

## Supplementary Materials

Strategy of Landfilled Waste Reduction by a Distributed Material Recovery Facility System in

Surabaya, Indonesia

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## Tables

Table S1. Temporary waste disposal sites' capacity and transportation frequency

<b>Daily Transportation Frequency</b>	<b>Capacity (m<sup>3</sup>)</b>			
	<b>6</b>	<b>8</b>	<b>10</b>	<b>14</b>
<b>TS</b>				
<1	15	18	-	18
1	10	11	8	39
1-2	1	2	2	14
2	5	3	-	34
3	-	-	2	6
3-4	-	-	-	1
4	-	-	1	3
4-5	-	-	-	1
5	-	-	-	2
6	-	-	1	-
<b>MRF</b>				
1	-	-	-	1
1-2	1	-	-	-

Table S2. Detail of investment cost

<b>Unit</b>	<b>Value (IDR)</b>
MRF Building <sup>1</sup>	480,000,000
Shredder	22,825,000
Conveyor Belt	693,000,000
Baler	65,000,000
Composting Site Area <sup>2</sup>	960,000,000
Screen Plant <sup>2</sup>	271,000,000

<sup>1</sup>(Mega and Trihadiningrum, 2010)

<sup>2</sup>(Wahyono and Sahwan, 2006)

Table S3. Operation and maintenance cost for one MRF

Details	Cost	Unit
Monthly Salary	3,500,000	IDR/person/month
Number of Workers (inside the MRF)	13	person
Working Period	12	month/year
<b>Salary</b>	<b>10,920,000,000</b>	<b>IDR/20 years</b>
Machinery Maintenance Ratio	5%	per year
Shredder	2,282,500	IDR/year
Conveyor Belt	69,300,000	IDR/year
Baler	6,500,000	IDR/year
<b>Maintenance Cost</b>	<b>1,561,650,000</b>	<b>IDR/20 years</b>
Fuel Price	5,150	IDR/liter
Fuel Needed for Machinery	5.7	liter/day
Working Days	7300	day/20 years
<b>Fuel Cost</b>	<b>214,291,500</b>	<b>IDR/20 years</b>
Electricity Price	1,343	IDR/kWh
Water Pump Power	0.15	kW
Water Pump Working Time	2	hour/day
Water Pump Working Days	7300	day/20 years
<b>Water Pump Operational Cost</b>	<b>2,941,126</b>	<b>IDR/20 years</b>
Lamp Power	0.2	kW
Lamp Working Time	8	hour/day
Lamp Working Days	7300	day/20 years
<b>Lamp Operational Cost</b>	<b>15,686,006</b>	<b>IDR/20 years</b>
Computer Power	0.5	kW
Computer Working Time	8	hour/day
Computer Working Days	7300	day/20 years
<b>Computer Operational Cost</b>	<b>39,215,016</b>	<b>IDR/20 years</b>
<b>Total OM cost</b>	<b>12,753,783,649</b>	<b>IDR/20 years</b>
	<b>637,689,182</b>	<b>IDR/year</b>

Table S4. Operation and maintenance cost for one composting site

<b>Details</b>	<b>Cost</b>	<b>Unit</b>
Monthly Salary	3,500,000	IDR/month/person
Number of Workers	7	person
Working Period	240	month
<b>Salary</b>	<b>5,880,000,000</b>	<b>IDR/20 years</b>
Machinery Maintenance Ratio	5%	/year
Screen Plant Maintenance	27,100,000	IDR/year
Shredder Maintenance	2,282,500	IDR/year
<b>Maintenance Cost</b>	<b>587,650,000</b>	<b>IDR/20 years</b>
Fuel Price	5,150	IDR/liter
Fuel Needed for Machinery	1.5	liter/day
Working Days	7300	day/20 years
<b>Fuel Cost</b>	<b>56,392,500</b>	<b>IDR/20 years</b>
Electricity Price	1,343	IDR/kWh
Water Pump Power	0.15	kWh
Water Pump Working Time	2	hour/day
Water Pump Working Days	7300	day/20 years
<b>Water Pump Operational Cost</b>	<b>2,941,126</b>	<b>IDR/20 years</b>
Lamp Power	0.2	kWh
Lamp Working Time	8	hour/day
Lamp Working Days	7300	day/20 years
<b>Lamp Operational Cost</b>	<b>15,686,006</b>	<b>IDR/20 years</b>
<b>Total OM cost</b>	<b>6,542,669,633</b>	<b>IDR/20 years</b>
	<b>327,133,482</b>	<b>IDR/year</b>

## Figures

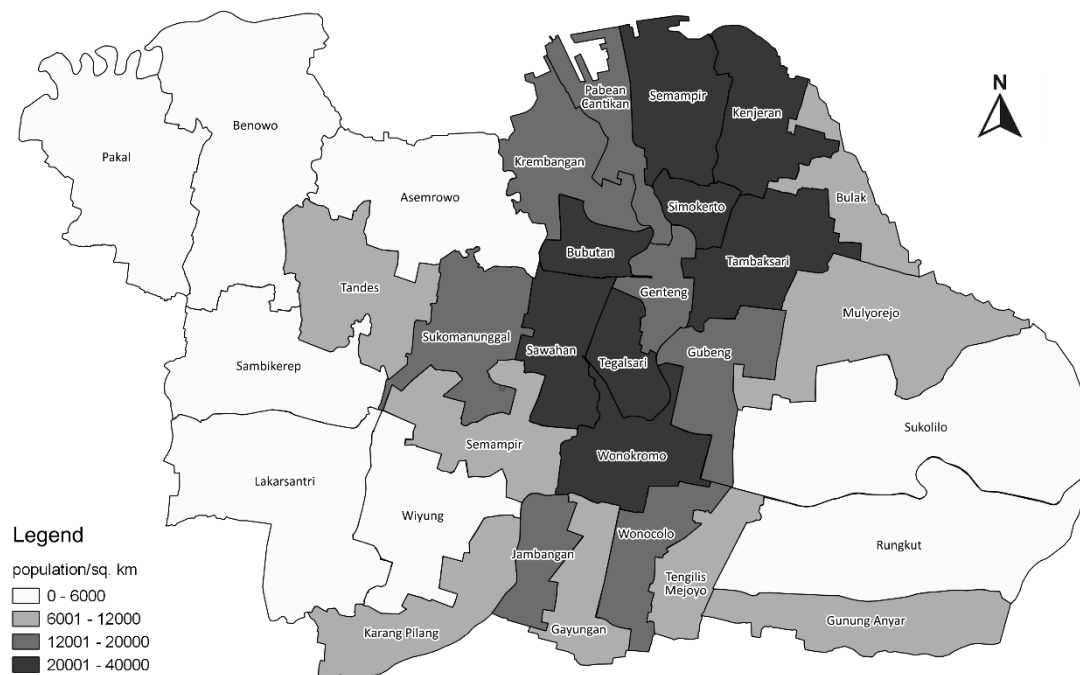


Fig. S1. Map of the study area with the population density distribution



Fig. S2. Waste flow in MRF

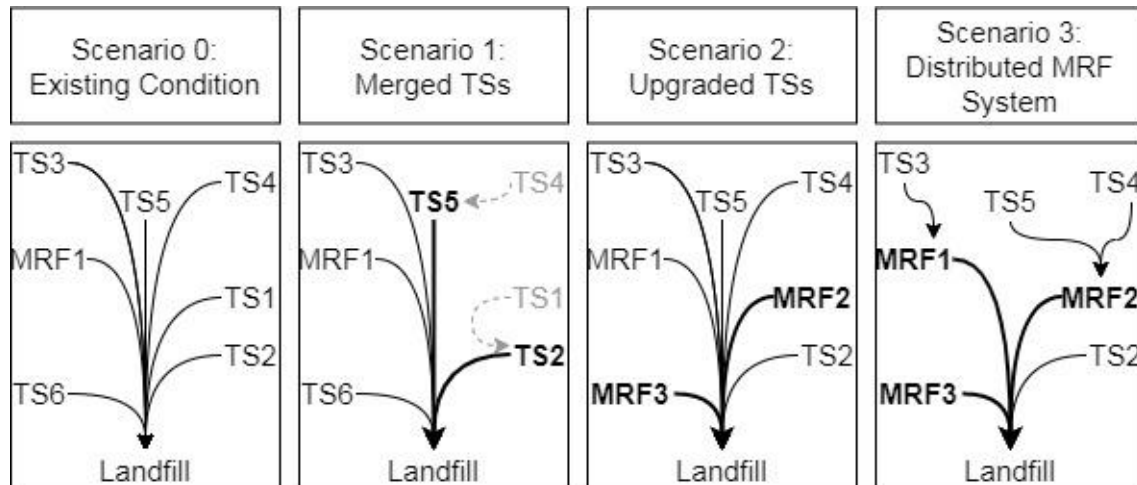


Fig. S3. Scenario setting



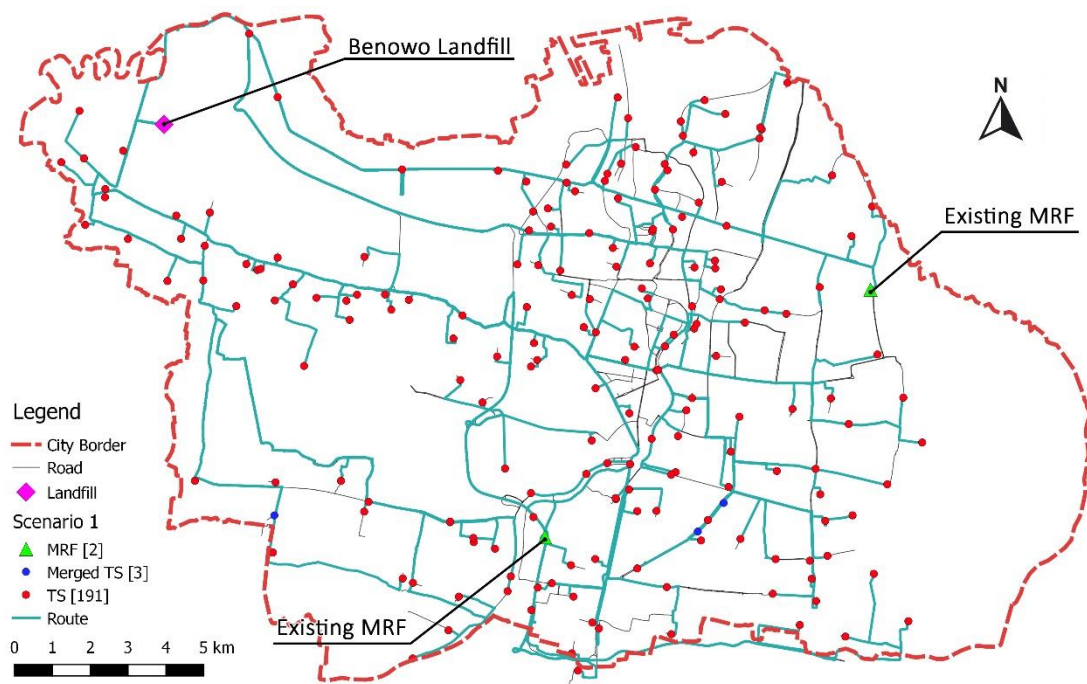


Fig. S4. Transportation route in Scenario 1

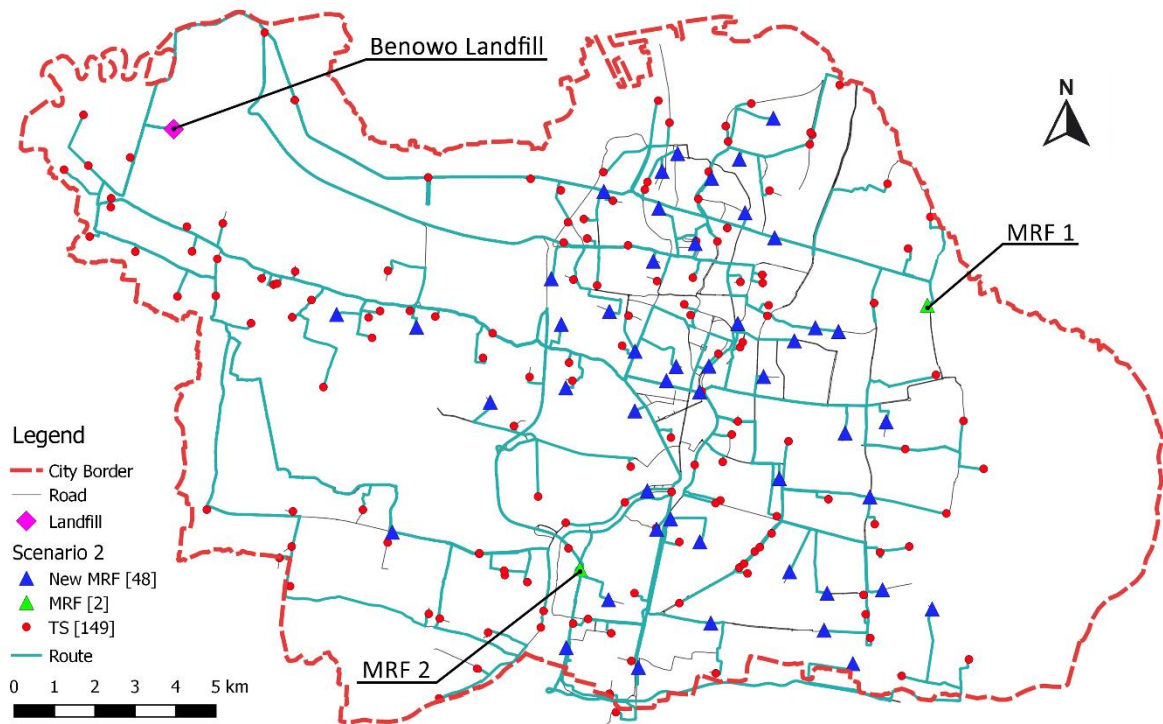


Fig. S5. Transportation route in Scenario 2

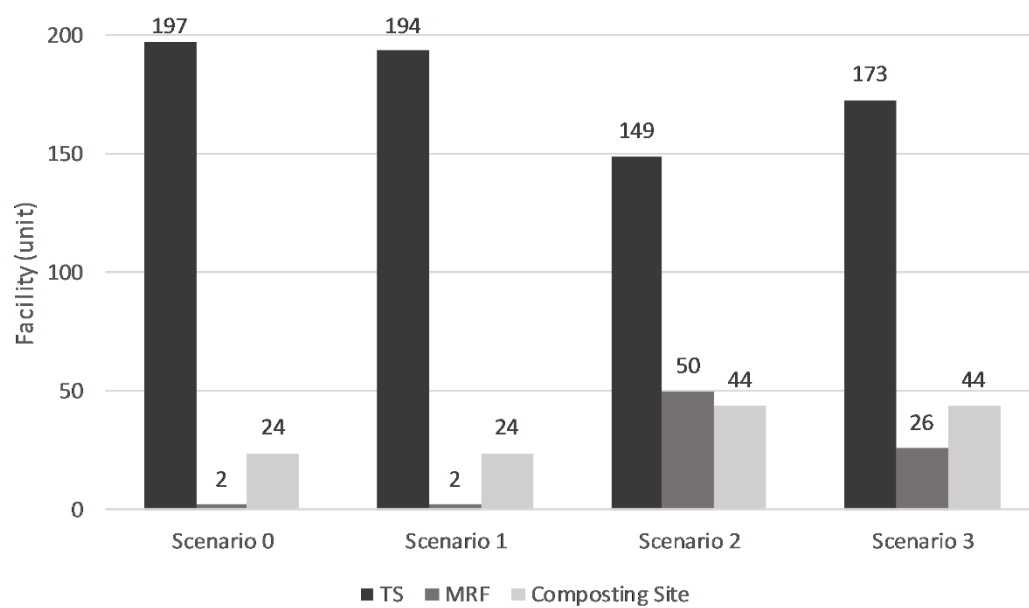


Fig. S6. Facilities and landfilled waste reduction

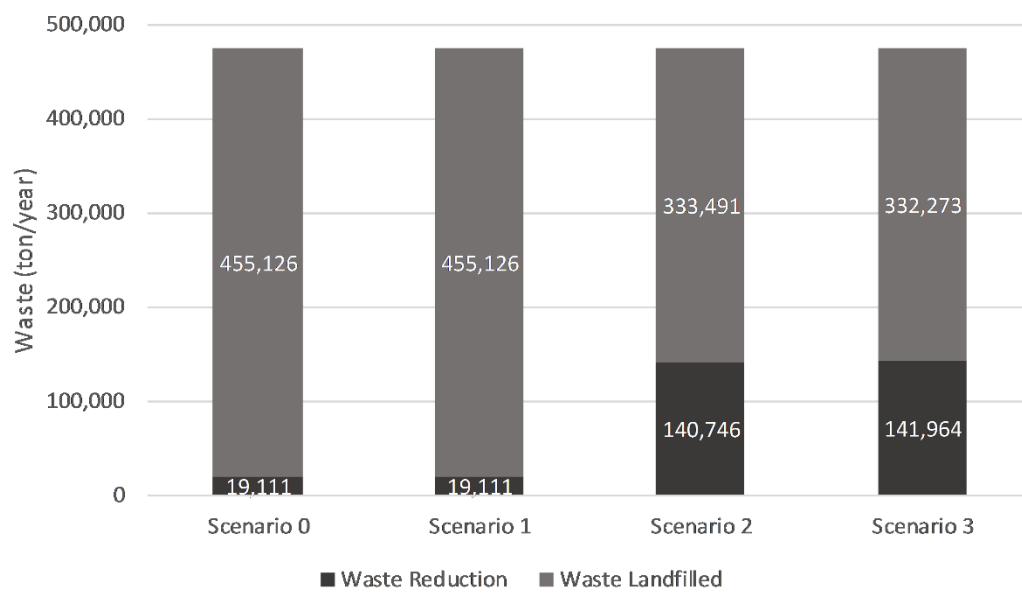


Fig. S7. Reduced and landfilled waste

## **References**

Mega R and Trihadiningrum Y (2010) Perencanaan Material Recovery Facility di Kecamatan Gubeng Kota Surabaya (Design of Material Recovery Facility in Gubeng District, Surabaya City). ITS Digital Repository. [In Indonesian.]

Wahyono S and Sahwan FL (2006) Analisa biaya mekanisasi produksi kompos sistem windrow (Cost analysis of mechanization of the windrow composting production). Jurnal Teknik Lingkungan 11: 87–93. [In Indonesian.]