Solid Waste Management in Quezon City, Metro Manila

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National Regulations on SWM

- Ecological Solid Waste Management Act
  - Segregation at source
  - Segregated collection
  - Closure of open dumpsites
  - Devolution of function to local government
- Clean Air Act
  - **Bans incineration**
- Toxic Substances and Nuclear Waste Act
  - Collection, transport, treatment and disposal
- Health Care Waste Management act
  - Collection, transport, treatment and disposal
  - Hospital licensure

Quezon City

- Located in the National Capital Region (NCR)
- Most populated (3.2 M) and wealthiest city in the Philippines
- Site to many government offices and academic institutions
- Situated in the Guadalupe plateau which is a relatively high plateau

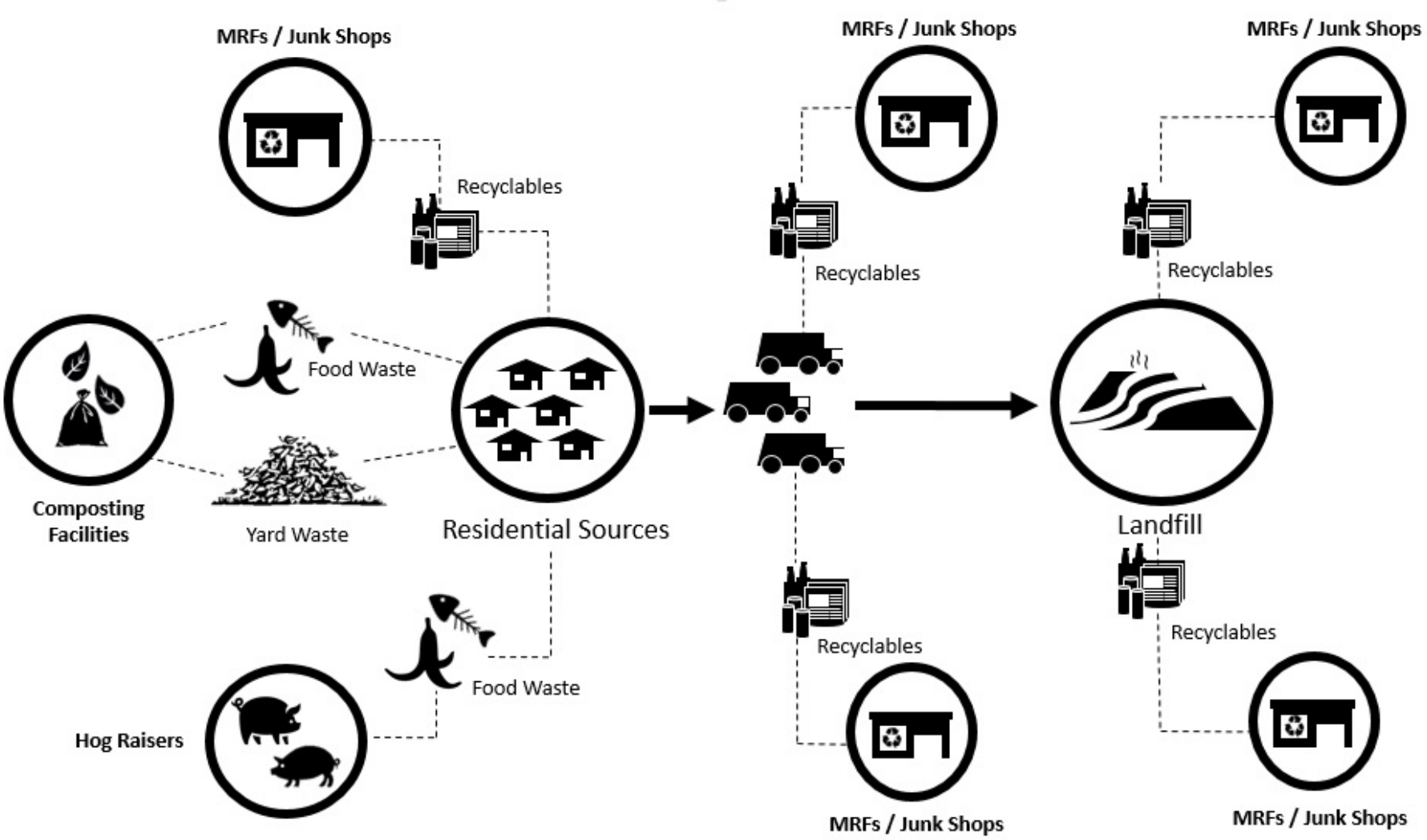
Climate data for Quezon City

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average high °C (°F)	29 (84)	31 (87)	32 (89)	34 (93)	34 (93)	31 (87)	30 (86)	30 (86)	30 (86)	30 (86)	30 (86)	29 (84)
Average low °C (°F)	18 (65)	19 (66)	21 (69)	22 (71)	23 (73)	23 (73)	23 (73)	23 (73)	23 (73)	22 (71)	21 (69)	20 (68)
Precipitation mm (inches)	18 (0.7)	8 (0.3)	5 (0.2)	23 (0.9)	150 (6)	360 (14)	503 (19.8)	516 (20.3)	373 (14.7)	224 (8.8)	163 (6.4)	69 (2.7)

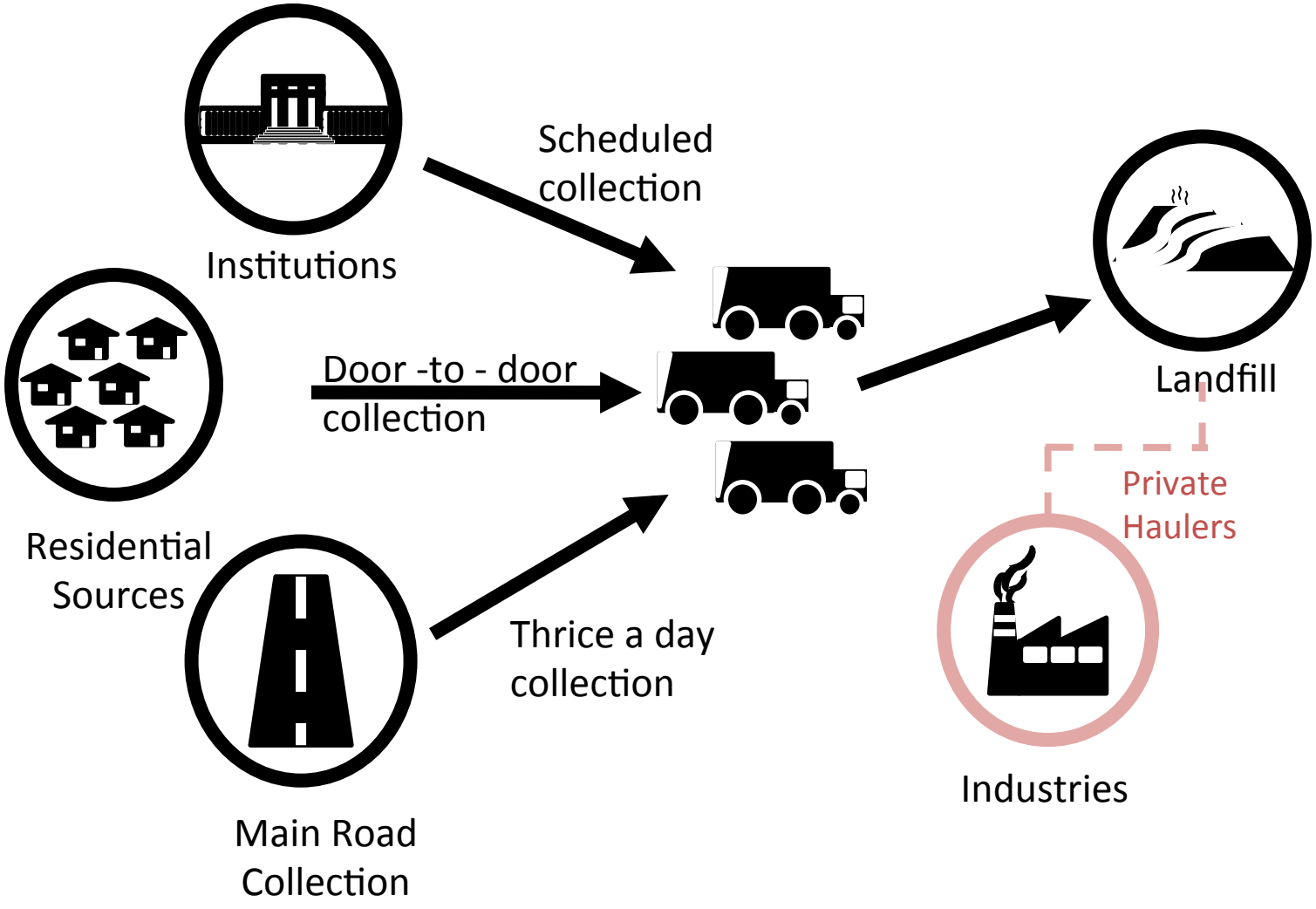
City Ordinances

- **Effective September 2012**
- SP-2140 – Plastic Bag Reduction Ordinance
  - Regulates the use of plastic bags and establishing an environmental fee for its use
- SP-2103
  - Mandates all business establishments to display a notice that encourages customers to bring their own reusable bags

Waste stream



Collection scheme



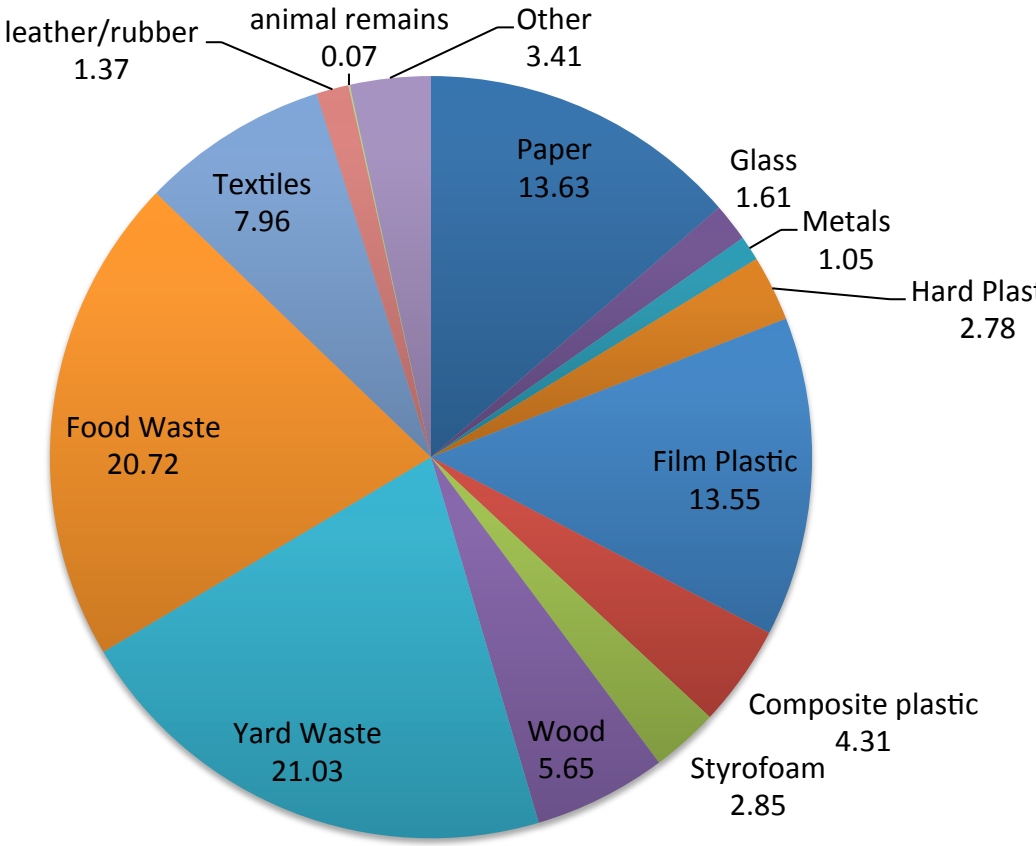
Segregated collection

- Biodegradable (Monday, Tuesday, Friday Saturday)
- Non-biodegradable (Wednesday, Thursday)

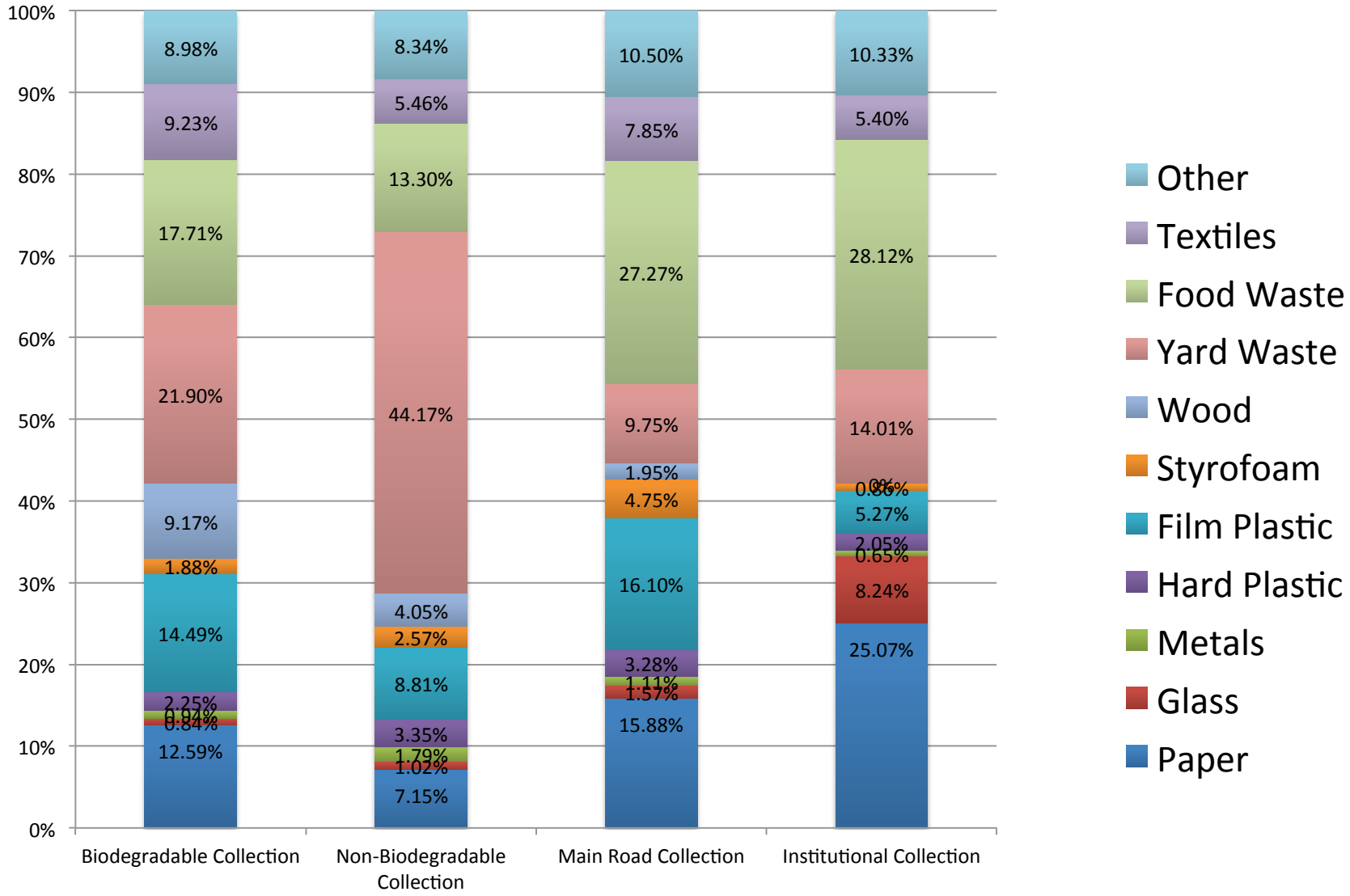
Waste generation

2016 Projected Population	3,177,435
Per capita waste generation	0.88 kg/pax/day
Waste Generation	2881 tons/day (2016 projected population based on 2010 census)
Average amount of waste disposed at QCCDF (Payatas)	1609.79 tons/day
Waste density	266 kg/m^3
Average waste disposal rate	**0.51 kg/cap-day**

Waste composition (weight)



Comparison of composition (by collection schedule)

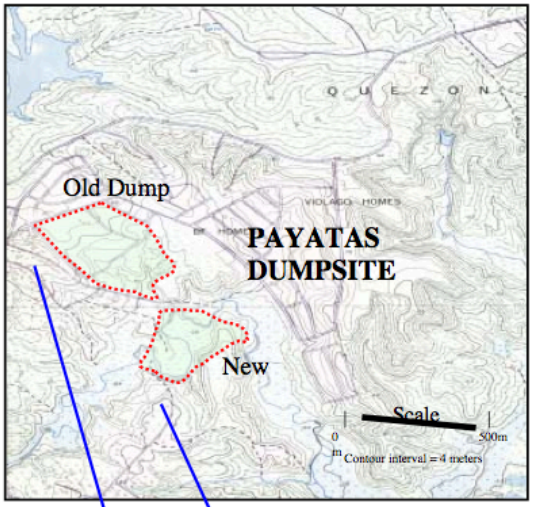


Waste Fraction	N(%)			
	Primary Data	Secondary Data	Author	Sample Source
Garden and Park Waste	.84	0.70[h]	[h]Rosen, Halbach and Mugaas (2000)	Yard waste (Minessota, USA)
		1.15[j]	[j]Moller et. al. (2016)	Various yardwaste compost (Germany)
Food Waste	1.0	4.68[g]	[g]Kadir, Ismail and Jamaludin (2015)	Makanan Ringan Mas – Industrial Plant (Malaysia)
		0.7-13.30[n]	[n]Nagy et. Al. (2014)	University's Cafeteria (Hungary)
Wood Waste	1.61	0.09[h]	[h]Rosen, Halbach and Mugaas (2000)	Wood (Minessota, USA)
		0.1– 0.34[l]	[l]Jerger et. al. (1982)	Various species of wood trees (Several states of USA)

QC Controlled Dumping Facility

- Oldest (since 1973) and largest dumping facility in the Philippines
- Average number of Trucks : 411 trucks/day
- Average waste intake: 1,600 tons/day
- Land Area
  - Old Mound → 12 hectares
  - New Mound → 10 hectares

QC Controlled Dumping Facility



History of QC Disposal Facility (Payatas)

1970 - Start of waste dumping in Payatas

1993 - Payatas became the main disposal site for Metro Manila waste

1998 - Approval of closure plan

2000 - Payatas dumpsite trashslide

2001 - QC resume dumping operation in Payatas

2004 - Conversion to Controlled Disposal Facility

2010 - Closure of Payatas Disposal Facility

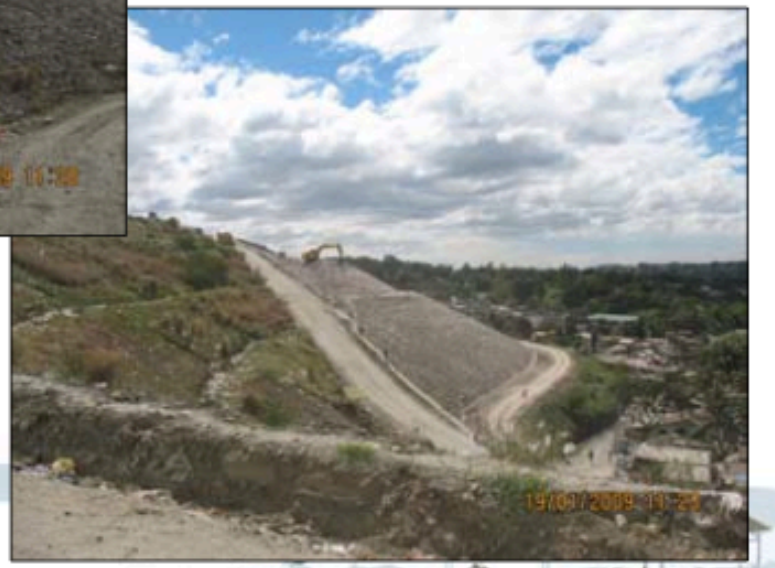
2011 - Opening of the Sanitary Landfill Facility, establishment of the Material Recovery Facility(MRF), and start of the Post Closure Care and Maintenance

Slope improvement

Slope Reprofiling

Dumpsite slopes, which previously ranged from 60 to 70 degrees were reprofiled and maintained at a more stable range of 23 to 25 degrees.

Benches **were constructed along the slopes to prevent global slope failure.**

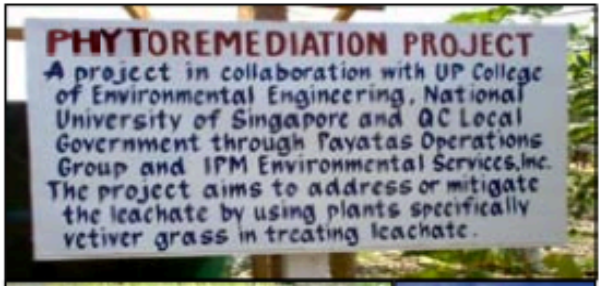


QC Controlled Dumping Facility

Soil Covering and Compaction

The reprofiled slopes are covered with soil before compaction to improve stability and control erosion and the migration of dumpsite gas.

Greening of Slopes

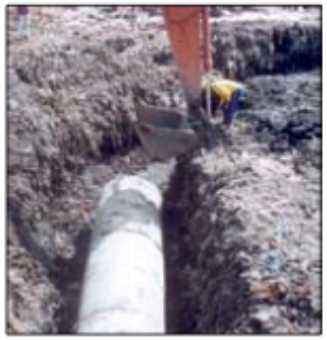


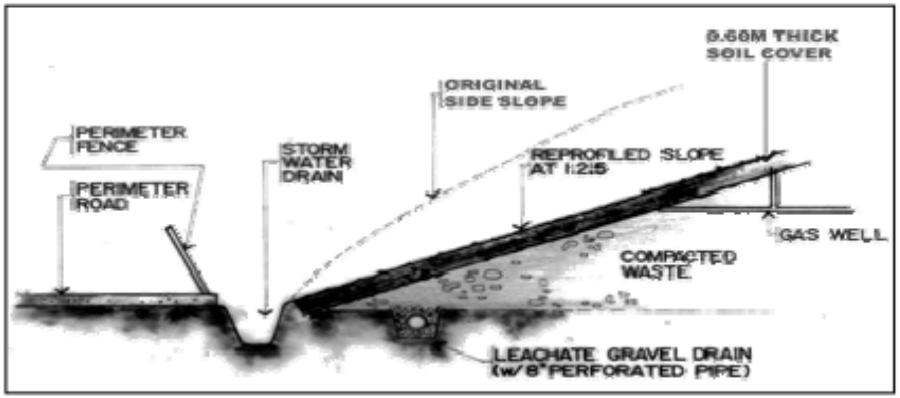
NURSERY & GREENHOUSE facilities are maintained for the propagation of plants used for the greening of the dumpsite.

VETIVER GRASS (found to be effective for leachate treatment and erosion control) and other perennial and ornamental shrubs and trees were planted along dumpsite slopes.

QC Controlled Dumping Facility

Improved Drainage System





Improved the dumpsite's drainage system by separating the leachate collection system from the storm water drain.

The collected leachate goes to pumping stations for recirculation onto the soil-capped mounds to water the vetiver grass and other plants.

QC Controlled Dumping Facility

Developed and fortified internal and perimeter access roads

QC Controlled Dumping Facility

Other Facilities

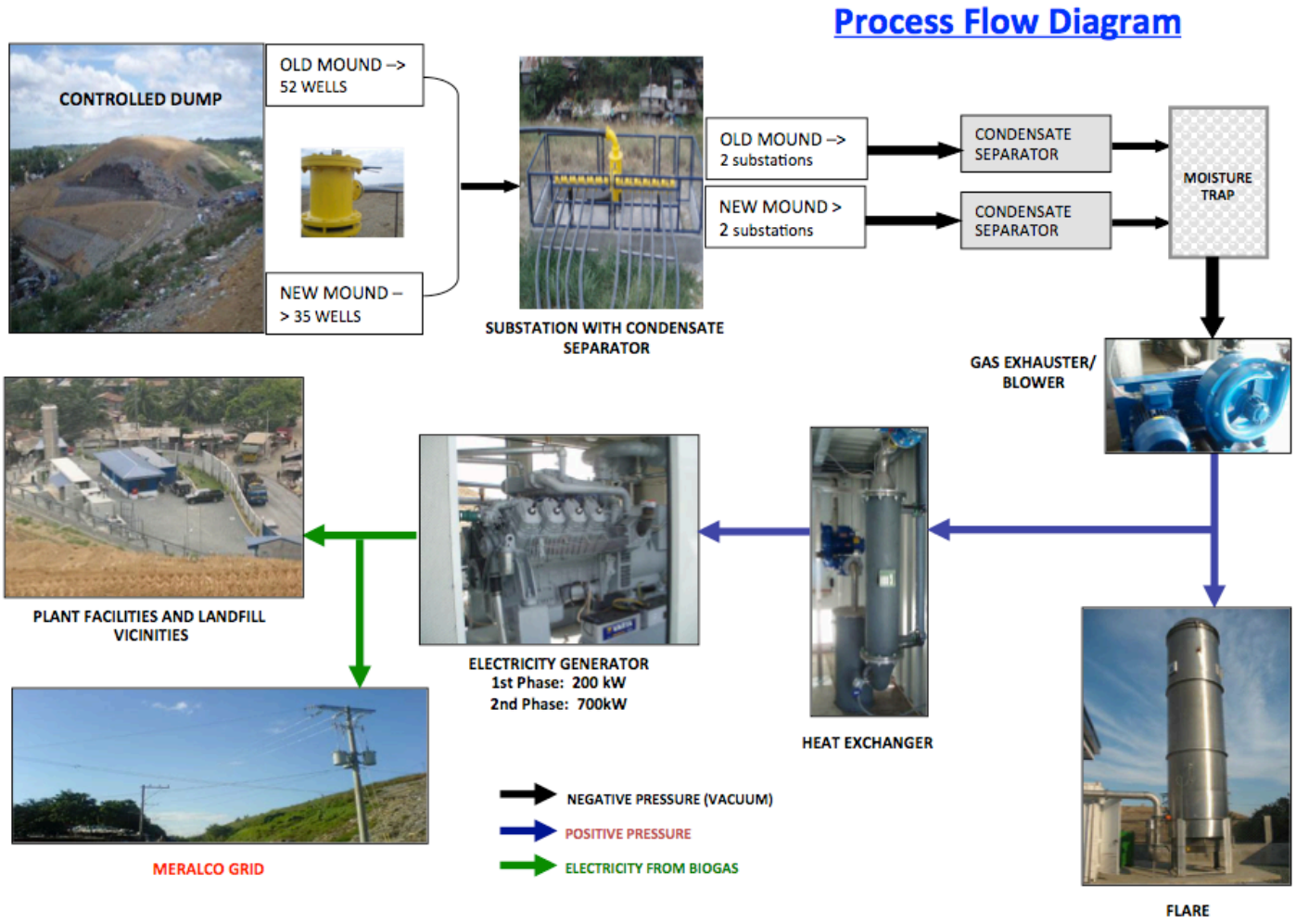
Viewing Deck

City Dog Pound

Multipurpose Hall

Firefighting Team

LANDFILL GAS IN PAYATAS



Major challenge

Payatas Controlled Dumpsite needs to be closed

- Option 1: Dispose waste in another landfill
- Option 2: Feasibility of Waste to energy?

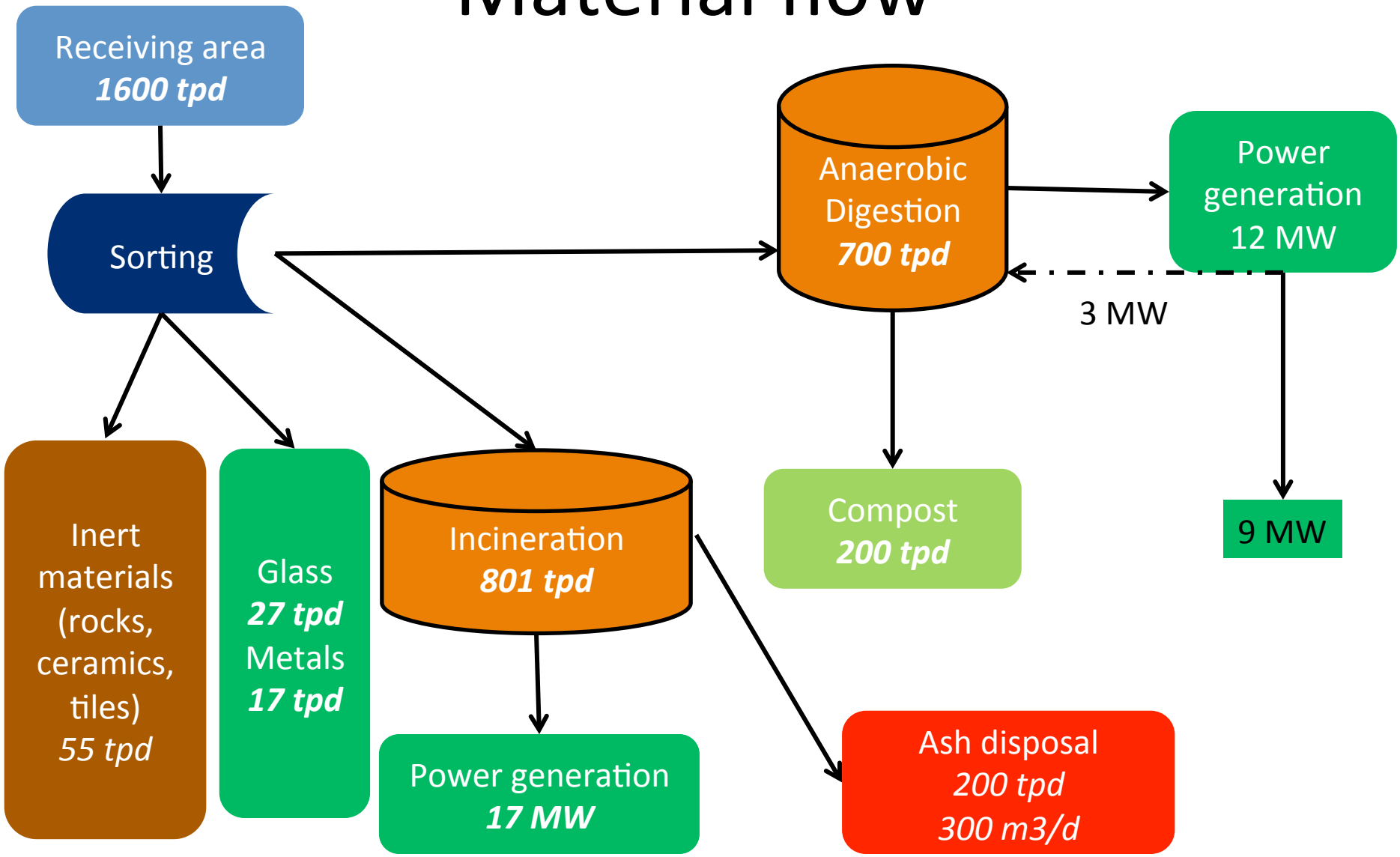
Calorific value

	Component specific data		Calculation
	Waste composition	Calorific value	NCV (net calorific value)
	% by weight	kJ/kg wet waste fraction	$kJ/kg_{wet\ waste}$
Paper	13.6%	7,452	1,016
Garden and Park Waste	21.0%	5,593	1,176
Food Waste	20.7%	2,334	484
Textiles	8.0%	13,053	1,039
Wood Waste	5.6%	6,384	360
Plastics	23.5%	31,190	7,330
Glass	1.6%	0	0
Metals	1.1%	0	0
Rubber	1.4%	19,334	271
Other	3.4%	0	0
Total	100.0%		**11,675**

Ratio of VS/TS

Waste Fraction	VS/TS			
	Primary Data	Secondary Data	Author	Sample Source
Garden and Park Waste	.88	0.88[b]	[b]California Energy Commission (2005)	Green Waste (Norcal Waste Systems, Inc.) California, USA
		0.97[c]	[c]Manios and Stentiford (2004)	Gardens and Park (United Kingdom)
Food Waste	.93	0.85[b]	[b]California Energy Commission (2005)	Food Waste (Norcal Waste Systems, Inc.) California, USA
		0.94[d]	[e]Kwon and Lee (2004)	University's Cafeteria - Cooked meals residue (Korea)
		0.89[d]	[d]Roa and Singh (2004)	Food waste from fruit and vegetable market (India)
Wood Waste	.92	0.98-0.99[l]	[l]Jerger et. al. (1982)	Various species of wood trees (Several states of USA)

Material flow



Issues for waste to energy option

- Closure of current dumpsite will affect waste pickers
- Siting of facility (digester and/or incineration)
- Social acceptability of incineration
- Water requirements for digestion and incineration
- Needs land for ash disposal
- Sorting requires costs
- Market for compost


MARAMING SALAMAT!