

HEPCA's Solid Waste Management Plan of Hurghada

Hurghada's solid waste management plan was formulated with a great deal of consideration for the specific characteristics of the city and the local environment. The plan reflects the city's sensitive surrounding ecosystems, its urban structure and its socioeconomic structure. Plans have been specifically devised for varying districts on the basis of population density, urban structure, available infrastructure, and the socioeconomics of the community. This process has produced an efficient & comprehensive collection plan, which is environmentally conscious and financially sustainable and is aware and flexible to seasonal fluctuations. From the experience gained in the *Hadaba pilot project* the plan stresses on community participation.

Street surveys were conducted throughout the city of Hurghada, the surveys provided information concerning the urban structure of each district, entailing the type of buildings the number of floors, apartments per floor, occupancy rates, infrastructure status, road quality and size in addition to waste production estimates. Surveys were also conducted to develop solid waste profiles for different quarters.

Some of the maps formulated with the statistics gathered for consideration during the preparation of the solid waste management plan are shown here.

The population density distribution within the city highlights the requirements of different areas and estimates of waste production with the consideration of different activities (i.e. residential, commercial, and industrial) and in accordance to the economic standards of each district, as demarked in the map which highlights the different land uses throughout the city.

This map highlights the overall structure of Hurghada as a coastal town stretched longitudinally along the coastline, linking development further inland with the rate of development on the shore. Leading to the conclusion that the 9.8% rate of population growth will decrease in the upcoming future as the coastline becomes saturated with development whose increase fuels development further inland as most of this development serves the growing need for homes and services for the touristic industry that occupies the coast and is the main source of job creation and attraction of migrants to the city.

The next two maps highlight the future needs of this rapidly growing city; on one hand it is evident that the density of construction at this point of time entails a known increase in waste production in the upcoming two years. On the other hand the origin of migration coupled with the socioeconomic profiles of the different points of origin provides us with an estimate of future waste production.

Different collection methods are utilized in different urban structures in order to maximize efficiency. There are four modes of operations, one for the touristic quarters, one for the residential commercial quarters, and the third for the informal settlement quarters, and the last is to cover the city streets and small industrial district.

Mode of Operations

1. Touristic Quarters

Approximately 150 resorts and hotels in the city of Hurghada, covering an area exceeding 55 km², a majority of which occupies the forefront of the coastal strip, produces approximately half of Hurghada's solid waste. Touristic operations classically produce large quantities of organic waste; it is estimated that of the waste produced by hotels, 60% is organic waste. Organic waste cannot be effectively compacted; its compaction leads to squeezing out the liquid content with little impact on volume. While the remaining 40% of inorganic waste customarily contains a high proportion of recyclables.

Due to the above mentioned profile of touristic waste, resorts are required to segregate their wet and dry waste. Two different trucks are responsible for collection from each resort, both collecting twice a day: an enclosed truck for the organic waste, and a 9m³ compactor, with a compaction ratio of 3:1 which is only utilized to 2:1, in order to preserve the quality of the recyclable materials, in two sectors

where hotels are highly concentrated it has proven more efficient to utilize 18m³ compactors in order to optimize the collection scheme. A total of eighteen trucks operate in this quarter.

2. Structured Residential and Commercial Quarters

The residential and commercial quarters of Hurghada are diverse in nature and layout, many different settlement structures are present in Hurghada; informal settlements lack any form of urban planning having been classified as an independent sector. The remainder of residential areas have planned road infrastructure even if not existing at this point of time, and sufficient maneuvering space for large vehicles. This classification also includes Hurghada's industrial zone and administrative buildings; all of which can be managed utilizing the same collection methods.

Large compactors are utilized in collection from these quarters, namely compactors with a net carrying capacity of 16m³ and 18m³; a total of sixteen compactors have been acquired, it is estimated that only nine of which will be required in the first year and a half of the project. The compactors collect waste from 770 liter containers, which have been made available throughout Hurghada. Containers are available within a maximum of 75m from every home in the city and emptied at least twice per day; compactors are all equipped with a lifting device designed to lift and empty the provided containers. A total of 900 of these containers have been placed in the streets of Hurghada. In every residential district workers on the ground insure that all waste is in the containers and that side streets are regularly swept.

At a later phase an adjusted system shall be introduced in some of the low population density districts; where 240 liter containers shall be placed at each unit and collection shall take place from door to door; the compactors are also equipped to lift these containers.

3. Informal Settlement Quarters

There are five informal districts in Hurghada that occupy more than 1.5 million square meters that host approximately 60,000 people. These districts have no urban planning or structured infrastructure. Most of the roads in this quarter are unpaved, filled with obstacles and often too narrow for vehicles to traverse. A unique collection methodology has been implemented in these districts; small tippers with a capacity of 2m³ are responsible for door to door collection, and tip the collected waste at centrally located 12m³ containers. A total of ten small tippers work in these areas and fourteen large containers are utilized in the system. Trucks equipped with a hook lift place an empty container and lift a full container from each of these locations every day or every other day depending on the need. Once the container is on the truck it can operate as a tipper in order to empty at the landfill. Workers, on the ground in all these districts, prevent the build-up of any pileups and channel the waste efficiently through the system.

4. Roads

A weekly schedule has been devised for the mechanical street sweepers to cover the major roads of the city. Main streets of the urbanized areas have manual sweepers present on a daily basis, equipped with hand carts that carry two 120 liter containers, a broom, fork and shovel. Roads that have little or no urbanization around them have a team of five to six workers to support the mechanical sweepers to remove any waste from pavements and the medial strip.

The equipment for this sector includes two mechanical street sweepers, two loaders, and a tipper, in addition to more than two hundred handcarts for manual street sweeping.

Operational Structure

The operational framework divides the city into four managerial sectors, one touristic and three geographic managerial sectors. The division of the city into these sectors facilitates the management of the work force and equipment. To have the touristic quarters under one manager facilitates the operation and maintenance of the vehicles specialized in this sector and as well a great majority of the informal quarters are confined to a single managerial sector.

The touristic sector is responsible for all the resorts in the city and is subdivided into two supervision sectors. The three geographic managerial sectors are displayed in the figure below: they are simply the northern, central and southern managerial sectors, each of which is subdivided into between six

and nine supervision sectors. The smallest of the sectors, the northern sector, assumes responsibility over the roads sector.