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Landfill mining as a remediation technique for open dumpsites in India

A. Dubey [a,*], M. Chakrabarti [b], D. Pandit [c]

[a] *Research Scholar, Ahmedabad, India*
[b] *Student, CEPT University, Ahmedabad, India*
[c] *Associate Professor, CEPT University, Ahmedabad, India*

Abstract

The study hereby is an attempt to evaluate the process of landfill mining as a remediation technique for Municipal Solid Waste dumpsites, which are an inherent feature of each city of note, in the developing countries. These dump sites, more often than not, nothing more than a piece of land where all of the city's refuse is collected, are threats to the environment and consume valuable land, which could otherwise be converted into a revenue generating asset. Many cities are extremely short on land and some are also facing the negative impacts of these dumps in terms of water contamination, air pollution and land degradation to name a few. Encouraged by the positive outcomes of studies carried out earlier, this study was aimed at applying the idea on a broader scale in terms of encompassing a number of cities across the country. The solid waste characterization for the cities taken into the study was obtained and the amount of solid waste deposited in the landfills of these cities was estimated. Based on these, various revenue generating fractions were identified. From the current market cost of the land used as dumpsite and the material salvaged by the landfill mining operation, the benefit-cost scenario was judged. It was found that for most of the scenarios the overall operation of mining the landfills was economical in terms of cost, but the intangible benefits, which cannot be monetized, are expected to be far greater than the rest.

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* Corresponding author.
E-mail address: dubey.amit12@hotmail.com

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1. Introduction

The Pirana dumpsite at Ahmedabad, Gujarat, has been witnessing non-segregated, open dumping of Municipal Solid Waste (MSW) since over 30 years and has been the centre of many controversies relating to various negative environmental impacts including contamination of the surrounding ground water, and the odour that is developed is an ever present irritant. The situation in other cities is not much different either. Open dumpsites, unlined areas, used for disposing off unsegregated MSW are constant entities in every city in India. All of these sites are either already polluting, or are extremely potent sources of pollution posing threat to the air, water and the land quality, and the environment at large.

A study on Surface Water Quality with respect to Municipal Solid Waste Disposal within the Imphal Municipal area, Manipur carried out in February 2014, concluded that the water quality in the river Nambul and other nearby surface water sources was being adversely affected by the open dumping of MSW. There was observed an increase in the pH, TDS (Total Dissolved Salts), Temperature, conductivity and BOD, all indicative of pollutants being introduced into the water.

A similar study on the physico-chemical properties and heavy metals in soils of municipal waste dumpsites at Allahabad, India, carried out in 2012 revealed that there was excessive heavy metal contamination in the soil below the dump, which is indicative of potential ground water contamination by the way of leaching of these metals into the aquifers underlying the dump.

In 2007, an investigation by National Solid Waste Association Scientists was carried out at Mindspace, Mumbai. Mindspace used to be a low lying area in the North-Western portion of Mumbai, and was used as a dumping ground for MSW for some time. The area deployed for this purpose was 19.22 ha and used to receive approximately 1100 TPD (Tons per day) of MSW which included putrefied waste, Biomedical Waste, Hazardous Waste, C&D (Construction and Demolition) Waste, animal manures and animal carcasses. The site was later on taken up for commercial and residential development, without any scientific treatment or post closure management being taken up before that. This led to the anaerobic decomposition of the underlying waste and continuous emission of gases like Hydrogen Sulfide (H_2S), Methane (CH_4) and Mercaptan (CH_3HS). The adverse effects of these are being observed now in the Mindspace region; commercial setups are having constant server failures and are forced to replace equipments, which are proving to be very significant financial burden to them; continuous breakdown of electronic appliances in residential places and deterioration of fabric paints used by the artists. Apart from this, gardens built over dumpsites, though appeasing to the eyes superficially, actually keep emitting gases like CH_4, H_2S, CH_3HS, etc. in high concentration, which pollute the air significantly. Thus, there is enough scientific evidence that goes to show that open dumpsites are ticking time bombs and should be remediated in the best manner possible at the earliest.

2. The Study

2.1 Objective

The objective of the study was to assess the suitability of landfill mining as a remediation technique for open dumpsites used for the disposal of Municipal Solid Waste in state capitals and metro cities around India.

2.2 Scope of Work

The study majorly focused on assessing the potential of resource recovery from the MSW dumpsites of various cities in India. The cities included in the study were from the list of metro cities and state capitals in the country.

The study included establishing the dumpsite characterization for each of the cities taken into consideration. This was followed by assessment of the probable revenue generation opportunity that would be presented by the various kinds of refuse fractions that were to be encountered in the dumpsites. A cost benefit analysis was then carried out based on the resource reclamation and investment made for the same, based on which the feasibility of