

# Kraaifontein integrated waste management facility

Cape Town, South Africa



## Kraaifontein - Cape Town's benchmark facility for integrated waste management

The integrated waste management facility Kraaifontein was opened in the northern suburbs of Cape Town in 2011 [1.] As “first of its kind” in South Africa it constitutes a benchmark for integrated waste management, incorporating various waste treatment facilities at one location. The facility, spanning over 15 ha, has the capacity to process 1,000 tonnes of waste per day. Collected at source, waste is brought to the facility and processed further. Incoming waste is sorted, chipped, recycled, and transported to landfilling, etc. [2]. The facility offers also a public drop-off and is equipped with a conference centre. The integration with a conference centre enables public events and visits to be held, and thus increases public awareness of waste management and the need and benefits of waste minimisation. Also processing, sorting and recycling of waste prevents landfilling of tonnes of waste, of which much could possibly be recycled. This not only results in environmental benefits and increased life quality but it is also expected to reduce costs of handling municipal solid waste in Cape Town [3].

### Country/ City Profile



Country		City	
Population (2014)	54 million [4]	Population (2014)	3.75 million (city) [6] 4.18 million (metropolitan) [7]
Land area (km <sup>2</sup> )	1.219 million	Land area (km <sup>2</sup> )	2,461 (city) [8] n/a (metropolitan)
GDP per capita (2014, current international \$, at purchasing power parity)	13,046 [5]	GDP per capita (2014, US\$, at purchasing power parity)	n/a (city) 14,086 (metropolitan) [7]
Region	Southern Africa	Region	Coastal

### City's physical geography

Location	<ul style="list-style-type: none"> <li>✓ Located on a peninsula on the Atlantic ocean coast (<b>flooding risk - sea level rise</b>)</li> <li>✓ The city centre is surrounded by numerous mountains (Table Mountain, Devil's Peak and Lions Head)</li> <li>✓ Many city suburbs lie on a large plain area (“Cape Flats”) which connects the peninsula with the main land - sandy geology, raising marine plain</li> </ul>
Climate	<ul style="list-style-type: none"> <li>✓ Warm summer Mediterranean climate ( mild wet winters - <b>risk of winter flooding</b>, dry hot summers)</li> <li>✓ Average annual rainfall: 515 mm, average annual amount of sunshine: 3,500 hours</li> </ul>

### Initiating context

In the early 2000s, Cape Town faced significant economic and population growth, which led to an increase in consumerism and thus in turn to an increase of waste generation. Recognising that not handling the increased waste would result in severe environmental, health, social and economic impacts, the City implemented the “Integrated Waste Management Policy (IWMP) and Plans” in 2005/2006. The IWMP formulated several measures, interventions, mechanisms and technologies intended to reduce, minimise and manage waste generation of Cape Town [8]. Based on this background and on the fact that existing landfills had already started to exceed their capacity, the idea of constructing a regional landfill and associated waste processing stations arose [2]. The new integrated waste management facility in Kraaifontein, which combined various waste treatment facilities in one location, opened in the City of Cape Town in 2011 [1]. Kraaifontein offers handling and compacting of waste to landfill, waste sorting, drop-off possibilities as well as material recovery [3].

## Project description

In processing waste, Kraaifontein integrated waste management facility offers a broad range of operations [2, 3]. The facility:

- operates as waste transfer station;
- separates waste;
- runs an integrated mechanised materials recovery facility with a capacity of 100 tonnes per day;
- offers a public drop-off;
- runs an integrated greens management facility;
- considers the provision of new “waste-to-energy” technologies;
- runs a compaction hall;
- handles transportation and container operations (transport from collection sources, transport to landfills);
- offers (green) chipping operations;
- runs an integrated domestic recycling centre; and
- is equipped with conference facilities (possibility for conducting workshops, meetings, trainings, visits, etc.).

Waste coming to Kraaifontein is collected at source and processed further in the facility. Receipt and transportation of waste is handled via a roll-on/ roll-off steel container system. At the facility, a loading magazine is able to load three containers at once [3]. The facility accepts all general waste, with the exception of hazardous and medical waste, sludge or large loads of building rubble. A drop-off station for hazardous household waste is planned open in future [1].

## Implementation process

In responding to new national waste regulatory requirements and increasing waste generation, the City of Cape Town formed the concept of developing an integrated local waste management facility. The process started in 2007, with the facility Kraaifontein being commissioned in mid-2012 [3].

## Projects implementation details

<b>Process</b>	<p>The construction of the Kraaifontein integrated waste management facility started in April 2007 and lasted about 5 years until final commissioning of the plant in mid-2012 [2].</p> <p>The steps of development included [2]:</p> <ul style="list-style-type: none"><li>✓ an initial period of national and international research activities to plan and assess how such a facility could be optimised. This involved a broad range of expertise in the design of all components of the facility.</li><li>✓ the construction phase - The most important civil work/ mechanical equipment, mechanical infrastructure and electrical installations were finalised in early 2011 and construction was finalised according to plan.</li><li>✓ finalisation and commissioning of the plant 2011 to mid-2012.</li></ul>
<b>Leadership</b>	<p>The project was managed by the City of Cape Town [1]. Consulting engineer companies were commissioned to plan, construct and realise the project [2]. Contractors have been appointed to run the facility [1].</p>
<b>Financing</b>	<p>The project is worth 230 million South African Rands (~ 15.12 million EUR) [2].</p> <p>Due to excellent financial management and on the finalisation of the plant's construction within the planned period, the project came-in significantly under-budget [2].</p>
<b>Involved stakeholders</b>	<p>Kraaifontein integrated waste management facility was developed, constructed and is operated by a teamwork of various key players [2]:</p> <ul style="list-style-type: none"><li>✓ City of Cape Town/ Solid Waste Management Department - client, overall project manager</li><li>✓ Jeffares &amp; Green (Engineering and Environmental Consulting) - lead consultant, responsible for the construction of the facility (civil and structural construction, design of the rail, road and transportation system), construction monitoring and contract management of the refuse transfer station, materials recovery facility</li><li>✓ GJA Consulting Engineers - project joint-venture partners, responsible for electrical and mechanical construction activities</li><li>✓ Haw &amp; Inglis (Civil Engineering) - main contractor in regard to civil and building constructions</li><li>✓ Various further consultants responsible for project construction</li><li>✓ Various contractors operating the plant and integrated facilities (chipping operations, materials recovery facility, transportation of waste from and to the site, etc.)</li></ul> <p>Waste is collected from and can be dropped off at the facility by:</p> <ul style="list-style-type: none"><li>✓ Citizens/ Industry of Cape Town</li></ul>

## Results

Since the facility only came into operation in mid-2012, quantitative results are not yet available. However, benefits associated with the Kraaifontein integrated waste management facility include [2, 3]:

- an enhancement of sustainability - the project's layout and design is intended to promote sustainability as well as "green engineering" and ecological performance (use of low-energy lighting and ventilation, special designed traps preventing pollution, use of indigenous plants/ greening in the area, monitoring of water bodies);
- a cost reduction of handling municipal solid waste/ reduction of waste transportation costs due to integrated activities;
- an increase in employment opportunities: at time of the facilities full operation, 150 new jobs will be created, and employ numerous people originating from the local community/ surrounding area;
- a reduction in greenhouse gas (GHG) emissions and carbon footprint as a result of decreased/ optimised transportation and increased re-use of materials and associated decrease in the demand for new raw materials; and
- a reduction in GHG emissions as a result of a decrease in the amount of organic waste transported to landfills which decreases methane emissions from landfill sites

Also with the opening of the facility, Kraaifontein - not only the name of the facility but also of a northern suburb in Cape Town - area was given the opportunity to legally dispose waste. This counteracts illegal dumping for which the area was well known in the past [3].

In 2012, the project was recognised as "the *most outstanding civil engineering achievement in the technical excellence project category 2012*" by the South African Institution of Civil Engineering [3]. In addition, it has been listed as one of major showcase projects in Cape Town's 2014 survey on sustainable best practices: Showcasing Excellence, Mayor's Portfolio of Urban Sustainability 2014 [see 3]. The assessment, undertaken in the framework of this survey, scores projects on a scale from 1 (poor) to 5 (excellent) in 12 different categories related to sustainability. Kraaifontein integrated waste management facility achieved a score of over 48, which means the project performs well across all categories [3]. Kraaifontein's detailed scores in specific assessment categories are given in the table below:

Assessment category	Score
Building community	3
Improving quality of life	5
Reducing threats and maximising opportunities	5
Creating economic opportunities	4
Improving productivity and efficiency	4
Alleviating poverty	3
Enhancing natural resources	4
Promoting and enhancing biodiversity	4
Addressing major ecological challenges	4
Ensuring strategic alignment	5
Facilitating community engagement	3
Promoting transparent and democratic processes	5

## Lessons learned

The integration of several waste treatment operations into one location - Kraaifontein integrated waste management facility - facilitates economically viable handling of municipal solid waste. Additionally treating waste properly results in environmental benefits and increased life quality for Cape Town's citizens. By processing, sorting and recycling as much waste as possible, the amount of waste ending landfill sites is significantly reduced. The Kraaifontein integrated waste management facility generated social benefits as it has created new job

opportunities for the local community and also - as being located in a suburb earlier known for illegal waste dumping - gives and opportunity for legal waste disposal [3].

In achieving all these benefits, the excellent teamwork of all parties involved was/ is essential. In regard to the projects development / construction, particularly, the large attention to detail, communication and interaction between all types of engineering teams (civil, structural, etc.) led to a favourable outcome. The design of the facility needed to ensure the seamless sequence of all waste handling steps (haulage, processing, container transport, etc.) in order to achieve a sustainable and efficient workflow. In addition, the excellent financial management, which led to cost savings during the construction phase of the project, enabled a barrier-free start of the facility. Also crucial to the project's success has been/ still is the close collaboration of the facility with the local community. The local community has not only been engaged within the project as the facility offers job opportunities for citizens but also due to the formation of a "residents monitoring committee", which meets regularly to discuss and solve concerns linked to the plant's operation [3].

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## Author/ Contact

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Leonhardstraße 59  
8010 Graz, AUSTRIA  
Tel. +43 316 876 6700  
life@joanneum.at

<http://www.joanneum.at/en/life/>