CHAPTER 22

ROLE OF *EIA* IN WASTE DISPOSAL AND MANAGEMENT

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"Your destiny is a mystery to me. What will happen when the buffaloes are all slaughtered? And what is it to say goodbye to the swift ponyand the hunt? The end of living and beginning of survival.
We love this earth as a new-born loves its mother's heartbeat. Care for it as we have cared for it. Hold in your mind the memory of the land. Preserve the land for all children and love it."

- A Native Indian Chief,
to one of the Presidents of the United States

Introduction

The above quotation was reported to have been sent to one of the Presidents of the United States of America by one of the native Indian Chiefs. It is a poignant message. *The world is confronted with two major environmental problems, which are inter-related. These are how to use available resources in a sustainable manner given the increasing demand on these resources and how to manage the waste generated by the increasing population so as to maintain the integrity of the environment and its ability to sustain the future generations and us.* Had the world listened to that Indian Chief? Perhaps we would not be as hard-pressed as we are now in regard to the environmental problems we have to contend with. This chapter will focus on the issue of how to manage the mounting waste that we are generating.

All living things generate some form of waste. Generally, the volume and complexity of waste generated increase in quantum proportion to the level of complexity of the species' living pattern (or life-style as far as humans are concerned) as determined by the species' biological requirements of sustenance and maintenance and social imperatives. It is obvious now that the waste is generated in our living space, although it was not so obvious not long ago. Earlier conceptions of the environment were compartmentalised: a 'closeted clean' living space with all the materials that we require for comfortable living and another space, often considered 'remote', into which the undesirable by-products of our living are discarded. We may even wonder whether this mentality is a thing of the past considering the shipment of waste of all types from one area for disposal in another that we hear of these days.

This mentality, despite the headline grabbing demonstrations of it, is surely dying. Several developments are responsible for this situation. One of the notable causes of the change in this mentality is the *phenomenal increase in global population during the 20th Century.* Associated with this is an equally *phenomenal increase in resource consumption and, therefore, a commensurate increase in waste generation.* This worldwide trend has demonstrated to us, in rather graphic tenns, that the living space we crave on this planet cannot be isolated from the space in which we discard the by-products of living. Of course, we can throw this by-products over the fence, into the public pathway, vacant land, gutters, rivers, wetlands, etc. However, sooner than later, we come to realise that in terms of natural processes, we cannot closet ourselves in a 'clean' living space. That is, we have to live with our waste in the same space.

This realisation implies that, if we want to improve our standard of living and maintain it at an optimum sustainable level, commensurate with the optimum benefit we can derive from the resources of our environment, we *need to develop systems to manage our waste in such a way that our very existence is not threatened.* In order to do this successfully, **EIA methodology** has to be adopted. This methodology has a major role to play in decisions pertaining to where to locate a waste disposal site, how to foresee likely impacts and how to mitigate these.

What is Waste?

Waste can be considered as *the by-product of our living.* We can distinguish between solid and liquid waste. Either type may occur individually although often they are inter-related or both associated. We can therefore define waste, in the broadest sense, as *all the discarded solid materials, either dry or wet or water-borne where the water itself was not of a discarding quality and discarded liquids which result from municipal, industrial and agricultural activities.*

In legal terms, we distinguish a category of wastes referred to as **'controlled waste'**. This may include *all waste from any or all of the above sources which a regulating authority wishes to control the disposal of. Normally, however, waste waters and mining wastes are excluded from municipal controlled wastes.*

Wastes are classified into four categories: *inert, general, wet and hazardous.* **Inert wastes** have the attribute of *little, negligible or no chemical interaction with the environment.* Inert wastes are also expected to have very little impact on the environment. Examples are builder's rubble (excluding plastic pipes and similar materials), excavation spoil, and material from the desilting of drains.

Hazardous waste comprises *waste that has the potential, even in low concentrations, to have a significant adverse effect on public health and/or the environment.* This categorisation is based on the inherent chemical and physical characteristics such as *toxic, ignitable, corrosive, carcinogenic or other properties*. The range of wastes considered hazardous are further divided according to type as follows:

Inorganic Waste

- Acids and alkalis;
- Cyanide waste;
- Heavy metal sludge and solutions as Cr(6+) from tanneries; and
- Waste containing appreciable proportions of fibrous asbestos.

Oily Waste

- Wastes resulting primarily from the processing, storage and use of mineral oils

Organic Waste

- Halogenated and non-halogenated solvents residues;
- Phenolic and PCB waste - paint and resin waste; and
- Biocide and other organic chemical residues regarded as waste which contains less than five percent of biodegradable organic compounds and which are neither wet or hazardous. Any waste that will support combustion is excluded from this category

General Waste

General Waste is *a generic term applied to all controlled waste that is not inert, wet or hazardous*. It may comprise garden, domestic, commercial and general dry industrial waste. It may contain greater than five percent of readily biodegradable wastes, as well as small quantities of hazardous substances dispersed within it, e.g. batteries, insecticides, weed killers and medical waste discarded on domestic and commercial premises.

Wet waste is characterised by a high moisture content and a high leachate generation potential. Such wastes include liquid wastes, sludge and abattoir wastes.

Miscellaneous Waste

- ❑ Waste from the production of edible oils, slaughter houses, tanneries and other animal and vegetable based products;
- ❑ Infectious waste such as diseased human/animal tissues, soiled bandages and syringes - redundant chemicals or medicines;
- ❑ Explosive waste from manufacturing operations or redundant ammunitions.

Waste reflects the socio-economic status of a community in terms of volume generated and the composition of the waste. If we measure the volume of waste generated and analyse its composition in different suburbs of Gaborone, we can tell the socio-economic status of the respective suburbs. The same goes for regions of the same country and from one country to the other, in general terms considering all wastes.

What Is EIA?

One other term that needs some clarification from the outset is environmental impact assessment or EIA, for short. In simple terms, EIA is a process and a tool which is used to identify, predict and evaluate both positive and negative environmental impacts of any proposed development activity or policy (Department of Environmental Science, 1995). Munn (1979) has proposed a more precise definition. They defined EIA as:

".. an activity designed to identify and predict the impact on the biogeophysical environment and on human health and well-being, of legislative proposals, policies, programs, projects, and operational procedures, and to interpret and communicate information about the impacts."

What Role can EIA Play in Waste Disposal?

Waste disposal means the deposition of a stream of waste at a site which has the facility to handle the type of waste and is biogeophysical-conducive to receiving that type of waste. The qualification that the disposal site be bio-geophysically suitable for receiving, the type of waste is an important one. It is this requirement which makes an EIA exercise very crucial for waste disposal. There are, normally, three objectives in selecting a waste disposal site. These are:

(i) **The economic objective** - The site should be within an economic haulage distance of the waste generation points. Because capital investment is required, the site should be suitable for use over a sufficiently long period to enable capital amortisation to be effected at normal market rates.

(ii) Environmental acceptability - The site selected should be environmentally acceptable for the particular type of waste envisaged. It should also provide for a simple, cost-effective design.

(ii) Social acceptability - The site should be socially acceptable to the majority of the community.

It should be clear that objectives two and three fall into the domain of EIA. The techniques of EIA are applied at a number of stages leading to the establishment of a waste disposal site.

Site Selection - Normally one starts with a number of possible sites. Even at this stage, a decision is required as to which sites to select as candidate sites. This decision can be facilitated by a preliminary EIA. The preliminary EIA at this point should be largely a desk study. Issues such as a description of the environment of the potential site (baseline description) its size and general location are considered. The description of the environment of the potential sites could come from personal knowledge of the area, books or other reports previously written. It is not necessary to undertake any elaborate study at this point.

Size should be considered in relation to the intended life of the disposal site bearing in mind whether or not compaction or burning will be allowed. Generally, the size of sites where compaction and/or burning is not possible would be larger than where such activities are allowed, for the same life span.

The general location of the waste disposal site is determined by the waste generation areas to be served. The disposal site should be as closed to the generation point as possible in order to minimise transport costs.

After candidate sites have been determined in the above manner, the real work now is to eliminate unsuitable sites.

Elimination of Unsuitable Sites: The information gathered about the candidate sites is now utilised to eliminate the most unsuitable sites as follows:

- ❑ Disposal sites must not be close to airports as dumps attract birds which may prove hazardous to aircraft. A distance of I km is the minimum recommended separation between a dump and an airport.

- A disposal site must not be below the 1-in-50 - year return period flood level. This condition would exclude dry riverbeds, wetlands, swamps, pans and floodplains from consideration as waste disposal sites.

- Geologically unstable areas such as fault zones, seismic zones and dolomite and karst areas where sinkholes and subsidence are likely must be excluded.

- Sensitive ecological and/or historical areas. These include nature reserves ecological and cultural or historical significance. Waste disposal sites must not be sited in these areas.

- Catchment areas for important water resources must be avoided.

- Flat areas must be avoided as they would not allow drainage control to prevent up-slope and runoff from entering the waste body.

- Areas characterised by shallow or emergent groundwater, e g: swamps, pans, and springs where a sufficient unsaturated zone separating the waste body and the groundwater would not be possible. There should a minimum 5m unsaturated zone between the waste and the groundwater. Areas that do not meet this specification must be eliminated.

- Areas of groundwater recharge must be avoided.

- Areas overlying or adjacent to important aquifers must be avoided.

- Areas to which the community attaches some importance whether tangible or not must be avoided. This will include residential areas, cemeteries and parks.

- Areas upwind of a residential area are also excluded.

This exercise should eliminate most of the unsuitable sites. The remaining sites are then subjected to an impact assessment.

Feasibility Study: The level of the EIA activity at the site selection stage is increased at the feasibility stage. At this stage, design of the facility is involved and so the EIA process is utilised to evaluate design options as well as a more detailed assessment of the proposed site(s). However, the EIA is still at the preliminary stage.

Final Stage: At the final decision point, EIA is very crucial to making the right choice of site. The objective of the EIA process at this stage are two-fold:

- To identify and evaluate the various ways in which a proposed waste disposal site will affect its receiving environment; and

- To assist the designer in addressing any identified impacts by means of manipulation of the appropriate design parameters.

This stage will culminate into an environmental impact report in which short and long-term impacts will be clearly spelt out and measures to mitigate the adverse impacts are also articulated.

Monitoring: Once the facility has been constructed and is operational, it needs to be monitored. Elements such as leachate or runoff emanating from the site, gas discharge, air quality, impact on nearby vegetation and others are routinely monitored and compared to the preproject situation. Particular attention is paid to groundwater contamination because, depending on the climate, there can be a continuous stream of leachate in to the saturated zone. Due to this, EIA reports normally include the construction of monitoring boreholes close to the site of the dump.

Another area where attention is also focussed is surface runoff. Surface runoff from waste disposal sites is like a flowing cesspit. It has a great potential to contaminate large areas even far away from the dumpsite. For this reason, cut off drains should be constructed on the upslope side of waste dumps and surface runoff should be regularly monitored.

The monitoring routine must be specified in the EIA report. The report should also provide threshold values of the monitored items beyond which alarm bells would ring. For effective management, the results of the monitoring exercise must be reviewed periodically by the authority tasked with supervision of waste disposal sites in the municipality.

Decommissioning: Waste disposal sites eventually get filled up. At this stage where the site is closed, EIA plays an important role. The site would have to be remedied and rendered useable for other activities. The particular activity that can be carried out on the site has to be decided in such a way as to minimise adverse impacts. The decision on how best to use a decommissioned dumpsite is a typical EIA process.

Monitoring, however, continues even after decommissioning for varying periods of time. In some US states and certain European countries monitoring, can be carried on for as long as 30 years after decommissioning.

The Role of Modelling in Waste Management

The above description of EIA procedures in waste management can be modelled on a computer. You will be hearing about the use of computers in environmental management at a later date. However, let us take a brief look at models in waste management.

The main principle upon which all EIA is based is the concept of a system. The environment is organised as a system. There are inherent response mechanisms that trigger off reaction to stimuli created by action in one part of the environment. Considering the environment as a system, therefore, provides the mechanism by which the environment can be 'taken' apart, analysed and synthesised again. Thus by adopting the system viewpoint, we are able to predict what the likely impact of waste disposal site in any part of the environment might be. Then appropriate remedial action can be considered even at the stage of planning of the site.

Computer models provide a ready tool by which all the intricate environmental processes that have a bearing on waste disposal can be unravelled. Such models can be based on any part of the environment, which is of concern in terms of impact. Most are based on groundwater for obvious reasons. Recently, such a model was developed for the South African Water Research Commission using only geohydrological criteria. It is used in the assessment of waste sites suitability in terms of groundwater. It is called WASP (Waste-Aquifer Separation Principle).

Conclusion

The above discussion has illustrated the vital role that EIA plays in the process of waste disposal and management. The involvement starts at the conception stage of the project through to its operation. It need not be over emphasised, therefore, that EIA is an important tool in waste management.

References

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