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ASSUMPTIONS[1] USED FOR TECHNICAL AND FINANCIAL MODEL OF OPTIONS

Population Projection

Population for States and Districts in Year 2000 is sourced from Population Census of Malaysia, 2000 (final publication).

Urban and rural population for States and Districts in Year 2000 is sourced from Population Census Malaysia, 2000.

Projection of population for States in Year 2005 is sourced from Rancangan Malaysia Ke-8 (8th Malaysia Plan).

Projection of population for States in Year 2020 is sourced from the Department of Statistics, 2001.

Population in years from Year 2000 to 2005 and from Year 2005 to 2020 is straight-line projection.

Projection of population for Districts from Year 2000 to 2020 is projected based on States' urban and rural population projections. For those Districts with 0% urban in Year 2000 will remain 0% in Year 2020. For those Districts which reach 100% urban during the period before 2020 they will remain 100% urban for years to 2020.

Within each District, population is further divided into four (4) categories, they are:

1. Urban population within the township within the LA boundary;
2. Urban population outside the township within the LA boundary;
3. Rural population within the LA boundary; and
4. Rural population outside the LA boundary.

[1] Note that the assumptions and projections are based on desktop analysis.

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Waste Generation

The waste generation rate being adopted for every State in Year 2002 is shown in following table:

States	LA Township (Urban)	LA Non-Township (Urban)	LA Non-Township (Rural)	Outside LA (Rural)
Perlis	1.0	0.5	0.5	0.3
Kedah	1.2	0.7	0.5	0.3
P. Pinang	1.5	0.7	0.5	0.3
Perak	1.2	0.7	0.5	0.3
Selangor	1.5	0.7	0.5	0.3
W.P. Kuala Lumpur	1.6	0.7	0.5	0.3
W.P. Putrajaya	1.6	0.7	0.5	0.3
Kelantan	1.0	0.5	0.5	0.3
Terengganu	1.0	0.5	0.5	0.3
Pahang	1.0	0.5	0.5	0.3
N. Sembilan	1.2	0.7	0.5	0.3
Melaka	1.2	0.7	0.5	0.3
Johor	1.5	0.7	0.5	0.3

The projection of waste generation rate from Year 2002 to Year 2020 is assuming 1% increase in every year considering higher per capita income and thus higher purchasing power.

Source Recycling

1% of waste reduction from the waste generation is considered due to recycling at source (such as the paper, plastic and glass recycling). The source recycling is estimated to ultimately reach 5% by 2020 (by considering higher awareness in the public we assume increase of 1% every 5 years.

Served Population

The percentage of population served in every District is assumed as follows (as proposed in the Draft Concessionaire Agreement):

Year	LA Township (Urban)	LA Non-Township (Urban)	LA Non-Township (Rural)	Outside LA (Rural)
In Year 2002	100%	50%	50%	0%
In Year 2020	100%	90%	90%	50%

The percentage of population served is straight-line projection in years between Year 2002 and 2020.

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Waste Collected

The amount of waste collected (WC) is the waste generation (WG) minus the waste recycling at source Rs and waste generated from population not being served (PNS).

WC = WG – (Rs + PNS)

Collection Distance

Generally the longest transport distance for waste collection vehicles is 30km. If the distance between waste source and final disposal is more than 30km, a transfer station is considered.

Existing Landfill Capacity and Remaining Life

The existing landfill capacities in Peninsular Malaysia and estimated remaining lives are directly sourced from the "MHLG List of Information and Status of Waste Disposal Sites before 10th March, 2002"

Capacities of Planned SWM Infrastructure

The capacities of transfer stations, material recovery facilities and thermal treatment plants are derived from the amount of waste collected (tonnes per day) within the catchment in Year 2020 as determined by the Study Team (based on the Proximity Principle and the general 30-km. rule). Where facilities are already committed, and design capacity is known, these capacities have been used[2] but otherwise capacity of facilities anticipates the total waste quantities for treatment.

The criteria for proposing a Material Recovery Facility is where waste collected is more than 700 tonnes per day.

The criteria for proposing a Thermal Treatment Plant is where waste collected is more than 1,000 tonnes per day.

Material Recovery Facility is able to recover 15.5% by weight of commingled waste received.

Waste reduction in a Thermal Treatment Plant is 75% by weight.

The capacity of new Sanitary Landfill is derived from waste collected from Year 2005 to 2020 assuming the site is taking two years for construction.

Collection and Haulage Vehicles

Haulage vehicles are used for transporting waste from intermediate treatment facilities to landfills only.

The collection and haulage vehicles will be replaced every 7 years.

50% of the waste will be collected using 4-tonne compactor and the remaining waste will be collected using 8-tonne compactor.

[2] This criteria relates to Rawang sanitary landfill, Selangor, and Kampung Bohol thermal treatment plant only.

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The number of collection trips for both 4-tonne and 8-tonne compactors is assumed at 2 trips per day based on maximum 30-km route.

The number of collection vehicles is derived from the amount of waste collected in the final year before replacement of new fleet of vehicles, related to carrying capacity of vehicles (as above).

The number of haulage vehicles is derived from the amount of waste after recovery, and reduction of waste in the intermediate treatment facilities, together with that waste passing through transfer stations.

The total number of vehicles includes 1 spare vehicle for every 6 vehicles.

Capital and Operating Expenditures

Base cost used for determination of CAPITAL EXPENDITURE:

	Cost (RM)
4T Vehicle	340,000 / vehicle
8T Vehicle	585,000 / vehicle
Transfer Haul	772,000 / vehicle
Transfer Station	99,000 / TPD
MRFs	300,000 /TPD
Thermal	1,300,000 /TPD
Landfill	15 /Tonne

Base cost used for determination of OPERATIONAL EXPENDITURE:

	Cost per Tonne (RM)
Collection/Transportation	42
Transfer Station	19
Transfer Haul	20
MRFs	25
Thermal	93
Landfill	25

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The capital cost for the facilities is adjusted **to reflect economies of scale** based on the capacities of the proposed facilities as shown in following table:

Facilities	Tonnes	Percentage of Base Cost
Sanitary Landfills	< 5,000,000	140%
Sanitary Landfills	5,000,000 - 15,000,000	110%
Sanitary Landfills	15,000,000 - 25,000,000	100%
	TPD	
Transfer Station	< 100 (no compaction)	50%
Transfer Station	100 - 200	170%
Transfer Station	200 - 500	130%
Transfer Station	500 - 1000	110%
Transfer Station	> 1000	100%
Material Recovery Facility	< 750	100%
Material Recovery Facility	750 - 1000	95%
Material Recovery Facility	1000 - 1500	90%
Material Recovery Facility	> 1500	85%
Thermal Treatment Plant	< 1000	140%
Thermal Treatment Plant	> 1000	100%

Assumptions for Rail Transfer

The Rail Line Head for receiving waste is also a Material Recovery Facility.

It is assumed that the length of spur line is 5km for the Rail Line Head and 20km for the Reception Facility at Regional Sanitary Landfill.

Base cost used for determination of CAPITAL EXPENDITURE

	Cost (RM)
Rail Line Head MRFs	350,000 / TPD
Reception Facility	99,000 / TPD
Regional Landfill	15 / Tonne
Spur Line	1,000,000 /km
Rail Transport (Wagon & Container)	25,000,000

Base cost used for determination of OPEX:

	Cost Per Tonne (RM)
Rail Line Head MRFs	25
Reception Facility	19
Regional landfill	25
Rail Transport	10