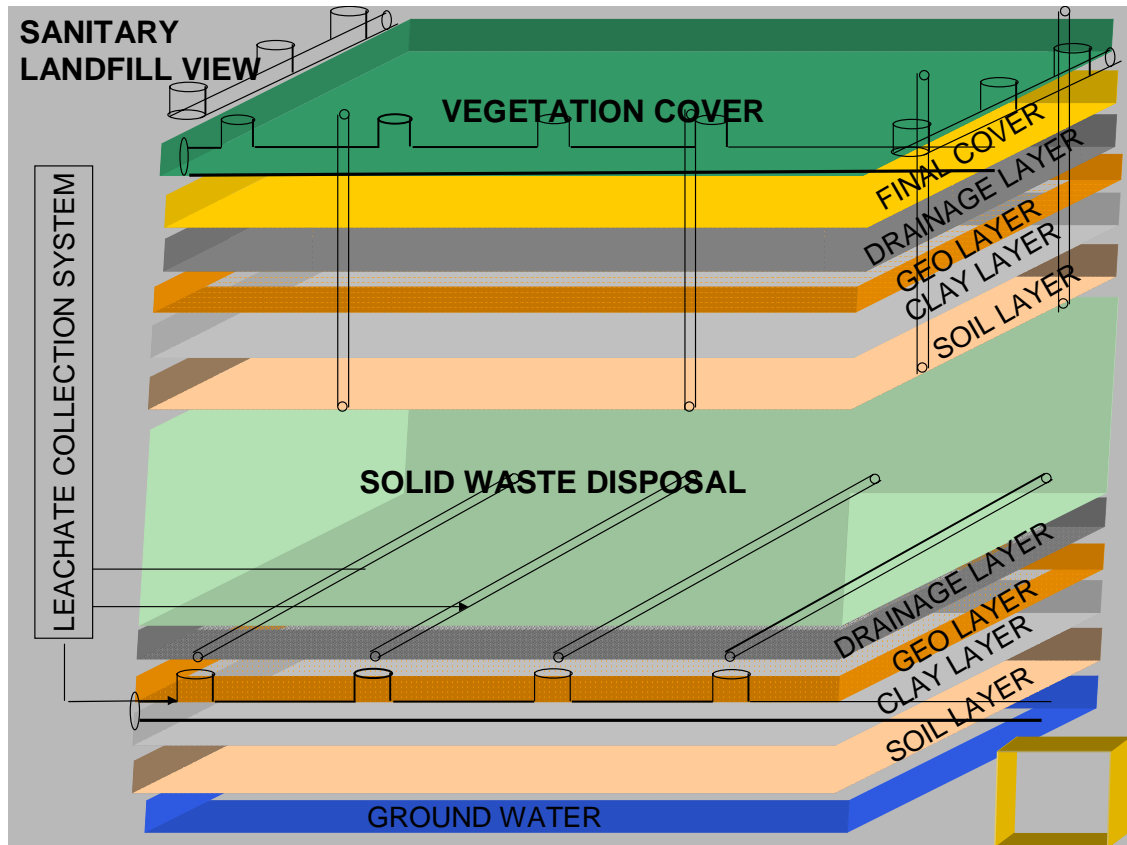


## Guidelines for the Identification and Establishment of a Landfill Site at TMA/District Level, Sindh, Pakistan



**Prepared by:**

*Muhammad Khalid  
Consultant on Environment & Solid Waste Management,  
Sindh Devolved Social Services Program,  
Government of Sindh, Karachi*

## **Guidelines for the Selection of a landfill site**

The following criteria for site selection are provided as guidance. A proposed landfill site can be selected even though it does not meet each of the following criteria. Engineering design can mitigate inadequate site conditions-but at a cost. Other literature for the selection of landfill site should also be considered before declaring a landfill site.

- Landfill shall be designed at least for 10-30 years therefore adequate land area and volume shall be provided for sanitary landfill capacity to meet projected needs for at least 10 years, so that the cost in access roads, drainage, fencing, building work if constructed at the landfill site and weighing bridge stations are justifiable
- A landfill site must be within distance of 25 Kilometer from the center of a town, if the average round-trip haul (travel) distance is more than 50 Km then garbage transfer stations will be constructed.
- Garbage transfer station (GTS) (Garbage transfer station GTS means where the garbage is primarily stored and then transported to landfill/dumping site). Transfer stations are centralized facilities where the waste is unloaded and collected, from scattered collection vehicles and reloaded in to longer vehicles for transport to a final disposal point or processing sites. Waste Transfer Stations are frequently accompanied with sorting units for separation of recyclable material. Compacting units for Solid Waste compaction further transported to final Disposal Point are also installed at transfer stations. If the hauling distance exceeds to 160 Km than rail hauling will be adopted (see in transfer station guidelines)
- The site is not within 1 Km of socio-politically sensitive sites where public acceptance might be unlikely (e.g., Mosques, Churches, graveyards, schools, hospitals, historical places, play grounds etc)
- Population shall be more than 200 meter away from the boundary of a landfill site.
- Landfill site shall not be sited near any existing or planned drinking water protection and catchments-areas.
- Landfill site shall not be located at an unfavorable local hydrogeological situation, e.g. springs or drinking water wells within very close distance to the chosen area

- Landfill site shall not be advised where the access roads are of very poor quality and the garbage collection vehicles has to pass through densely populated areas
- There should be no private or public drinking, irrigation or livestock water supply wells down-gradient of the landfill boundaries if at risk from contamination, unless alternative water supply sources are readily and economically available
- No significant protected forests are within 0.5 Km of the landfill cell (in landfills, a portion of refuse that has been compacted and then surrounded with cover material. Daily cover is placed over the landfilled materials at the end of each day to complete the cell) development area. No major lines of electrical transmission or other infrastructure (e.g., gas, sewer, water lines) are crossing the landfill cell development area, unless the landfill operation would clearly cause no concern or rerouting is economically feasible
- There is no underlying limestone, carbonate, or other porous rock formations that would be ineffective as barriers to Leachate and gas migration, where the formations are more than 1.5 meter (m) in thickness and present as the uppermost geological unit.

**Landfill site shall not be developed in the following areas**

- a) The site shall not be 3-5 Kilometer nearer to the airport area
- b) The landfill site shall not be located at the areas which are susceptible of flood plains, wetlands, fault zones, seismic zones, and unstable areas.
- c) The site should not be near water catchments area, surface water and other sources of fresh water
- d) The landfill site shall not be constructed in low permeable soil areas which allows a fast penetration and permeation of water or possible Leachate to the next aquifer (ground water pollution)
- e) Areas with unstable ground like swamps, moors, swallow holes, collapse sites, deep digging
- f) Areas nearer than 200 meter to populated areas
- g) National parks, natural protection areas and nature monuments, historical, religious or other important cultural sites or heritage
- h) Near very intense agricultural use, mainly small scale farming
- i) Extremely bad access, i.e no existing access roads to the selected area which may involve long hauling distances (5 km) from main roads to the surroundings of the site and to the site itself
- j) Access roads of a very poor quality or passing through densely populated areas

- k) Too little available volume

### **Site appropriate for Landfill**

- a) The site must be accessible from major roadways
- b) The site should be large enough to accommodate the TMA wastes for a reasonable time of 10 to 30 years
- c) The ground water table should be atleast 1 m below the foundation of landfill
- d) The site must be located in an area where the landfill's operation will not detrimentally affect environmentally sensitive resources
- e) The site should have an adequate quantity of earth cover material that is handled and compacted
- f) The site should have enough space to accommodate workshop area, office building, mini lab, weigh bridge, recycling activities etc
- g) Area for the intermediate storage of hazardous waste, e.g. industrial waste and medical waste which must not be mixed with household waste and which will have to be taken away to a special landfill for hazardous waste
- h) Fence around the site; instead of a wire fence a living fence, i.e. a row of bamboo or cactus
- i) Construction and equipment to collect (and treat) the biogas produced in the landfill during the process of decomposition of the refuse

## **Steps for the up-gradation of the Existing Dumping sites to engineering landfill and sanitary landfill in Sindh**

### ***Stage 1: From open dumping to "controlled dumping."***

1. This involved reducing the working area of the site to a more manageable size (compact your process)
2. Daily or weekly excavation of ground (1 meter to 2 meter) in the form of cell for the burial of waste, daily burial of waste in the excavated pit
3. Daily covering of solid waste disposed off in the pit with soil
4. Stopping open burning of waste at the dumping site
5. Agreeing about rules of on-site work with scavengers if they cannot be removed completely.

### ***Rules for Scavengers***

- I. Register all the scavengers working on the dumping ground
- II. Provide them access with identity card
- III. Restrict scavengers to not put fire on waste at dumping site
- IV. Restrict scavengers to wear gloves, caps and boots during extraction of material
- V. Scavengers should not allowed to life at the dumping site

### ***Stage 2: From controlled dumping to "engineered landfill."***

1. Gradual involvement of engineering techniques and practices
2. Surface drainage system for the collection of storm water from the landfill site. Storm water shall be collected in storm water drains and no rainwater shall enter into the landfill site
3. Provision of clay liner to stop Leachate penetration in subsoil strata
4. Provide layer of coarse aggregate for the safe collection of Leachate
5. Provide perforated pipes for the collection of Leachate connected to the Leachate collection system in lagoons
6. Install Leachate collection system in lagoons and provide proper gas vents
7. Proper covering of the waste with soil daily cover,
8. Spread and compact solid waste in thin layers
9. Prepare new sites of landfill with excavation equipments, and try to dig deep cells if possible
10. No open burning at the engineering landfill site
11. Make computerized weighbridge available at the landfill site
12. Gradually start fencing of the engineering landfill site, so no one can be allowed to enter into working area
13. No scavengers shall be allowed to collect valuables from the landfill site

14. Stage 2 represents the longest period in the evolution towards sanitary landfill techniques.

***Stage 3: From engineered landfill to "sanitary landfill."***

1. Make deep sanitary landfill site of atleast 10 meters deep
2. Layer by layer construction of sanitary landfill site, soil layer, clay layer, geo-layer, and drainage layer, Leachate collection piper between the geo-layer and drainage layer, waste cells, soil layer, clay layer, geo-layer, drainage layer for storm water collection, final cover and vegetation.
3. Sanitary landfills are more likely to have the pre-planned installation of landfill gas
4. Drawings of sanitary landfill is available
5. Environmental monitoring of Air, Noise and Leachate from the sanitary landfill site as well as ground water monitoring through the test wells to check the quality of ground water of the nearby area of sanitary landfill site
6. Sanitary landfills are more likely to have the pre-planned installation of landfill gas control or utilization measures,
7. A highly organized and trained work force,
8. Detailed record keeping of incoming waste, Leachate generation and treatment, energy consumption (electricity) etc
9. Advanced equipment and resources required to achieve and maintain high standards of operation