



Utilization of Refuse Derived Fuel (RDF) Technology in Waste Management in Medan City

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OUTLINE



1. BACKGROUND



Driving Force

- ❑ Increasing the number and diversity of consumption per capita
- ❑ Diversity of socioeconomic and demographic levels and backgrounds
- ❑ The growth and development of packaging technology



Pressure

- ❑ With a population of Medan City reaching 2.85 million people, waste production reaches 2000 tons / day, with the following conditions:
 - TPA Falls will have a maximum occupancy in the next 2-3 years and the height of waste generation reaches 15 m (the number of daily scavengers in the TPA is 300 people)
 - The pattern and behavior of the people who are not fully aware of waste and the perspective that has not been formed about the economic value of waste.

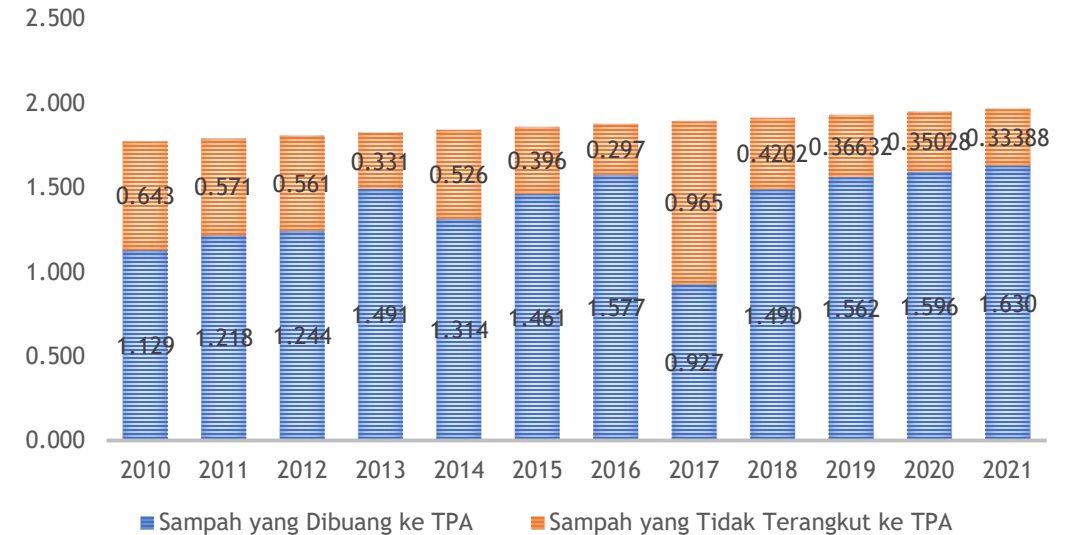


Response

- ❑ Responsibilities of Medan City Government in managing waste from upstream to downstream:
- ❑ Budget allocation for waste management sector > 5%.
- ❑ The target is to reduce waste by 30% and waste to be handled by 70%.
- ❑ Provision of infrastructure to utilize waste into renewable energy sources.
- ❑ The large potential for waste generation, budget constraints and the ability of local governments to utilize appropriate technology requires innovation and breakthroughs in accelerating the achievement of waste management targets with the Government Cooperation with Business Entity (PPP) scheme.

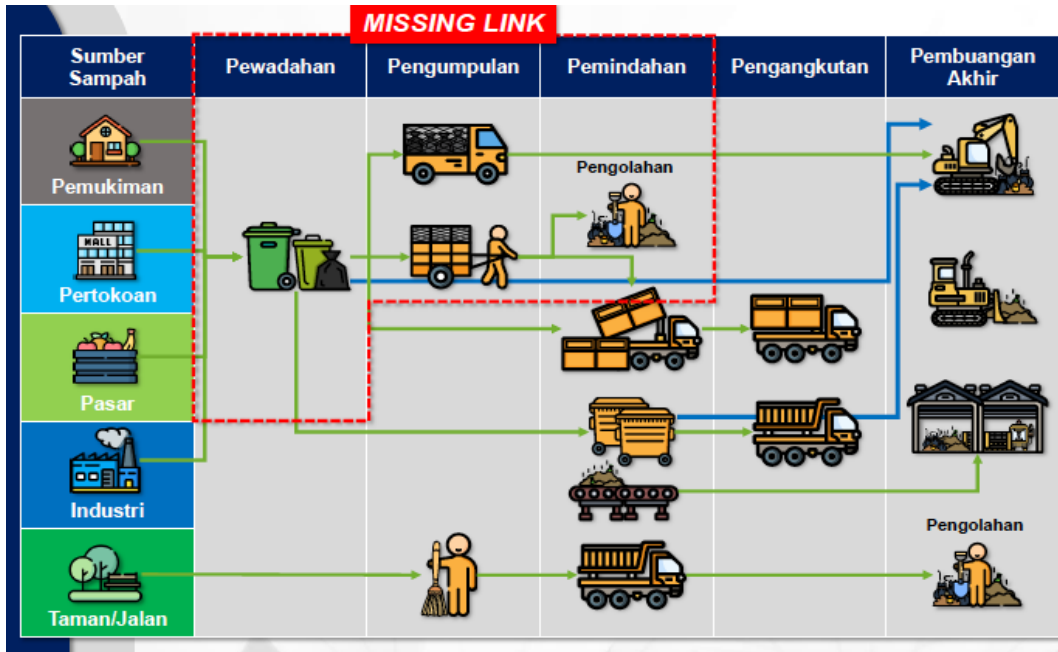
2. NEEDS ANALYSIS

PARAMETER	TAHUN							
	2018	2019	2020	2021	2022	2023	2024	2025
A. POPULASI	[2,273,720]	[2,295,150]	[2,316,782]	[2,338,618]	[2,360,659]	[2,382,908]	[2,405,367]	[2,428,038]
A. PERKIRAAN POPULASI SIANG HARI = [A X 1,2]	2,728,464	2,754,180	2,780,138	2,806,341	2,832,791	2,859,490	2,886,441	2,913,645
B. PERKIRAAN JUMLAH TOTAL TIMBULAN SAMPAH (TON/HARI) = [B X 0,7]	1,910	1,928	1,946	1,964	1,983	2,002	2,021	2,040
C. JUMLAH SAMPAH YANG DIBUANG DI TPA (TON/HARI)	1,489	1,561	1,595	NA	-	-	-	-
D. PERKIRAAN SAMPAH YANG TIDAK TERKUMPUL	420	366	350	NA	-	-	-	-



- ❑ In 2020: the amount of waste transported or disposed of to the Waterfall TPA is 1,595 tons or 83% of the total waste per day in Medan City..
- ❑ The condition of the MedanCity TPA Falls is classified as an unmanaged landfill based on the criteria of the intergovernmental Panel on Climate Change (IPCC) and the observations made at the Waterfall TPA, namely::
 - ✓ The location of the TPA Falls plot is more than 5 meters from the ground water line.
 - ✓ There is no special treatment in the form of closing the waste with certain materials.
 - ✓ The slope of the land is 3:1 or even more.
 - ✓ There is no treatment for leachate, gas and waste generated.
 - ✓ The plot of land is not protected by a fence so that scavengers can freely enter and leave the landfi;
 - ✓ Visible bursts of fire accompanied by a puff of gas at a certain point and no visible effort to control it.

Material Recovery Facility



- ❑ Still rely on conventional waste management patterns.
- ❑ Waste originating from the source is attempted to be accommodated by type, then collected and managed at a household or regional scale (intermediate treatment).

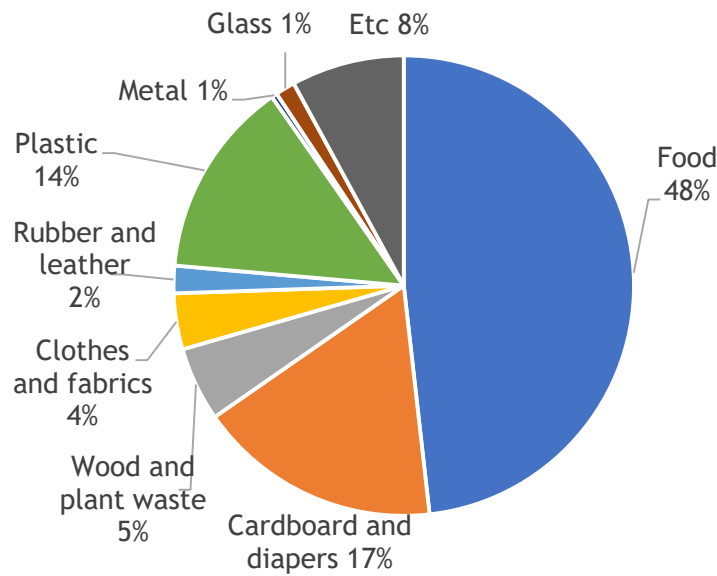


Circular Economic:
 The problem of waste can be solved by using waste as a resource and economic growth can grow well

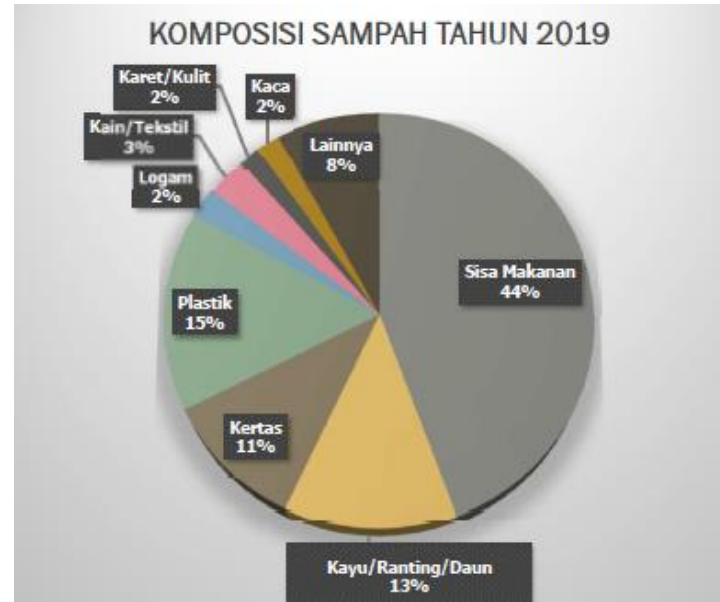


The choice of waste technology that is currently being developed in Indonesia:

1. Material Recovery Facility
2. Recycling Industry
3. Composting Industry (Maggot Technology)
4. Thermal Technology
5. Plastic for Fuel Technology
6. RDF (Refuse Derived Fuel)
7. Waste to Electricity
8. Landfill Technology



Characteristics of Urban Waste in Medan City (JICA, 2012)



Characteristics of Urban Waste in Indonesia (KLHK, 2021)

Refuse Derived Fuel or RDF is fuel derived from waste (garbage) that has gone through a process of sorting and homogenizing into small grain sizes or formed into pellets that can be used as a substitute for fossil fuels.

Another form of RDF is Solid Recovered Fuel (SRF) or Solid Jemputan Fuel (BBJP) which has a higher quality and calorific value than RDF.

Sumber: Kementerian ESDM, 2020

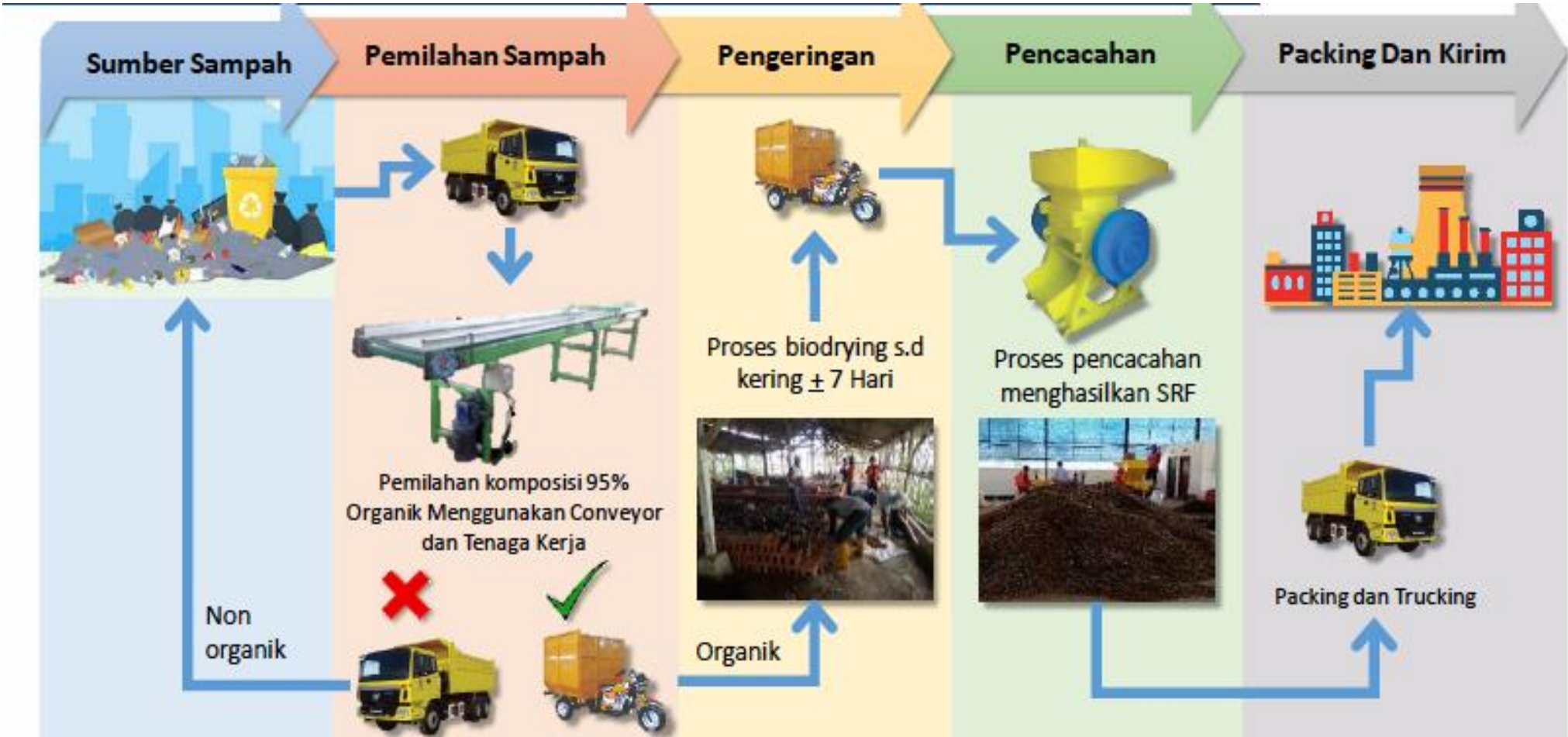
BBJP is non-B3 solid waste where the energy content contained in it can still be reused.

Sumber: SNI 8966:2021

- ❑ Incineration technology as a final waste treatment method may not be suitable for application at TPU Terjun because of the low calorific value of the waste. The lowest waste calorific value of at least 7 MJ/kg (for information, the calorific value of organic material is 4 MJ/kg) to maintain stable combustion of waste at high temperatures in incinerator facilities which reduces the risk of producing dioxins and other toxic materials

WASTE PROCESSING FLOW INTO RDF

(KLHK, 2021)



The cement industry is an industry whose production process is high energy because it requires a lot of fuel, both in the preheater and the kiln (main burner). About 30-40% of the total production cost of cement production is only used to finance fuel needs. So it can be concluded that combustion in cement production requires good energy management, so that production costs can be minimized and also harmful gases are discharged.

Characteristics of BBJP for Cofiring PLTU Utilization

No.	Parameter Uji	Satuan Min./Maks.	Kelas			Metode Uji	
			I	II	III		
1.	Kadar Material Organik*	%, min.	Organik ≥ 95	87,5 ≤ Organik < 95	80 ≤ Organik < 87,5	Lihat 6.1	
2.	<i>Sizing</i>					Lihat 6.2	
	Fluff	Mm (Mesh no.)	0,297 (50) ≤ Ø ≤ 2,38 (8)				
	Pellet	diameter	mm	6 ± 1,0 ≤ Ø ≤ 10 ± 1,0	6 ± 1,0 ≤ Ø ≤ 12 ± 1,0		
		panjang	mm	3,15 ≤ P ≤ 40			
	Bricket	diameter	mm	50 ≤ Ø ≤ 70			
panjang		mm	20 ≤ P ≤ 70				
4.	Kadar Air	%-berat	< 15	< 20	< 25	SNI 01-1506	
5.	Kadar Abu	%-berat	< 15	< 20	< 25	SNI 06-3730	
8.	Nilai Kalor Netto	MJ/kg, mean	≥ 20	≥ 15	≥ 10	SNI 01-6235	
		kcal/kg, mean	≥ 4.777	≥ 3.583	≥ 2.388		
9.	Kadar Sulfur Total	%-berat	≤ 1,5	≤ 1,5	≤ 1,5	Lihat 6.3	
10.	Kadar Klorin	%-berat, mean	≤ 0,2	≤ 0,6	≤ 1	Lihat 6.4	
14.	Hardgrove Grindability Index	HGI, min.	35			Lihat 6.7	

Sumber: SNI 8996:2021 dalam Paparan PT. Oligo (Cynthia Hendrayani), 2021

- ❑ With the waste management conditions in Medan City (BAU), it is difficult to obtain a material of origin condition > 95%.
- ❑ The only RDF used by the Cement Plant is BBJP class III with a fluff size of 20 – 50 mm. While BBJP has a smaller size of 0.297 – 2.388 mm.

Characteristics of RDF used by the Cement Plant

	Moisture (%)	NCV (kcal/kg)	Ash (%)	Chlor (%)	Sulfur (%)
Product (20-50mm)	22,32	2.981	20,55	0,2	0,17
Oversize (>50mm)	22,45	3.348	17,16	0,22	0,15
Inert (<20mm)	22,51	1.749	29,33	0,22	0,17

Sumber: SNI 8996:2021 dalam Paparan PT. Oligo (Cynthia Hendrayani), 2021

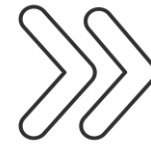
Calorific Value Based on Characteristics Urban Garbage

Fraksi Sampah	Nilai Kalor	Kadar Air
Sisa Makanan	545 kcal/kg	55%-80%
Kayu & Serat	3,160 kcal/kg	15%-25%
Combustibles	4,318 kcal/kg	25%-40%
Non-Combustibles	0 kcal/kg	-

Sumber: SNI 8996:2021 dalam Paparan PT. Oligo (Cynthia Hendrayani), 2021

- ❑ Types of wood waste and fiber have a relatively high calorific value (3,160 kcal/kg) with water content in a lower range than food waste.
- ❑ The type of wood and fiber waste is not more than 10% of the total waste in Medan City, the remaining 90% will still be a burden for the Waterfall TPA.
- ❑ Mixing wood and fiber with food waste will reduce the calorific value to 976 kcal/kg with a water content of up to 65%, thereby reducing BBJP to class III.
- ❑ Mixing food waste (48%) to be managed into BBJP Class III has logical consequences on the availability of landfill land and costs.

EXISTING CONDITIONS FOR THE UTILIZATION OF TPA FALLS

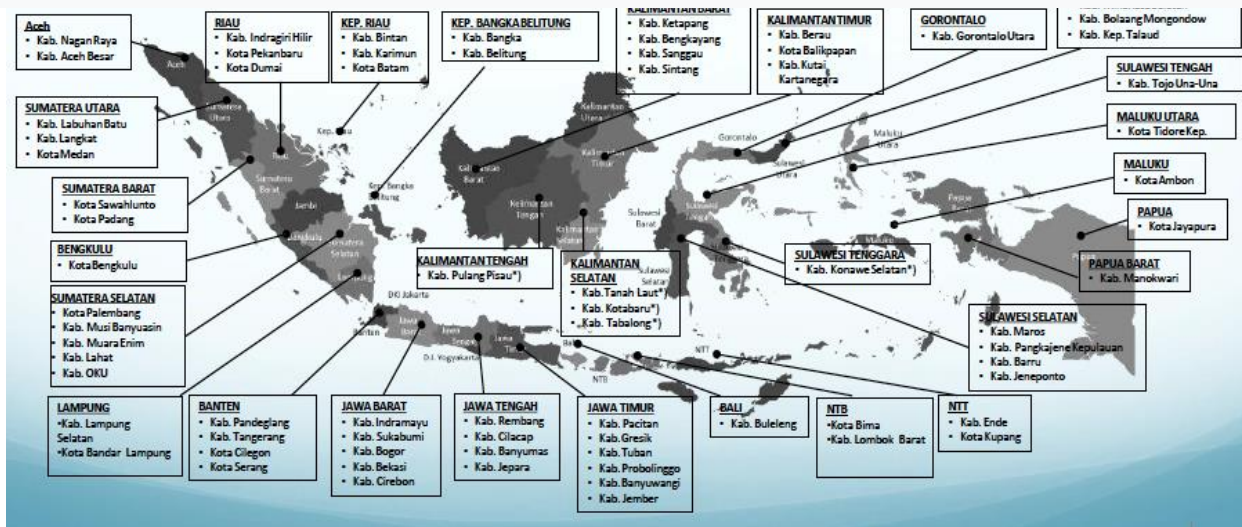


- ❑ Mixing wood and fiber with food waste will reduce the calorific value to 976 kcal/kg with a water content of up to 65%, thereby reducing BBJP to class III.
- ❑ efforts that can be made to reduce the moisture content of food waste thermally with an energy requirement of 412 kWh. So to dry food waste of 782 tons per day, it costs 113 billion per year.
- ❑ However, if drying is carried out using biological drying, it will have consequences on land availability. With reference to the RDF Plant in Cilacap, which requires 0.5 Ha to dry 120 tons of waste, TPA Falls requires at least 6.5 Ha. This condition is not possible considering that there are only 2 Ha of vacant land that can still be utilized at the Waterfall TPA (Zone C).

Conclusion:

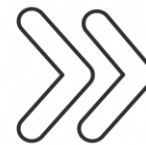
- ❑ optimizing the use of waste in the Waterfall TPA of more than 50% which will be processed into RDF, it will utilize food waste.
- ❑ The consequence is that the BBJP produced is class III which does not meet the SNI standard to be used as cofiring for the PLTU (if enforced, it will pose a risk to assets and the environment).
- ❑ The RDF Plant that will be developed can utilize food waste so that the biggest off-taker potential is a cement plant instead of a steam power plant.

Capital Expenditure to Develop RDF Plant



Sumber: Kementerian ESDM (2021)

- ❑ The Cement Mortar plant is planned to be developed in the KIM III area with a capacity of 180,000 tons per year and is estimated to require 50 tons of RDF per day.
- ❑ The total waste that will be used in this process can reach 53% of the total daily waste or as much as 850 tons/day.
- ❑ The availability of land that can be used as a biological drying bay is only 3.5 Ha, so the maximum capacity of the RDF Plant to be developed can reach a total waste of 850 tons per day or 7 times larger than the RDF Plant in Cilacap.
- ❑ Due to the limited acceptance of off-takers, the production capacity of the Cement Mortar Plant is only 180,000 tons of cement (compared to the capacity of the cement factory in Cilacap which can reach 4.1 million tons per day), so the development of the RDF Plant in Medan City with a capacity of 120,000 tons of waste per day is considered to be maximum by Note that this capacity is very likely to be expanded up to 7 times larger if the potential off-taker for RDF with BBJP Class III quality will increase.
- ❑ The plan to build an RDF Plant in TPA Falls with a capacity of 120 tons per day still only utilizes 14% of the total waste that has the potential to be processed into RDF.
- ❑ Conclusion: Handling waste into alternative fuel is not the main pillar, community-based infrastructure activities are more reliable and sustainable. Alternative fuel only as a substitute.



RDF Production Cost for 1 Year

Biaya proses produksi 1 ton sampah	Rp	210.800
Biaya penanggulangan limbah	Rp	71.202
Total harga produksi	Rp	282.002
1 Ton sampah = 0,420 ton RDF		
Kapasitas produksi harian RDF (ton)		50,4
Biaya produksi 1 ton RDF	Rp	671.443
Biaya produksi harian	Rp	33.840.727,2
Biaya produksi 1 tahun	Rp	12.351.865.428

Capital Expenditure to Develop RDF Plant

Belanja pembelian lahan 3,5 Ha	Rp	0
Pekerjaan sipil dan fasilitas	Rp	35.200.000.000,-
M&E Equipment	Rp	43.000.000.000,-
Total CAPEX	Rp	78.200.000.000,-

Determining Criteria for Implementation of RDF Technology in Medan

No.	Kriteria	City Checklist	Penjelasan
1.	Produksi sampah yang memenuhi ± 400 ton/hari	√	Total sampah yang diangkut ke TPA Terjun adalah 1.630 ton per hari. Sampah yang dapat dimanfaatkan untuk RDF berupa sampah sisa makanan (48%) dan kayu dan serat (5%) atau 850 ton per hari.
2.	Kesiapan <i>off-taker</i> baik dari PLTU yang akan melakukan <i>cofiring</i> maupun industri yang dapat menggunakan bahan bakar RDF secara masif (pabrik semen atau industri lain)	√	<ul style="list-style-type: none"> Rencana pembangunan Pabrik Semen Mortar di KIM III (Kecamatan Medan Deli) dengan kualitas BBJP Kelas III. Jika memaksakan untuk menjadikan PLTU sebagai <i>off-taker</i> maka konsekuensi logis pada penambahan investasi khususnya pada <i>treatment</i> sampah (sorting dan pengeringan) untuk menaikkan kualitas RDF menjadi BBJP Kelas II
3.	Jarak lokasi RDF Plant dengan <i>off-taker</i> . Diperlukan perhitungan terkait biaya logistik dan keekonomian (rata-rata < 100 km)	√	<ul style="list-style-type: none"> Jarak lokasi ke Pabrik Semen Mortar di KIM III = ± 9 km Jarak lokasi ke PLTU Pangkalan Susu di Kab. Langkat = ± 95 km
4.	Ketersediaan lahan yang cukup sesuai RTRW untuk pembangunan RDF plant	√	Sesuai dengan Rencana Pemanfaatan Ruang pada Perda Kota Medan Nomor 2 Tahun 2015 tentang RDTR dan Peraturan Zonasi Kota Medan Tahun 2015-2035
5.	Pemerintah daerah mempunyai kapasitas fiskal sedang s.d. tinggi	√	Peraturan Menteri Keuangan Republik Indonesia Nomor 120/PMK.07/2020 tentang Peta Kapasitas Fiskal Daerah: Indeks kapasitas fiskal daerah Kota Medan: 3,384 (Sangat Tinggi).
6.	Pemerintah daerah memiliki komitmen untuk menyediakan Biaya Layanan Pengolahan Sampah	√	Ya

Sumber: Kementerian ESDM (2021)

3. DECISION ANALYSIS



PPP Regulations

- 1) Presidential Regulation Number 38 of 2015 concerning Government Cooperation with Business Entities in Infrastructure Provision (Perpres 38/2015).
- 2) Regulation of the Minister of National Development Planning/Head of Bappenas Number 4 of 2015 concerning Procedures for Implementing Government Cooperation with Business Entities in Infrastructure Provision (Permen/Bappenas 4/2015)
- 3) Minister of Home Affairs Regulation Number 96 of 2016 concerning Payment for Service Availability in the framework of Government Cooperation with Business Entities in the Provision of Regional Infrastructure (Permendagri 96/2016).
- 4) Head of LKPP Regulation Number 19 of 2015 concerning Procedures for Procurement of Business Entities for PPPs as amended in LKPP Regulation Number 29 of 2018. (Perka LKPP 19/2015).

Waste related regulations

1. Law Number 18 of 2008 concerning Waste Management.
2. Law Number 23 of 2014 concerning Regional Government
3. Government Regulation Number 81 of 2012 concerning Management of Household Waste and Similar Household Waste.
4. Presidential Regulation Number 97 of 2017 concerning Jakstranas Management of Households and Household Similar Waste.
5. Presidential Regulation Number 35 of 2018 concerning Acceleration of Construction of Waste Processing Installations into Electrical Energy Based on Environmentally Friendly Technology.

Medan City RPJMD

- ❑ Muhammad Bobby Afif Nasution - H. Aulia Rachman as Mayor and Deputy Mayor of Medan was elected since being appointed on February 24, 2021 carrying the vision of "The Realization of an Advanced, Blessing and Conducive City of Medan"
- ❑ Establishing Mission: Medan Building as the main framework for realizing the improvement of facilities and infrastructure that supports the economy and local potential of the community while still paying attention to environmental sustainability.
- ❑ The Medan City RPJMD 2021-2026 draft sets the percentage of service coverage and waste reduction as the main indicators for the Mayor.

Regional Spatial Planning Regional Regulation

- That the strategy to realize the policy for the development of the waste system and waste water network, namely:
 - a. developing individual and communal waste management systems through reduce, reuse, recycle, replace and repair (5R)
 - b. processes; develop waste management technology;
 - c. develop a network of integrated Wastewater Treatment Plants (WWTP);
 - d. develop a Sludge Treatment Plant (IPLT).

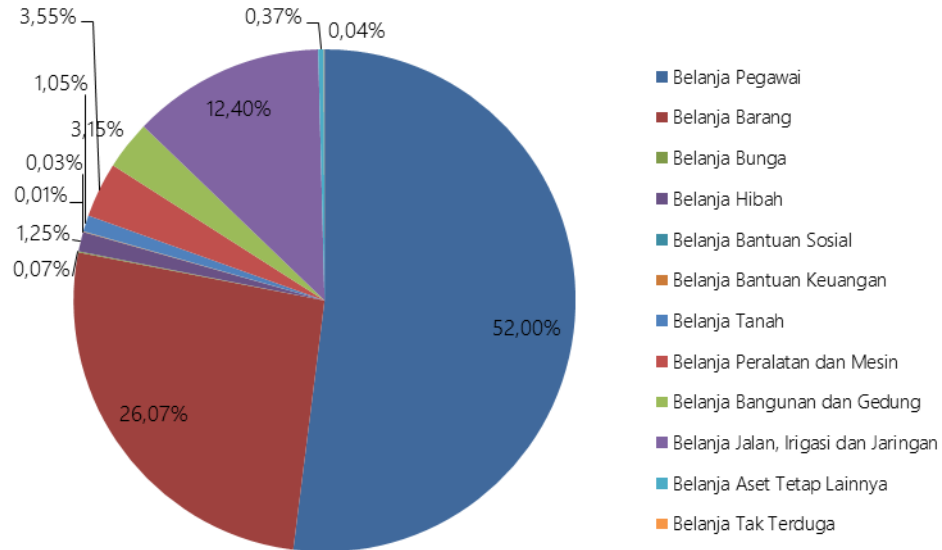
4. VALUE FOR MONEY

Rentang Nilai Keputusan atas Kelayakan KPBU	
Nilai Keputusan (Angka Total x 20) = 84	
Nilai 1 - 50	Pengembangan proyek tidak tepat bila dilakukan dengan skema KPBU
Nilai 51 – 75	Proyek tidak sepenuhnya memiliki kriteria layak KPBU. Perlu dilakukan evaluasi lebih lanjut
Nilai 76 - 100	Skema KPBU dapat dijadikan sebagai alternatif pengadaan atau dapat dilaksanakan

- The project is still new and there are more than 5 business entities capable of forming a consortium with the expertise to provide infrastructure.
- The Medan City Government does not have adequate resources for the operational and maintenance needs of the project which will be the main determinant of the control of the resulting RDF (meeting SNI).
- Accurate estimates and the possibility of revenue are also strong points for the implementation of this activity carried out with the PPP scheme.
- Although the investment value is not so large (capital cost < 500 billion) and the service life of the infrastructure built is not so long (estimated at only 10-14) years, it is believed that the PPP procurement approach has the potential to provide Value For Money (VFM) that is better than on using conventional procureme.

ANALYSIS

Persentase komposisi rata - rata realisasi belanja 2013 - 2018



Sumber: Backgroundstudy RPJMD Kota Medan 2021-2026

- Most of Medan City Government expenditure is still in the form of operational expenditure. On average, almost $\pm 80\%$ of the realized budget for the Medan City Regional Budget is absorbed for operational expenditures, especially personnel expenditures which reached 52% and goods expenditures of $\pm 26\%$.
- The rest of the capital expenditures were mostly realized for road, irrigation, and network expenditure types with an average annual achievement of 12.40%, equipment and machinery expenditures of 3.55%, building and building expenditures of 3.15% and realized land expenditures of Rp. . 43 billion annually or approximately only 1.25% of the total expenditure realization

Uraian	2013	2014	2015	2016	2017	2018	Rerata
Kemandirian (PAD : Dana Perimbangan)	58,26	58,22	52,12	55,20	53,79	52,28	54,98
Ketertanggung (Dana Transfer : Pendapatan)	57,36	45,92	48,55	37,57	42,58	47,34	46,55
Efektifitas (Realisasi : Target PAD)	76,42	82,55	83,01	81,46	85,30	77,64	81,06
Rasio Retribusi Daerah : PAD	15,62	12,34	13,44	7,53	6,53	5,19	10,11
Derajat Desentralisasi (PAD : Pendapatan)	36,81	34,26	34,98	35,64	43,81	38,52	37,34
Efisiensi (Belanja/ Pendapatan)	98,42	101,42	92,12	108,36	102,72	104,51	101,26
Rasio Belanja Modal dan Barang	39,54	46,00	43,90	48,62	43,55	47,08	44,78
Rasio Belanja Pegawai	60,46	54,00	56,10	51,38	56,45	52,92	55,22

	2013	2014	2015	2016	2017	2018	2020
Indeks Kapasitas Fiskal	0,31	0,25	0,25	0,51	4,62	3,63	3,38
Kategori	Rendah	Rendah	Rendah	Sedang	Sangat Tinggi	Sangat Tinggi	Sangat Tinggi

The independence ratio which is a calculation of the comparison between local revenue and transfer funds has an average value of 54.98%, which means that the Medan City Government is classified as a medium level for dependence on the Government and the Provincial Government of North Sumatra.

Budget Allocation per Government Affairs in the Regional Apparatus for the Infrastructure and Environment Development group in 2013 - 2018 (Billion Rupiah)

Urusan Pemerintahan	2013	2014	2015	2016	2017	2018
Bidang Ketenteraman Dan Ketertiban Umum Serta Perlindungan Masyarakat	0,29	0,22	0,15	0,00	0,00	0,00
Bidang Lingkungan Hidup	156,72	149,99	183,39	151,27	168,49	32,84
Bidang Pekerjaan Umum Dan Penataan Ruang	669,85	759,30	1.059,58	1.058,47	1.258,91	1.016,87
Bidang Perumahan Dan Kawasan Permukiman	56,61	133,52	214,62	188,62	118,85	106,56
Bidang Perhubungan	91,34	75,04	61,28	61,19	51,19	52,50
Penunjang Urusan Pemerintahan Daerah	58,45	100,60	94,90	125,73	170,44	293,80
Total	1.033,26	1.218,66	1.613,91	1.585,28	1.767,88	1.502,57

Sumber: Background study RPJMD Kota Medan Tahun 2021-2026

The waste sector in the 2013-2018 period has not become a major concern as seen in the average budget allocation of only 2.76% or 102.6 billion rupiah of the total expenditure of the Medan City Government.

Standard Waste Management Fees based on Waste Management Methods in TPA (per tonnage)

	Low-income countries	Lower-middle-income countries	Upper-middle-income countries	High-income countries
Collection and transfer	20-50	30-75	50-100	90-200
Controlled landfill to sanitary landfill	10-20	15-40	20-65	40-100
Open dumping	2-8	3-10	—	—
Recycling	0-25	5-30	5-50	30-80
Composting	5-30	10-40	20-75	35-90

Sumber: World Bank (2018)

Total Financing through 3 (three) Waste Management Scenarios

Metode Pengelolaan Sampah	Skenario I: BAU				Skenario II: TPA Controlled Landfill				Skenario III: TPA Controlled Landfill 3R			
	Sampah (ton)	Biaya	USD	Rupiah	Sampah (ton)	Biaya	USD	Rupiah	Sampah (ton)	Biaya	USD	Rupiah
Prosentase sampah terangkut	2002	30	60.060	810.810.000	2002	30	60.060	810.810.000	1201	30	36.030	486.400
Open Dumping	2002	3	6.006	81.081.000								
Controlled landfill					2002	15	30.030	405.405.000	1201	15	18.015	243.200
Daur ulang (bank sampah)									200,2	5	1001	13513
Kompos									600,6	10	6006	81.081
Total Pembiayaan per hari (Rp)		891.891.000				1.216.215.000				824.202.000		
Total Pembiayaan per tahun (Rp)		325.540.215.000				443.918.475.000				300.833.730.000		



A. 3R Program Initiation (Composting)

- The potential character of Medan City waste in the form of food waste is 48%.
- Procurement strategy through the construction of TPST 3-R
- Compost is produced at a maximum of 35% of the total raw material, thus there is as much as 210.21 tons/day of compost produced, the nominal value that can be produced from this composting activity is Rp. 84.084,000/day or Rp. 30.690.660,000/year if the price is per 1 kg of compost worth IDR 400,-



B. 3R Program Initiation (Waste Bank)

- With the condition of this waste bank that is not yet optimal, it is recorded that there is 63,050 kg of waste/month that is deposited into the waste bank. With the improvement of the supervision and support system for the waste bank, it is considered quite optimistic to target a waste reduction of 10% or 200.2 tons of waste per/day through the waste bank. With this scenario, it is estimated that the economic value to be obtained is IDR 73,073,000,000/year with an estimated selling price of waste in the range of IDR 500, - IDR 1,500 per kilogram of inorganic waste.



C. Implementing a Decent and Fair Retribution System

- Based on data obtained from the Office of Hygiene and Parks in 2018, that the total object of retribution is only 87,000 with the total income obtained by the Medan City Government if using an average levy value of Rp. 20,000, - is Rp. 1,740,000,000, - or only 2% of the total average budget in the waste management sector per year
- Permendagri Number 7 of 2021 concerning Procedures for Calculation of Tariffs for Retribution in the Implementation of Waste Handling provides an opportunity for the Medan City Government
- Based on the above considerations and assuming that the number of households in Medan City is 550,000 (assuming the average family configuration is 4 people with a population of 2.2 million people), a user fee of at least IDR 20,000 per month per household will can reach Rp132,000,000,000,-/year.

- ❑ Even though it is only an indication, at least the estimated total new source of financing of Rp.290.559.660.000,-/year can give an idea that innovation in waste management should be needed and no longer conventional, seeing waste not as an enemy but something of economic value.
- ❑ The total estimated new funding sources can even reach 3 times the average waste financing so far. The potential and resources are owned by the City of Medan, it's just a matter of how to mobilize all these potentials and resources so that they become added value for the progress and welfare of the community: The City of Blessings, Prosperous Citizens.

6. RECOMMENDATIONS AND FOLLOW-UP PLANS

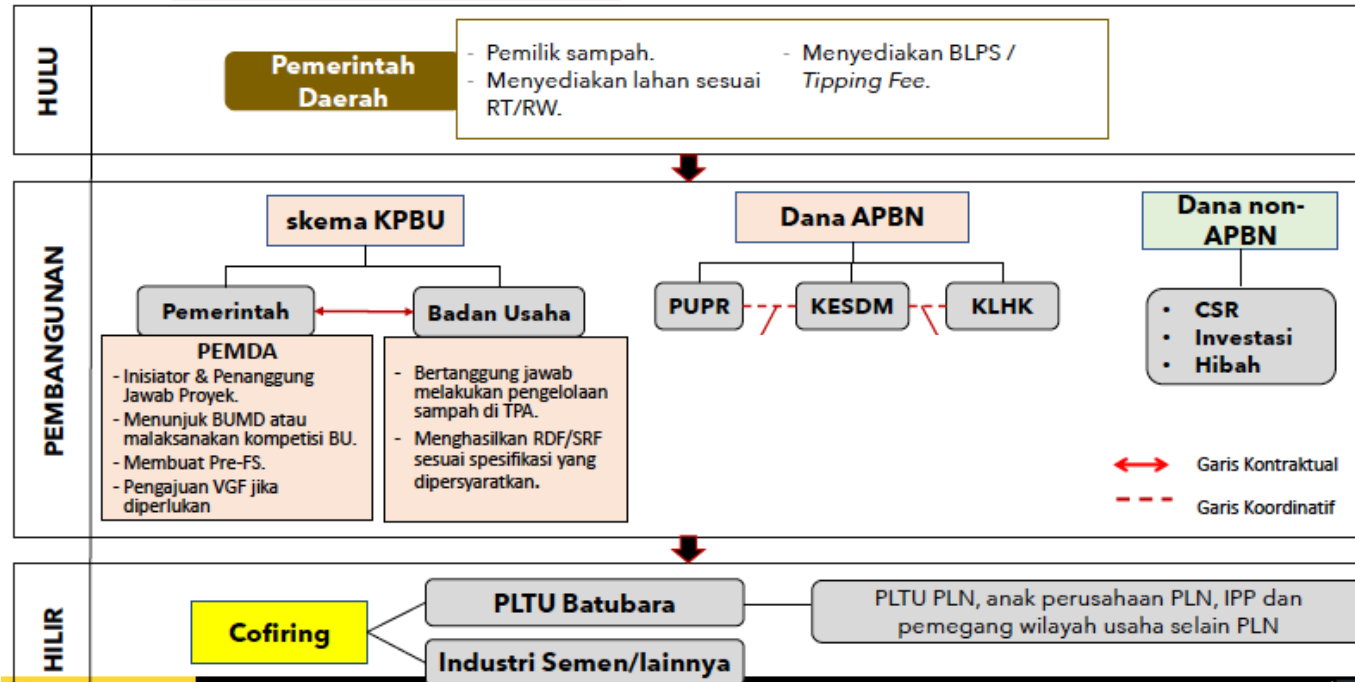


Figure 6. 1 Project Structure for Utilizing RDF Technology in Waste Management in Medan City

BOT scheme where in this option the Business Entity designs, builds, seeks financing, carries out maintenance for a certain period and transfers at the end of the cooperation agreement.

No.	Tahapan Kegiatan	Durasi Pelaksanaan
1.	Identifikasi proyek	Januari 2022
2.	Studi pendahuluan	Februari 2022
3.	Kajian Awal Prastudi Kelayakan (OBC)	Maret – November 2022
4.	Market Sounding (Penjajakan Minat Pasar)	Juni 2022
5.	Review Kajian Awal Pra-Studi Kelayakan (OBC)	Desember 2022 – Februari 2023
6.	Kajian Akhir Pra-studi Kelayakan (FBC)	Maret – September 2023
7.	Pra Kualifikasi	September – Nopember 2023
8.	Permohonan proposal	Desember 2023 – Februari 2024
9.	Penunjukan pemenang lelang	Maret 2024
10.	Penandatanganan perjanjian KPBU	April 2024
11.	Pemenuhan pembiayaan	Mei – Juni 2024
12.	Konstruksi (mulai)	Juli 2024

Thank you