

# Environmental Impacts of Improper Solid Waste Management in Developing Countries: A Case Study of Bani Walid City, Libya

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## Abstract

In Libya, refuse dumpsites can be found both inside and outside cities, and open burning of these dumps is a frequent practice, mostly to reduce waste and odour. Open garbage incineration releases harmful fumes into the atmosphere. Solid waste dumps have a major negative impact on the environment in poor countries. Improper solid waste disposal has a negative environmental impact that may be seen almost everywhere in the developing countries. The solid waste management situation in Libya is deteriorating day by day due to a lack of effective planning and finance. Today there is growing focus on management of municipal solid waste. This research concentrates on municipal solid waste that is mainly composed of paper, plastic and food waste. Nonetheless, some environmental and human health issues are attributed to improper management of municipal solid waste. As such, there is a dire need to look into present practices as well as future opportunities in terms of solid waste collection, management and disposal. With regards to the present situation, this investigation suggested a reversal approach for management of municipal solid waste. This research regarded municipal solid waste collected in Bani Walid to have immense potential for generating wealth. As such, for future investigations, this study suggests incineration and anaerobic treatment for municipal solid waste, considering the hostile environment.

## Keywords

Solid Waste Management, Bani Walid City, Environmental Impacts, Land Pollution

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## 1. Introduction

Waste generated from commercial and residential areas as termed as municipal solid waste (MSW). This excludes those that originate from hazardous properties such as construction and industrial premises [1]. Despite the fact that they also occupy landfills, materials such as demolition and construction debris, non-hazardous industrial waste and municipal waste water treatment sludge are not regarded as MSW [2, 1]. Various changes have been done in the management of municipal solid waste during the last six decades as it depended on the specific problem and

requirements of different regions and countries. In Benghazi (Libya), a research pinpointed that the rising issues of solid waste are attributed to the rapid urbanization, industrialization and population growth [3]. Currently, MSW management is receiving growing attention from the public, since ineffective waste management often causes environmental and sanitary issues [4-6]. MSWM's major tendency is to enhance the sustainability of waste management efforts. Waste recycling, reduction, treatment and source separation are carried out in order to enhance MSW as well as to further redirect materials away from land disposals in a more integrated manner [4, 7]. A

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significant role in Libya's sustainable development will be held by integrated solid waste management (ISWM) system that includes reusing, reducing, recycling and disposal of waste material. This is owing to its various advantages, which includes its ability to minimize pollution generated by discharge of untreated waste [8, 9]; indirect conservation of energy [8]; and minimizing depletion of the planet's limited natural resources [5, 10, 11, 12]. Currently, the ISWM is regarded as an enhanced management system in which the solution which is most economical and environmental-friendly is handpicked for each case, without any regards to hierarchy of waste [13], and to be the key towards a good MSW process [14]. Nevertheless, there are various factors that influence the implementation of ISWM system in developing nations and Libya in particular, such as country's economic status, strategies in management of environment, economic and technological feasibility, environmental requirements, education and environmental awareness among the citizens and energy policy [6, 15, 16, 17]. Several advanced industrial nations including Japan, United States of America, Sweden, Germany and the Netherlands have showed excellent outcomes in management of solid waste and comprehensive utilization of resources [18, 19, 20]. Moreover, instead of disposal via landfills, composting and incinerating of organic waste has become the main approach of solid waste treatment. Integrated solid waste management (ISWM) is now the most commonly utilized and practiced concept for solid waste management [11, 21]. It has been termed as "the selection and application of suitable techniques, technologies and management programs to achieve specific waste management objectives and goals" [22]. Arguably, IWM is a holistic method of resource and environmental management [23, 24]. In order to determine the developing nations' best MSWM approach, Life Cycle Assessment (LCA) methodology has been used, especially considering the fact that the MSW generated is often left in unregulated sites of dump, in the absence of any biogas capture or liners. This is towards the goal of achieving health and environmental regulation, social acceptability and economic reliability [25-28]. The development and implementation of an ISWM plan is generally a local activity that entails selection of mixture of technologies and alternatives that fit the alternating local waste management needs, while maintaining adherence to legislative mandates.

## 2. Solid Waste Management Issues in Bani Walid City

In Bani Walid, there are many adverse effects as a result of poor solid waste management [29]. The following

Figure 1 shows the lack of proper solid waste management plans and insufficient funding and shows that some collected solid waste are unhygienically left on the group in certain areas of Bani Walid city. Solid waste management authorities are also very concerned about masonry bins in the Bani Walid city.



Figure 1. Lack of proper solid waste management plans.

## 3. Negative Environmental Impacts in Bani Walid

Investigations show that poor solid waste management systems in Bani Walid City have resulted in the following negative environmental effects. Figure 2 shows that dispersed solid waste from illegal open dumps frequently block sewers and drains, which results in flooding and dirty conditions. Air pollution arises when the collected solid wastes are openly burned. The uncollected solid wastes originating from several sites of the city are dampening efforts to maintain the cleanliness of open spaces and streets [30]. Polythene bags that are left discarded are becoming an aesthetic nuisance and endangers grazing animals. Traffic blockage also arises due to open dumps by the roadside and large sized solid waste storage containers. It appears that there are inadequate separate waste collection facilities that are provided by the city government [31]. Thus, most often, many harmful items such as razor blades, healthcare wastes, broken shards, aerosol cans, industrial chemicals and potentially explosive containers may poison or injure scavengers or school going children. In Bani Walid, trucks that are exposed are utilized without covers.

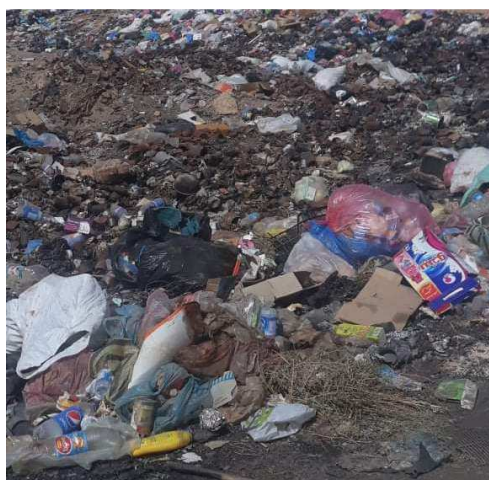


Figure 2. Blocked drains due to solid waste dumps.

#### 4. Solid Waste Collection Practices in Bani Walid City

Despite the recommendation of sanitary landfilling with leachate and gas collection, collected solid wastes are still not treated and mostly disposed in an unsatisfactory manner [32, 33]. Since open dumping is the single option in Bani Walid city, the current approach of waste disposal fails to meet the requirement for sanitary or controlled landfilling Figure 3. This dumpsite, which has almost reached its maximum capacity, is positioned at about 8 km from the city, towards the south. Another new dump site has been identified by the EGA, which is located more than 20 km from the city. However, there is an absence of any reclamation plan if the old dumping site will be shut down or for the actual pattern of exploitation. Solid waste is only levelled by bulldozers in a disorganized pattern. In addition, there is poor regulation of the entry of ragpickers who rag pick in a hazardous manner. The areas are also not fenced, thus lacking any control towards unauthorized entry of people or animals.



Figure 3. Pen burning of dumped solid waste.

#### 5. Conclusion

The environment in Bani Walid city is negatively affected by open dumping of municipal solid wastes. Storms and strong winds are spreading filth and dust from open dumps of solid waste to nearby areas. The odor emitted from these dumps are affecting nearby areas. The organic matter of municipal solid waste causes the continuous release of toxic gases to the atmosphere. Leachate permeating rainwater via the open dump has contaminated resources of ground water. Human health and sanitation are gravely threatened by open dumps of solid wastes. Rising need of landfills owing to huge generation of municipal solid waste requires wide areas of land. This then exacerbates the environmental issues. As such, a reversal approach has been recommended in an effort to reduce municipal solid waste at the source. The cost of transportation and segregation could be lowered via this method. Moreover, this investigation recommends incineration method for safe management of municipal solid waste. The ashes generated from this approach can be integrated into the building of durable and sustainable concrete. Municipal solid waste ash is essentially a pozzolanic material that holds the potential of improving the traits of concrete.

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