

LANDFILL FOR INERT WASTE

APPLICATION OBJECTIVE:	<ul style="list-style-type: none"> - Landfill/Deposit site for waste material of inert/mineral type with no potential danger for the environment - Inexpensive, controlled deposition of materials that require few measures to ensure the protection of the environment.
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OUTLINE ON APPLICATION FRAMEWORK

PARTICULARLY APPLICABLE FOR WASTE TYPES

Glass	X¹	Light-weight packaging	Biowaste
Paper/paperboard		Mixed household waste	Bulky waste
Lamps		Textiles	Electrical & electronic waste
Scrap metal		Wood waste	C&D waste
Waste oil		Old paint & lacquer	Waste tires
Hazardous waste			
Branch specific waste	X	e.g. certain plastic materials which cannot be recycled or otherwise treated	
Other waste material	X	such as excavated soil and solid waste consisting of earth and earth-like products, concrete, cured asphalt, rock, bricks, and land clearing debris or mineral residues and slags from other treatments	

SPECIAL CHARACTERISTICS AND REQUIREMENTS OF THE APPLICATION:

Aftercare requirements:

Aftercare comprises first of all safeguarding of the area, regular inspections and monitoring of the wells and other control facilities.

Protective needs:

Protection against the release of harmful substances into water, soil or air, measures to prevent unauthorized access and use of the facility

Financing options:

Financing can be supported by a landfill tax, fees and charges

RESTRICTIONS OR INFLUENCE OF EXTERNALITIES ON THE APPLICATION:

Infrastructural conditions:

For the erection must be considered that this type facilities

- do have high spatial needs with specific geological and hydrogeological requirements
- must be erected/located in sufficient distance to dwelling areas
- need to be accessible via roads or railway

Climatic conditions:

- no limitations regarding the erection and operations due to climatic influences

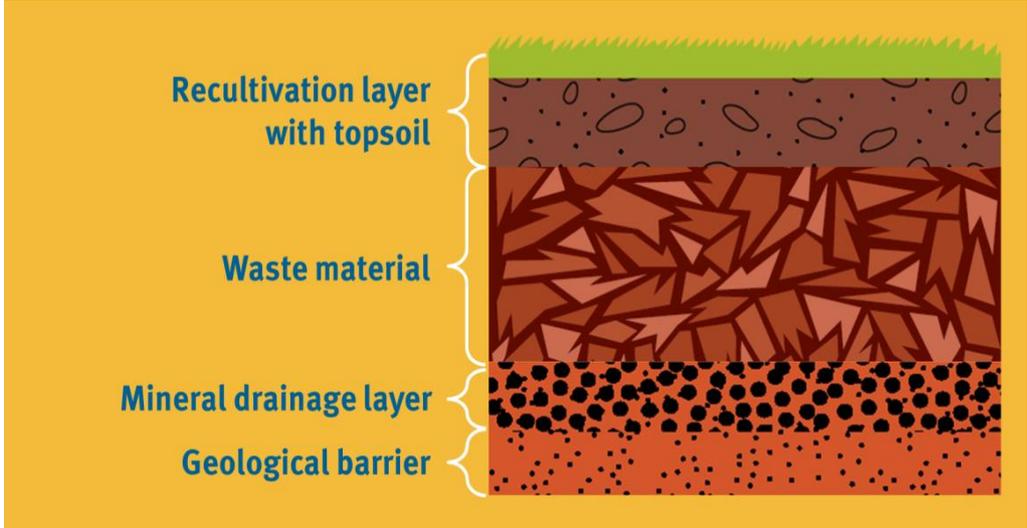
TECHNICAL DETAILS

GENERAL OVERVIEW

ABSTRACT

These landfills are designated areas and rather simple engineered facilities for the deposition of mineral matter or materials that are inert in their character and pose no potential danger for the environment. Often this can be excavated sites or abandoned quarries or open pit mines which meet the basic geo-hydrological requirements.

¹ only temporal deposition, options that lead to the material recycling or thermal utilization of this waste should be prioritized

<p>BASIC REQUIREMENTS</p>	<p>Requirements of location: Suitable geological and hydrological conditions with</p> <ul style="list-style-type: none"> - an underground that should have a permeability of 10^{-7} m/s or lower in an undisturbed state (underground protection) and a thickness of more than 1 meter - a mineral drainage layer of at least 30 centimeter - sufficient distance to the groundwater table.
<p>EXPECTED RESULTS</p>	<ul style="list-style-type: none"> - long lasting and controlled deposition of waste materials with only few needs for special protective measures
<p>SPECIFIC ADVANTAGES</p>	<ul style="list-style-type: none"> - rather easy to realize and inexpensive - to be covered with a recultivation layer after closure - very little aftercare needed
<p>SPECIFIC DISADVANTAGES</p>	<ul style="list-style-type: none"> - space demanding
<p>APPLICATION DETAILS</p>	
<p>TECHNICAL SCHEME</p>	<p>Landfills for inert waste shall consists of minimum 3 operational areas:</p> <ul style="list-style-type: none"> - area of entrance - area of storage - working area <p>In addition, following constructional measures are mandatory to operate a landfill for inert waste:</p> <ul style="list-style-type: none"> - area shall be fenced to prevent an access of unauthorized persons, - access roads shall be designed for heavy goods vehicles, - measures shall be applied that prevent an inflow of surface water of neighboring sections into the landfill body, especially during heavy rain (e.g. ditches) <p>The basic structure of a landfill for inert waste is presented in Figure 1.</p> <p>Figure 1: Basic structure of landfill for inert waste (according to German landfill ordinance)</p>  <p>The diagram illustrates the vertical structure of a landfill. From top to bottom, it shows: a thin green layer of grass; a brown layer with small circles representing topsoil; a thick layer of dark brown, angular waste material; a layer of black dots representing a mineral drainage layer; and a bottom layer of orange-brown soil representing a geological barrier. Brackets on the left side group these layers into four categories: 'Recultivation layer with topsoil' (grass and topsoil), 'Waste material' (angular waste), 'Mineral drainage layer' (black dots), and 'Geological barrier' (orange-brown soil).</p> <p>Once the deposition of waste material is completed in a certain section of the landfill or in the overall, a surface sealing should be erected in the following way:</p> <ul style="list-style-type: none"> - if necessary a leveling layer of 0.5 meter thickness - recultivation layer of 1.0 meter thickness that consists of soil and, if necessary, a drainage layer of 0.3 meter that is situated below the recultivation layer

SCALE OF APPLICATION	The location of the deposit/landfill should be chosen to allow active operations for at least 10 years, better 15–20 years, in order to ensure the amortization of the investment for the erection and closure of the site (Access roads, drainage system, fencing, weighing platform, etc.). Size of the area and of the installations must be determined depending on the local circumstances, size of the collection area resp. the quantity of material to be deposited
INTEROPERABILITY	A landfill for inert waste serves the safe storage and long lasting deposition of materials that pose almost no risk to the environment. Such facility can be combined with any suitable installation for the pre-treatment of materials to be deposited.
OPERATIONAL BENCHMARKS: RESOURCE CONSUMPTION	
ENERGY BALANCE	<p>Input:</p> <ul style="list-style-type: none"> - energy, e.g. fuel for landfill equipment, electricity <p>Output:</p> <ul style="list-style-type: none"> - no possibility for energy recovery due to the mineral input material which generates no or very little landfill gas
CO ₂ -RELEVANCE	- not of relevance since no gas emissions or very low amounts can be expected
AIDS AND ADDITIVES NEEDED	- cover and sealing materials as specified above
HUMAN RESOURCES NEEDED	<p>Personnel requirements depend on the size of the facility. The operator of a landfill ensures at any time that adequate qualified staff is available to control and monitor the operational processes and to prevent accidents and to limit possible accident consequences. The staff shall periodically take part in trainings (at least every 2 years).</p> <p>For a facility with an annual receipt of approx. 500,000 Mg, the number of personnel needed is in the range from 8–10 persons, with at least 1 chief engineer, 3 qualified staff for registration (weighing) and receiving control, 3 engine mechanics/drivers plus a number of helpers.</p>
SPATIAL NEEDS	<p>The spatial needs depend from the planned capacity of the facility and the profile of the deposit area. Generally, higher space consumption must be assumed for depositing the same amount of waste in a flat area than using an excavated site, valley or abandoned quarry for landfilling.</p> <p>As an exemplary figure a deposit area of 42,000 m² and a total operation area of 55,000 m² are given for a landfill with a capacity of 340,000 m³ and about 30,000 Mg annual receipts deposited 15 m in height. For the total landfill capacity of 2 million m³, a space consumption of 240,000 m² is estimated.</p> <p>To operate a landfill site, additional space shall be considered for</p> <ul style="list-style-type: none"> - supply networks (fresh water, electric power), - road connections, railroad or waterways and - leachate catchment, groundwater control and green belts <p>Not actively operated parts/completed cells must be properly covered.</p>
AFTERCARE DEMANDS	The landfill area should be enclosed by a fence, regular inspections and monitoring shall be undertaken.

ORIENTIERUNGSWERTE FÜR DIE ANWENDUNG: KOSTEN	
INVESTMENT COSTS	The investment needs depend from the local conditions and planned capacity of the site, above all the costs for the <ul style="list-style-type: none"> - acquisition and preparation of the area, - construction: The construction costs should be well below that of a sanitary landfill for mixed waste (See also fact sheet "Landfill for non-hazardous waste") - equipment: usually wheel loader(s) and weighing at the entrance gate
OPERATING COSTS	The operating costs depend from the planned capacity of the site and the equipment used. Running, maintenance and personnel costs are supposed to be well below that of a landfill for non-hazardous waste, especially due to the very limited aftercare demands. (See fact sheet " Landfill for non-hazardous waste ")
POSSIBLE PROCEEDS	- from tipping fees and possible landfill taxes
MASS SPECIFIC OVERALL COSTS	- According to European experience and current pricing levels the overall costs should not exceed the amount of EUR 10 per Mg of material deposited (as of 2008).
OTHER RELEVANT ASPECTS	
	During the search and selection of the appropriate location, sufficient spatial resources shall be considered as reserve which – in the case of an advanced state of technology – at a later date can be used to set up the corresponding recycling facilities close to the material deposits.
MISCELLANEOUS	
MARKET INFORMATION	
REFERENCE FACILITIES <i>(important note: the list of firms does not constitute a complete compilation of companies active in the specified fields)</i>	Most countries in Europe do run facilities for the storage and deposition of inert waste. Also Germany has a number of these facilities, examples are: <ul style="list-style-type: none"> - Zweckverband für Abfallwirtschaft Kempten, Deponie Steinegaden www.zak-kempten.de - Boden- und Bauschuttdeponie "Sundern – Meinkenbracht" der Sauer & Sommer Straßen- und Tiefbau GmbH www.sauer-sommer.de - Deponie Dersenow der RBS Bodenverwertungs GmbH www.rbsfirmengruppe.de
RECOGNIZED PRODUCER AND PROVIDER FIRMS <i>(important note: the list of firms does not constitute a complete compilation of companies active in the specified fields)</i>	Numerous firms in Germany produce and/or offer specialized technical components, construction and other services for the erection of facilities for the storage and safe deposition of inert wastes. Some examples are: <p>Laying of mineral sealing:</p> <ul style="list-style-type: none"> - TD Umwelttechnik GmbH & Co. KG www.trisoplast.de - Bickhardt Bau AG www.bickhardt-bau.de - Kügler & Belouschek www.kuegler-textoris.de
REMARKS AND REFERENCE DOCUMENTS	
A list of companies dealing with the construction of deposit sites and landfill areas and further information on the subject can be obtained from: <ul style="list-style-type: none"> - AK GWS Arbeitskreis Grundwasserschutz e.V. www.akgws.de - Überwachungsgemeinschaft Bauen für den Umweltschutz BU www.ueberwachungsgemeinschaft-bu.de 	