangladeshi and generates at least 50 times more waste. The total ecological demand (or environmental impact) of any society can be approximated by the following simple equation.

$$I = P \times A \times T$$

where I = Impact

P = Population

A = Affluence

T = Technology (where T can be greater or less than 1)

Throughout the industrial revolution technology and the management of resources have been developed in a way which increases human impact on the planet. In the last few decades, however, there has been increasing effort to develop technologies and industrial systems which are more environmentally benign and help to lessen the impact of humanity on the environment. Examples of such technologies include, solar water heaters, catalytic converters and a range of recycling technologies which enable the recycling and/or reuse of everything from plastics to waste oil and old tyres to textiles.

An ancient Chinese proverb defines waste "as a resource we have simply not yet learnt how to use". Worldwide commercial "waste" recycling industries have a turn over of many tens of billions of dollars annually. It is likely that informal reuse and recycling of everything from glass jars to old tyres accounts for tens of billions more. Despite this only a small fraction of the materials

which could be reused and recycled is being utilised. The most common reason for this is that it is “un-economic” to do so. Unfortunately, the calculation of whether a certain activity is “economic” is based on a short-term determination of supply and demand. This is why for some materials it may be economic to recycle them this year even if it was not last. A different perspective, is gained if the long-term environmental costs including the price which may have to be paid by future generations to clean up pollution and contamination created by today’s wasteful activities, or the cost of finding more expensive substitutes to replace over exploited resources is considered. From a long term point of view many of today’s supposedly uneconomic activities may in fact make economic sense. Perhaps, the best illustration of this issue is the American “Superfund”, a multi-billion dollar fund which has had to be set up to start cleaning up toxic waste dumps across the United States. Some estimates for the total cost of doing a thorough cleanup of the many thousands of such sites across America run to as much as US\$500 billion, Miller (1992).

Advantages and Disadvantages of Reuse and Recycling

Given the immensity of the problems of effectively managing the waste created by modern society around the world, any activity which can help reduce the size of the waste stream is generally welcomed especially if it can pay for itself.

Environmental Aspects

The environmental benefits of reusing and recycling waste are obvious. With less waste oil, waste water, waste paper, beverage containers, plastics etc entering the environment either at formal dumping sites or generally through illegal tipping and littering, the negative impacts of pollution and visual untidiness would be reduced. Equally important is the fact that reuse and recycling reduces the demand for virgin materials, so fewer trees have to be cut or minerals mined. The environmental benefits of this are also clear: less pollution, less scarring of the landscape, fewer greenhouse gas emissions and so on.

In general reuse and recycling activities have few negatives on the environment although some processes may be relatively water and energy intensive or produce pollutants. Another negative aspect is that individuals and institutions that are actively involved in recycling activities may become convinced that they are doing far more vis-à-vis environmental protection than they are in fact doing. Reuse and recycling are only small components of environmental protection and it is important to remember that ultimately it is better to reduce waste than recycle it.

Social and Economic Aspects

The economic advantages of recycling enterprises may be both direct and indirect in nature. Direct benefits may include job creation and reduced demands on foreign exchange reserves for importing raw materials. Indirect benefits may include a decline in waste disposal costs resulting from reduction in total size of the waste stream and benefits to other sectors such as the tourism industry. The main negative aspect of recycling activities from an economic perspective is that due to the abrupt price fluctuations which can affect the price of both the waste being recycled and the recycled end-product, jobs and companies in the recycling industry are often short-lived.

Public Health Aspects

If beverage containers, old tyres and plastic bags are not recycled, invariably these may cause health problems for wildlife, livestock and humans. Young children are especially vulnerable to injuries and accidents caused by broken bottles and sometimes are tempted to drink the remaining contents of discarded containers. Cans and tyres trap rainwater and become ideal breeding sites for mosquitoes and other disease carrying vectors.

Furthermore, since reuse and recycling of waste reduces the quantity which has to be disposed of through more conventional methods such as land filling it reduces the extent of associated pollution risks. In the case of serious air or water contamination these may have serious health impacts and environmental impact associated with them. Certain products like waste oil are relatively easy and economic to recycle for direct reuse or alternative uses. Yet if dumped in an unlined landfill, waste oil can seep into groundwater where one litre of oil can contaminate a million litres of water.

A Strategy for Recycling: The Role of Government, Industry and NGO's

In order to ensure the effective adoption and sustainable operation of recycling activities it is essential that government, private enterprise and non-governmental organizations (representing the community) work in partnership. None of these three groups can operate effectively without the co-operation of the others. Ideally, these three groups should work together to formulate an overall strategy in which the role of each is clearly defined.

Any strategy designed to increased recycling and reuse of waste materials needs to incorporate specific targets which should be ambitious yet realistic. In the U.K. for example where in 1990 only approximately 5% of domestic waste was

recycled out of a total 50% considered recyclable, it was decided to set a target of recycling 25% of all household waste by 2000. Even if such targets are not achieved they do provide goals to work towards and standards against which progress can be measured. Both success in achieving the targets or failure to reach them can act as spurs for further action. What is important, however, is that targets are realistic and potentially achievable so that no one gives up. The roles of the various players should be clearly defined and normally the responsibilities would most probably fall along the following lines.

Role of Government

Government should provide the overall framework, legislation and economic instruments to ensure that the conditions are right to promote and encourage recycling activities.

The framework might take the form of a *national waste management strategy* with supporting legislation in the form of a Waste Management Act. In Botswana this approach is being adopted and the concept of a Waste Management hierarchy has been embraced as a valid basis for addressing waste management. Such a hierarchy is envisaged to encompass both *reuse and recycling of waste as well as waste reduction as key elements for effectively addressing waste management throughout the country.*

Economic instruments can be applied in a variety of ways, either in the form of incentives such as subsidies, grants or tax breaks or in the form of fines for illegal or unacceptable practices, such as illegal dumping of building rubble and other waste in the bush. The problem with fines is that they have to be enforced which may involve substantial policing resources and costs. Incentives are normally more effective at encouraging good practice. In the case of recycling the carrot is normally better than the stick.

There are many indirect ways in which Government both at a national level and local level can assist recyclers. At a national level in a country like Botswana where the railways are state owned the possibility for providing subsidised rates for transporting recycled materials exists. On the roads too, empty government vehicles could be made available to assist in transporting recyclable materials from small and remote communities, where the costs of employing private transport would be prohibitive. At a local level town and district councils can provide space in the form of fenced enclosures within the fenced perimeter of landfills for lease or rent at subsidised rates to recyclers. This form of assistance not only helps small entrepreneurs, and creates jobs but it may help to make recycling of certain materials more economically viable.

Role of Industry

It is normally the private sector through both small scale entrepreneurs and large scale recycling industries which actually implement recycling activities and also those involving reuse eg. use of returnable bottles etc. It is essential that industry profit from recycling activities to ensure the sustainability of these activities. This can be a problem since the market for recycled materials can be uncertain owing to high variable supply and demand. For this reason it is essential that industry liaise and work closely with government to ensure that where possible the two can work in tandem.

Role of NGO's, Communities and the Individual

NGO's and community based groups have an important role to play in promoting recycling activities through raising public awareness. This can be done through a variety of ways including *holding public meetings, seminars, environmental fairs and through publications, posters and the media.* Another important role for NGO's is to monitor recycling and waste disposal activities in general and alert the public and the authorities when problems or difficulties arise. NGO's can also act as a clearing house and information source for enquiries from the public, about how, what and where to recycle as well as sometimes providing facilities of their own. Ultimately, for recycling and reuse to play a major role in contributing to waste minimisation it is essential that it is also supported by the individual. In societies where the majority have been highly conscientised about the importance of individual actions vis-à-vis addressing environmental problems, recycling is most likely to be effective.

Current State of the Art and Prospects for the Future

The current state of the art of reuse and recycling in Southern Africa is one where although certain materials such as steel cans and paper are recycled quite extensively, many potentially recyclable materials are currently being landfilled, and even large quantities of paper and steel cans fail to be collected. For example in Southern Africa as a whole only about 25% of the two billion cans produced annually are actually recycled. In Botswana alone where 200 million cans are imported annually, (NCSA 1996a), at a cost of around P60 million the proportion recycled averages around 50%, this still only generates a meagre Pula 1 million in return revenue from South Africa where the used cans are sent for recycling. Many materials such as waste oil, plastics, organic materials, textiles are only locally recycled. Globally, the trend is towards greater recycling is increasing. In some places like Tokyo recycling rates already exceed 50%. With the possibility that the world's population could

almost double by 2100 and at the very least increase by 50% and increased levels of consumption virtually inevitable, we will have no choice in the future than to further adopt the 3R's waste management and reduce, reuse and recycle.

Conclusion

Worldwide recycling is a multi-billion dollar industry and there is a steady trend towards increased recycling and reuse of waste. In Africa and Southern Africa the same trend exists although the region remains some way behind the world leaders in this field.

Ultimately, "spaceship" earth has finite resources, and a growing number of passengers. If we are going to successfully complete our journey into the future without running out of resources or polluting and contaminating our planet, we had better start doing what every astronaut has to do, reduce consumption levels and recycle as much as possible.

References

- Gould, J.E., M. Humme and R. Senior (Eds) (1995). *Proc. of Workshop on "Waste" Recycling, Gaborone*, p89.
- NCSA (1995). *Guidelines for the Disposal of Waste by Landfills (Draft)*, Govt. of Botswana, P/Bag 0068, Gaborone, 104p.
- Miller, G.T. (1992). *Living in the Environment*, Waddington Publishing Co., 743p.
- NCSA (1996a). *Study on the Management of Oil Wastes*, Govt. of Botswana, P/Bag 0068, Gaborone, 50p.
- NCSA (1996b). *Study on the Recycling of Metal Wastes*, Govt. of Botswana, P/Bag 0068, Gaborone, 80p.
- NCSA (1997). *Waste Management Strategy (Draft)*, Govt. of Botswana, P/Bag 0068, Gaborone, 18p.
- Waite R.(1995). *Household Waste Recycling*, Earthscan, London, 174p