

Sowing the Seeds of Destruction

Review of **Waste-to-Energy**
National Strategic Project in
Indonesia

Wahana Lingkungan Hidup Indonesia (WALHI)
2024

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Wahana Lingkungan Hidup Indonesia (WALHI)

2024

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LIST OF ABBREVIATIONS

| | |
|------------|---|
| ADB | : Asian Development Bank |
| AMDAL | : Analisis Mengenai Dampak Lingkungan |
| APBD | : Anggaran Pendapatan dan Belanja Daerah |
| BOT | : Build, Operate, Transfer |
| BPKP | : Badan Pengawasan Keuangan dan Pembangunan |
| BPPT | : Badan Pengkajian dan Penerapan Teknologi |
| CCB | : China Construction Bank |
| COP | : Conference of the Parties |
| DER | : Debt-to-Equity Ratio |
| DLH | : Dinas Lingkungan Hidup |
| EBITDA | : Earnings Before Interest, Taxes, Depreciation, and Amortization |
| FABA | : Fly Ash Bottom Ash |
| FBC | : Financial Business Case |
| FS | : Feasibility Study |
| GCA | : Griya Cempaka Arum |
| GRK | : Gas Rumah Kaca |
| ICEL | : Indonesia Center for Environmental Law |
| IFC | : International Finance Corporation |
| IRENA | : Badan Energi Terbarukan Internasional |
| ISPA | : Infeksi Saluran Pernapasan Akut |
| ITF | : Intermediate Treatment Facility |
| Jakpro | : Jakarta Propertindo |
| JETP | : Just Energy Transition Partnership |
| JICA | : Japan International Cooperation Agency |
| Kemen ESDM | : Kementerian Energi dan Sumber Daya Mineral |
| KPBU | : Kerjasama Pemerintah Badan Usaha |
| KRuHA | : Koalisi Rakyat untuk Hak Atas Air |
| LPPM | : Lembaga Penelitian dan Pengabdian kepada Masyarakat |
| LSM | : Lembaga Swadaya Masyarakat |
| MoA | : Memorandum of Agreement |
| MoU | : Memorandum of Understanding |
| NDC | : Nationally Determined Contribution |
| PJBL | : Perjanjian Jual Beli Listrik |
| PLN | : Perusahaan Listrik Negara |
| PLTBm | : Pembangkit Listrik Tenaga Biomassa |
| PLTSa | : Pembangkit Listrik Tenaga Sampah |
| PMD | : Penyertaan Modal Daerah |
| PSN | : Proyek Strategis Nasional |
| RKP | : Rumah Kompos Padangtegal |

| | |
|---------|---|
| RUPTL | : Rencana Usaha Penyediaan Tenaga Listrik |
| SIPSN | : Sistem Informasi Pengelolaan Sampah Nasional |
| SLO | : Sertifikat Laik Operasi |
| TPA | : Tempat Pemrosesan Akhir |
| TPST | : Tempat Pengelolaan Sampah Terpadu |
| UU PPLH | : Undang-Undang Perlindungan dan Pengelolaan Lingkungan Hidup |
| UPST | : Unit Pengelola Sampah Terpadu |
| WALHI | : Wahana Lingkungan Hidup Indonesia |
| YPBB | : Yaksa Pelestari Bumi Berkelanjutan |
| ZWC | : Zero Waste Cities |

INTRODUCTION

Domestic waste management is a hot issue in the global south. In its development, global south countries try to adopt the global north's way such as waste-to-energy (PLTSa). This approach does not unfold well because the waste situation in the South fundamentally differs from the North. For example, India have developed 14 PLTSa since 1987¹, and 7 of them have stopped operating, citing poor waste quality as one of the reasons. Indonesia does not shy away from this technology with a series of plans and frameworks in place to roll the solution out.

Indonesia have consistently become the main contributor to global waste generation. Annually, we are estimated to generate 63.8 million tons² to 77.7 million tons of municipal solid waste (assumed waste generation of 0.76 kg/person/day³). If the estimate is converted into an area, it is equal to burying Bandung City with a meter high of waste every year. This shows that waste management is an essential sector that the government must pay attention to given the issue's significance to the environment.

Indonesia has a notable poor record in waste management. In 2005, an explosion disaster at Leuwigajah landfill killed over 150 locals and became a highlight that reminded us of the importance of having a proper waste management system. Since the tragedy, the government of Indonesia (Gol) has committed to progressively shaping the waste management system, starting from Law (UU) Number 18 Year 2008. Through this law, the government shifted from using the collect-transport-dump concept to reduce, reuse, and recycle (3R).

During the system development using the concept, the Gol prefer PLTSa. The preference for this solution is propelled by the claim of its ability to treat waste on a huge scale and in mixed conditions, the status quo that requires a long-term and intensive commitment to be changed. As an added value, PLTSa also promises electricity generation that is expected to reduce the government's budget allocation to treat waste. Through President Decree (Perpres) Number 3 Year 2016, the government has pushed this solution as the champion for treating waste by determining PLTSas in several locations as a National Strategic Project (PSN). The policy is then enforced through Perpres Number 18 Year 2016 regarding the Construction Acceleration of Waste Power Plants in DKI Jakarta Province, Tangerang City, Bandung City, Semarang City, Surakarta City, Surabaya City, and Makassar City to propel the acceleration of waste power plants construction in 7 sites.

¹ Scroll.in, "Waste-to-energy plants have mostly failed in India – and yet governments are building more", <https://scroll.in/article/1027554/waste-to-energy-plants-have-mostly-failed-in-india-and-yet-governments-are-building-more-of-them#:~:text=This%20waste%2Dto%2Denergy%20plant,management%20and%20circular%20economy%20expert> accessed on 1 April 2024

² Kaza, Silpa; Yao, Lisa C.; Bhada-Tata, Perinaz; Van Woerden, Frank. 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Urban Development; © Washington, DC: World Bank. <http://hdl.handle.net/10986/30317> License: CC BY 3.0 IGO. accessed 14 March 2024

³ Mochammad Chaerul, Masaru Tanaka, dan Ashok V. Shekdar, "Municipal Solid Waste Management in Indonesia: Status and the Strategic Actions", Journal of the Faculty of Environmental Science and Technology, Okayama University, Vol. 2 No. 1. (Maret 2007), page 1.

On 2 November 2016, based on the judicial review request proposed by the National Coalition on Waste Incineration Refusal towards Perpres Number 18 Year 2016, the Supreme Court (MA) revoked the regulation. However, in the year 2018, the government issued Perpres Number 35 Year 2018 regarding the Construction Acceleration of Environmentally Friendly Waste-to-Energy Power Plants that is substantially similar to the revoked regulation and instead increased implementation sites to 12 sites. With the new regulation, 12 sites in Indonesia have officially received a task from the GoI to construct and operate PLTSa as the championed solution to the waste management challenge.

However, in its implementation until 2024, the solution persistently encounters constraints and rejections. From its questionable contribution to climate change mitigation⁴, massive and long commitment needs, down to its counterproductive nature against waste management hierarchy and the purpose of waste management. PLTSa development that stagnates most of the time raises the question if the solution is worth supporting and funding by the government and international financial institutions. That being said, a critical review of Indonesia's waste and PLTSa context is essential to assess the risks that can and have happened.

Information is sourced from primary and secondary resources during the report's development. Secondary resources include formal documents or public statements from the government, at the central or regional level, and documents from partnering institutions involved in the facility's development. Primary resources are from interviews with informants using a qualitative approach. Through the combination of both, the evaluation will capture PLTSas development in Indonesia in a generalized and contextualized sense in every reviewed area.

⁴ Janek Vahk, *The Impact of Waste-to-Energy incineration on climate* (s.l.: Zero Waste Europe, 2019), page 3.

BIG PICTURE

© Photos:AZWI

Indonesia and PLTSa's History

PLTSa has a long and positive relationship with the government of Indonesia and international financial institutions. Between available options, PLTSa currently receives a red carpet from the strategic to tactical level to ensure its implementation. Regardless of its recurring failures in various development sites, support from key stakeholders never recedes.

PLTSa introduction into Indonesia's waste management landscape

PLTSa started to enter Indonesia's waste management landscape not long after the Leuwigajah landfill disaster as a response to the waste emergency. In 2006, the government of Bandung City initiated the development of PLTSa Gedebage as a response to the existing condition. The government partnered with PT Bandung Raya Indah Lestari (BRIL) as the winner of the tender process for the construction and operation of the facility. Despite still facing hurdles until 2024, the facility becomes the starting point for PLTSa to be presented as the solution to Indonesia's waste management.

Besides the development plan from the regional level, the GoI also started developing policies on a national level with financial and capacity support from international financial institutions. In 2006, the Asian Development Bank (ADB) agreed to lend 400

million USD to the GoI for infrastructure reform.⁵ One of the infrastructure elements that became the focus of the reform is the waste management sector, which became the precursor for PLTSa development nationally.

The extension of this loan was technical support to design the said reform with the National Development Planning Agency (Bappenas). In its final report, PLTSa Gedebage becomes one of the Public Private Partnership (PPP) projects that is being recommended to be prioritized for its development.⁶ Even though this recommendation does not explicitly recommend PLTSa in general as the solution in the future, prioritizing PLTSa Gedebage becomes an indicator that international finance institutions are open to supporting the implementation of this technology.

Coronation of PLTSa as the right solution for waste management

In 2016, the image of PLTSa as a power plant and an environmentally friendly solution was developed. After the infrastructure reform plan was developed in 2012, Bappenas, with the aid of ADB developed a national development plan for 2015-2025 that is centered around environmental horizons. In the document, PLTSa is perceived as an environmentally friendly waste management solution with Batam, Malang, and Medan as the case study for concept implementation.⁷ With the document capacity as a strategic directive at a national level and developed with an international finance institution, PLTSa has bureaucratically become the green solution with the potential to be funded by investors.

After incorporating PLTSa into the national plan, the championing process by the GoI continues by written means in the form of regulation and implicit means in the form of public statements and small-scale pilot for concept proofing. At the regulatory level, the championing starts from Perpres Number 3 Year 2016 including PLTSa in 3 locations as PSN. Gaining this status means that the government will prioritize the project, which means more attention and facilities will be provided in its development and roll-out process. The government's commitment to this technology is progressively growing through Perpres Number 18 Year 2016 which increased the number of PLTSa gaining PSN status into 7 locations and finally enhanced again through Perpres Nomor 35 Year 2018 into 12 locations.

Implicitly, the GoI consistently fed positive sentiments to the public and investors through activities and public statements. An example of these efforts can be seen in PLTSa Merah Putih, a small-scale facility at the Bantargebang landfill designed by the Agency for the Assessment and Application of Technology (BPPT) to prove the concept. In the series of events that involve the facility, the GoI also built a positive narrative

⁵ ADB, "Loan Agreement for Infrastructure Reform Sector Development Project between Republic of Indonesia and Asian Development Bank dated 23 November 2006", <https://www.adb.org/projects/documents/indonesia-40009-013> accessed on 2 April 2024

⁶ ADB, "Indonesia : Infrastructure Project Development Facility", <https://www.adb.org/projects/40009-013/main>, accessed on 2 April 2024

⁷ ADB, "Indonesia : Green Cities: A Sustainable Urban Future in Indonesia", <https://www.adb.org/projects/46380-005/main>, accessed on 2 April 2024

such as the technology's ability to be replicated, process various types of waste, and generate electricity.

The GoI's effort to create a positive sphere around PLTSa

After the regulation and bureaucracy had been completed, aside from granting PSN status, the GoI also developed a supporting framework to create a positive investment environment for PLTSa development. Regardless of its discrepancy as renewable energy, the government included PLTSa as a renewable energy source in the Electrical Energy Provision Business Plan (RUPTL) of PT Perusahaan Listrik Negara (PLN) and included 8 projects with a total capacity of 136 MW as a part of the Just Energy Transition Partnership (JETP), a strategic document that was developed with funding from ADB, thus enforcing its position to be implemented and receive investment priority.

To solidify, PLTSa also becomes a part of Indonesia's greenhouse gas (GHG) emission reduction plan in the Enhanced Nationally Determined Contribution (NDC) with a target contribution of 1.9 million tons of CO₂-eq (13% of the total GHG reduction target in the municipal solid waste sector). This contribution can still grow 6.3 million tons of CO₂-eq through a landfill optimization scenario that is yet to have a roadmap and is open to the utilization of thermal technologies as a means to optimize.⁸

Resistance and skepticism from the people and internal

Despite PLTSa appearing as a collective effort orchestrated by the GoI, in reality, the development faces consistent resistance from the people and skepticism from other government bodies regarding the facility's operational worthiness.

People's resistance in Indonesia can be traced back as far as 2008 when affected communities by PLTSa Gedebage filed a lawsuit for the development plan to the local tribunal.⁹ The phenomenon repeats in every development site with varying affected community elements involved, indicating the high and multi-faceted negative collateral impact PLTSa creates toward communities within its proxy.

The resistance from communities finally transformed into an advocacy coalition named National Coalition Against Waste Incineration, consisting of Bali Fokus (now Nexus3 Foundation), WALHI, Gita Pertiwi, YPBB, KRUHA, and ICEL). Through this coalition, the resistance becomes more comprehensive through national-level advocacy as a complement to the resistance at the grassroots and regional government levels.

Besides resistance from the people, skepticism also comes from internal government bodies. The Commission for Corruption Eradication (KPK) is one of the bodies that

⁸ Indonesia, *Enhanced Nationally Determined Contribution*, 2022, page 29.

⁹ Pokja AMPL, "PLTSa Gedebage vs Gugatan Warga", <https://www.ampl.or.id/digilib/read/pltsa-gedebage-vs-gugatan-warga/21356>, accessed on 3 April 2024

calls into question the operational worthiness of the facility. In its review document published in 2020, KPK pointed out that PLTSa as elaborated in Perpres Number 35 Year 2018 is a liability to government instruments involved with all of its risks that are not managed properly yet.

Latent Consequences of PLTSa

Despite the Gol's commitment to implement PLTSa, the reality is that the technology poses latent consequences that impact the government itself. At least 6 consequences will bind the government when implementing PLTSa.



Waste management annual budget increment

Generally, in both province and city/regency level Regional Budget Plan (APBD), spending is distributed per agency. Waste management is usually the scope of the regional environmental agency (DLH) that is responsible for basic sanitation, thus forcing waste management to share the budget with other sanitation aspects. In the breakdown, the waste management budget is distributed from the source collection to treatment at the final site. With the wide scope, each part will only receive a fraction of the total budget. This budget model is typically based on the landfill model. If PLTSa is going to be operated, the budget that regional governments have to allocate for waste management will increase by 2-3x. This demand will put pressure on regional governments that have different priorities or cause disproportion in allocation where most of the waste management budget goes to the PLTSa, causing a sub-optimal

service at the rest of the chain.¹⁰

The consequence will have further negative implications given that data indicates GHG emission is 70% higher compared to the landfill method.¹¹ The calculation used life cycle analysis that takes into account transport distance to each facility and methane emission factor that is up to 80x stronger compared to CO₂. To conclude, implementing PLTSa means the regional government have to increase its waste management budget up to 3x only to increase its carbon footprint by 70% relative to the landfill system.

Hotbed for corruption, collusion, and nepotism, as well as political conflict of interest

PLTSa is a hotbed for corruption, collusion, and nepotism. First, the transaction value for the facility is massive, usually taking billions if not trillions of rupiah for either capital or operational (cumulative during operational lifetime), making it a lucrative target for certain groups. Second, its high complexity opens loopholes to be abused. For example, proposal evaluation criteria that are designed to benefit certain candidates without consideration of proper governance is a common practice in PLTSa development.

Aside from corruption, collusion, and nepotism, PLTSa is also a political commodity for government officials. The massive project value makes the facility an appealing transaction item between businesses and political actors. The situation becomes the precursor of horizontal conflicts incited by particular groups of interest to secure the agreed transaction.

Both points emphasize high governance risk in PLTSas development. Where the worst scenario happens, this project is susceptible to flop during preparation, construction, or operation due to poor governance. This infers a risk of wasted budget and creates a ripple effect due to other feasible work plans being abandoned since they receive no budget support, especially projects that rely on regional budget support.

Political and budget commitment for at least 20 years

PLTSa is an infrastructure project with an operational lifetime target of 20-30 years. To achieve the break-even, the main source of income is not energy, but a tipping fee from the government. Due to these factors, PLTSa operators usually ask for a government guarantee on the tipping fee during the operational lifetime. The huge budget commitment across leadership is a huge risk that reduces the government's flexibility in allocating budget for other agendas during the facility's operational lifetime.

¹⁰ Doun Moon, *The High Cost of Waste Incineration* (s.l.: GAIA, s.a.), page 3.

¹¹ Delaware County, *Delaware County's Path Toward Zero Waste*, 2023, page 64.

Inflexibility towards the governance and planning

Aside from the budget, governance, and planning, flexibility is also affected. Strategically, the region's waste management system will revolve around the PLTSa due to its high budget consumption. The consequence of this frame is an opportunity cost due to overlooking other options in the future that are impactful but against the interest of PLTSa.

Tactically, it will be difficult to adjust PLTSa's design due to the high process complexity and budget. The situation is potentially preventing the improvement of environmental governance standards to protect PLTSa from violating the enhanced standards. In this situation, communities will be the bearer of the negative consequences generated by the operating facility.

Discrepancies between PLTSa and other waste management approaches

In its frame as a PLTSa, the facility is perceived as a power plant instead of a waste treatment facility. Due to this perception, PLTSa is expected to be consistent and reliable. To achieve it, one of the important things is a stable feedstock. This means, waste has to be generated and cannot decline in quantity. The demand is counterproductive with the reduce principle of the waste management hierarchy and ultimately will hinder other waste management efforts related to the principle for the sake of satisfying PLTSa waste needs.

Indonesia's waste composition and PLTSa disconnection

The main composition of Indonesia's waste is organic material and paper/cardboard. Both are not the desired feedstock for PLTSa if the facility is expected to generate energy. Especially for organics, PLTSa will instead need additional energy to process the material. This shows that the solution is not problem fit and will instead struggle to perform due to the characteristics of the problem itself.

Moreover, PLTSa is designed with plastic waste as the desired feedstock. All the while the type is not as abundant as the top two and there are lots of plastic products that potentially can emit harmful side products when incinerated. With the implementation of PLTSa, similar to the lock-in effect, we will be directed to generate unnecessary plastics and instead fail to reduce the amount of plastic waste generated.

"Price" of PLTSa

Waste management at heart is a basic service to protect the environment, public health, and empower the community. In Indonesia's context, waste management is utilized as labor-intensive with varieties of reuse and recycle methods passed through generations. However, PLTSa will potentially go against the intention.



Public health risk of PLTSa

PLTSa poses a high detrimental risk to public health if carelessly designed and operated. If the facility is not able to incinerate waste in the required state, whether due to false waste assumptions or poor machine capability, the combustion will generate gases and particulates that are scientifically proven to be harmful to living beings. Exposure to the toxic compounds will not only occur to the proximities but also be distributed as far as possible due to dispersion into the ambient air, thus increasing the amount of people and environment impacted.

Occupation losses due to mechanization

Just like the Global South, Indonesia sees waste management as a labor-intensive industry capable of employing a high amount of workers. Although it is hard to make an accurate estimate, the informal sector of waste management has created lots of jobs. If PLTSa operates with mixed waste feedstock, one of the collateral damages will

be soaring unemployment. Mechanized PLTSa will require a less unskilled workforce compared to the existing situation, thus causing more unemployment than employment for the facility operation. It is also worth noting that the informal sector has become employment opportunities for women, elders, and disabled groups, which means mechanization will also impact the inclusivity in waste management significantly.

Diminishing obtainable material resources

With the incineration of materials, the total obtainable material is reduced. This is due to the fact that incineration will turn the material into particulate matter that cannot be molded into a reusable material. In the long run, the process will trigger a material crisis or environmental quality reduction due to essentials and minerals not being recirculated into the system.

JAKARTA: THE COMPLICATED BUSINESS MODEL

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The Story of Jakarta, Waste, and ITF Sunter

Jakarta and a mountain of new organic waste every day

Jakarta is one of the highest waste generator provinces in Indonesia. In 2022, the province generated 3.11 million tons of domestic waste, or equal to 8,500 tons of waste per day. The generation increased by 0.938% compared to the previous year. The growth indicates a rising consumption level among the locals.

| Year | Waste Generated (tons) |
|------|------------------------|
| 2020 | 3.050.000 |
| 2021 | 3.080.000 |
| 2022 | 3.110.000 |

Table 1. Waste Generation in DKI Jakarta 2020-2022¹²

¹² “Timbulan Sampah DKI Jakarta Masih Tinggi, ITF Justru Dibatalkan Heru Budi”, <https://mediaindonesia.com/lima/timbunan-sampah-dki-jakarta-masih-tinggi>, accessed on 7 April 2024

Of all waste generated, 54% are organic material and 10% are residue (SIPSN, 2022). This shows that incineration is not fit to treat Jakarta's waste and has a high potential to manage waste properly if source segregation is applied in the waste management system.

| Type | Percentage (%) |
|-----------------|----------------|
| Food waste | 53,75 |
| Garden waste | 0,87 |
| Paper/cardboard | 14,92 |
| Plastic | 14,02 |
| Metals | 1,82 |
| Textile | 1,11 |
| Rubber | 0,52 |
| Glass | 2,45 |
| Others | 10,54 |

Table 2. Waste Composition in DKI Jakarta¹³

The effort to manage waste as practically as possible becomes complicated

To treat waste generated, the government of Jakarta have been relying on the TPA Bantargebang located outside of the province. As the landfill was approaching its capacity in 2016 and surpassed its extended capacity in 2024, the provincial government sought a new solution to handle the waste generated. Propelled by the urgent needs, the planning for an intermediate treatment facility (ITF) was commissioned with the target of reducing the waste volume by a minimum of 80%.

The idea for the facility was already introduced in 2009, but the process stucked in the investor auction phase. The project was eventually mandated through the Governor Decree (Pergub) Number 50 Year 2016 in March 2016 where PT Jakarta Propertindo (Jakpro) received the task and is responsible for the whole project. In December 2016, Jakpro announced a partnership with Fortum, an energy company from Finland, as the strategic partner.¹⁴ Through the partnership, Fortum will work with Jakpro from planning, preparation, and implementation, until handover.

In April 2018, Pergub Number 33 Year 2018 was introduced as an extension to the mandate for Jakpro. In the document, the site is decided in the Sunter area, and through a public statement, it was discovered the capacity of the facility is 2,200 tons

¹³ Kementerian Lingkungan Hidup dan Kehutanan, "Komposisi," <https://sipsn.menlhk.go.id/sipsn/public/data/komposisi>, accessed on 7 April 2024.

¹⁴ Pembangunan, "PT Jakpro Gandeng Finlandia Bangun ITF Sunter," <https://m.beritajakarta.id/read/39682/pt-jakpro-gandeng-finlandia-bangun-itf-sunter>, accessed on 7 April 2024

per day. To accelerate the construction, the government of Jakarta and Jakpro held a groundbreaking in December 2018, signaling the start of the construction, and declared the construction will take 3 years from the groundbreaking day.¹⁵

However, after the event, no meaningful construction activities take place. In June 2021, it was discovered that Fortum resigned as the partner due to a deadlock.¹⁶ After the withdrawal, ITF Sunter floated without clarity until October 2023 when the government of Jakarta declared that the facility would not be processed further, as shown by the reallocation of Regional Capital Investment (PMD) worth up to 517 billion IDR that was intended for ITF Sunter. From a regulation perspective, the project is still alive since there is no revocation of the policy by the president as of 2024.

A regulation that is simplistic and attempts to shift responsibility

The latest regulation that covers ITF Sunter is Pergub Number 33 Year 2018 which continues Jakpro's mandate to work on the project. 2 things expressed in this regulation are that the problem statement is simplified and there is an impression the regional government want to shift the risk of the facility to external.

First, since Pergub Number 50 Year 2016, the problem is framed simply in the form of a volume reduction target of a minimum of 80%. The target is charged on 1 facility, making the PLTSa solution the strong candidate due to its claimed ability to process mixed waste in 1 facility. On the other hand, if the facility only focuses on organics, at best only 50% of the waste will be handled, and 20% will be on recyclables. Sharpened with Jakarta's context which suffers from land scarcity, it will be difficult to satisfy the land requirements for a combined facility. In the end, due to the simplified and not properly assessed problem statement, the options available become limited.

Second, in Article 20 Pergub Number 33 Year 2018, it is stated that any losses will be Jakpro's responsibility. The article feeds an impression of the government's awareness of the risk and want to externalize it to other parties. Even though bureaucratically Jakpro will report to the government first, the article becomes an indicator of how they (re: government) perceive themselves on the implementation of the facility.

Intensive capital financed through international financing institutions

ITF Sunter is projected to cost 4 trillion IDR to construct. Similar to other major projects, the project is expected to be financed through loans. In the development, PT Jakarta Solusi Lestari (JSL), a joint venture between Jakpro and Fortum, engaged with the

¹⁵ Kompas, "https://megapolitan.kompas.com/read/2023/06/27/22172891/jalan-panjang-proyek-itf-sunter-digagas-era-gubernur-fauzi-bowo?page=all#google_vignette", diakses pada 8 April 2024

¹⁶ Bisnis, "Proyek ITF Sunter, Perusahaan Finlandia Fortum Power Mundur. Mengapa?", <https://jakarta.bisnis.com/read/20210601/77/1400043/proyek-itf-sunter-perusahaan-finlandia-fortum-power-mundur-mengapa>, diakses pada 8 April 2024

International Finance Corporation (IFC) as the financing institution for ITF Sunter. Through the loan mechanism, JSL is expected to pay IDR 5.2 trillion in total.

For operational expenses, the government of Jakarta will be expected to pay a tipping fee to the operator. The fee is estimated to be 600,000 IDR per ton of incoming waste. This means that without any price adjustment, every year for 25 years, the government have to pay 480 billion IDR. Citing the PIC governor of Jakarta, Heru Budi, ITF Sunter's operational cost can spike up to 2 trillion IDR per year, which Jakarta's APBD cannot provide at all.

Partial Public Transparency

During its development, the public rights for the information on ITF Sunter are not distributed openly and clearly. According to Indonesia Center for Environmental Law (ICEL) review of the environmental impact assessment (AMDAL) document, the file does not elaborate clearly on the ecological limitations that have to be complied with, creating a potential abuse of the standards that should be adhered to. Adding to ecological limitations, crucial impacts (e.g. hazardous waste treatment, air quality impact, public health impact, etc.) created are not well-documented where the methodology used is not representative enough, and the capacity is not calculated properly.

Regarding public consultation, according to Wahana Lingkungan Hidup (WALHI) Jakarta, the trace of ITF Sunter public consultation is hard to track. This is against the public consultation principles according to Prof. Dr. I.B.R Supancana where consultation has to be transparent, accessible as wide as possible, and involves every relevant element. With the limited access, the concern is that the consultation might not exist or create a bias due to only involving small parts of the community. On the latter, there is a risk the process becomes tokenism where communities are only a symbolic gesture and do not represent the majority of the aspiration.

Until 2024, regional civil society organizations (CSOs) still sporadically accompany locals in Jakarta to obtain their rights to information. This is due to the information circulation on public consultation is not easy to obtain. Aside from the sporadic accompaniment, CSOs also initiated public hearings and involved the local government as the event facilitator.

PLTSa: Complex, Expensive, and Volatile Business Model

ITF Sunter is a financial fail case due to the model's complexity, cost, and volatility. Stakeholders' inability to make it a viable case has proven to make the project unable to achieve a financial close.



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Lots of stakeholders with various interests that are hard to accommodate in the middle

In ITF Sunter's case, there are lots of interests that are hard to accommodate, thus making it difficult to settle the agreement. At least there are 6 parties involved explicitly in the business model; Jakpro, JSL, Fortum, the government of Jakarta, GoI, and IFC. There are 2 conflict of interest examples due to multiple entities involved that created a domino effect on other agreements. First, disagreement on the Electricity Transaction Agreement (PJBL), and second, disagreement in the payment method and commitment for the tipping fee.

For the PJBL case, disagreement takes place between PLN and Fortum through JSL. The first party want the take-and-pay method, meaning PLN have the flexibility to decide the amount of electricity they can purchase and pay accordingly. On the other hand, Fortum wants the take or pay, where JSL as the operator will receive a fixed payment if PLN take less than what is generated. In the ITF Sunter context, PLN do not have the incentive to increase their electricity stock since they already have Java supply secured up until the redundancy. Moreover, electricity production from PLTSa is more expensive compared to other sources, thus cutting down PLN's profit margin. Due to these contexts and Fortum's position as a private for-profit entity, a deadlock happens since an agreement cannot be found between both entities.

Tipping fee has a higher complexity with the long commitment demand on top of the “take and/or pay” disagreement. Entities involved are the government of Jakarta and Fortum through JSL. Similar to electricity, Fortum want the tipping fee to have a fixed floor fee based on the maximum capacity and the commitment has to be locked during the concession period of 25 years. The government of Jakarta find it hard to satisfy both terms as the payment scheme is putting them at a loss and the long-term commitment reduces their flexibility to respond to the field dynamics. Similar to PJBL, the situation ends up as a deadlock and no agreement can be found.

Both deadlocks ultimately impacted the financing process where investors cannot approve the loan due to no business model certainty proven through the PJBL or the tipping fee agreement. In this context, the entities involved are IFC and JSL. The GoI was expected to be able to provide a guarantee as an alternative form of certainty for the investor and the operator, however, the request never materialized until a public statement on the halting of the project.

Initial capital and operational beyond government and Jakpro’s ability

As explained before, ITF Sunter requires a capital of 5.2 trillion IDR (including interest) and OPEX in the range of 480 billion IDR to 2 trillion IDR per year. If we observe Jakpro’s financial performance and DLH Jakarta historically, then it is practically impossible to execute the project.

Jakpro consistently recorded a net loss from 2019 until 2022.¹⁷ According to the Jakarta Regional Secretary (Sekda) in 2022, the net loss is propelled by the maintenance cost of other assignment projects.¹⁸ This means Jakpro will be at a very high risk if they have to do another capital and operational expenditure to build and run the PLTSa. Without a clear profitable business model, Jakpro will then rely on regional equity investment (PMD) every year to run the facility, which is against the very purpose of a company that should be seeking profits.

Meanwhile in DLH Jakarta, in 2019, they had a budget of IDR 3.5 trillion. Integrated Waste Management Unit (UPST) receive IDR 1.19 trillion out of all budget. The budget received has to be then distributed into all chains of waste management from collection to transfer to the final site. From the budget allocated, it can be inferred that DLH’s financial muscles will not be enough to construct or operate a PLTSa properly. Adding to the fact that the budget has to be distributed into sub-components, it is impossible to rely on the APBD to run the facility.

In the business process sense, the most logical conclusion for Jakpro is to not work on

¹⁷ BPBUMD, “Profil BUMD Provinsi DKI Jakarta”, <https://bpbumd.jakarta.go.id/web/bumd/JKPRO>, accessed on 10 April 2024

¹⁸ Bisnis, “Keuangan Jakpro: Limbung Karena Beban Penugasan Menggunung?”, <https://kabar24.bisnis.com/read/20230807/16/1682199/keuangan-jakpro-limbung-karena-beban-penugasan-menggunung>, accessed on 10 April 2024

PLTSa. Moreover, the bleeding financial performance makes it impossible for Jakpro to get a loan due to poor credit rating, thus making conventional financing methods unlikely. Meanwhile, increasing DLH's budget allocation requires a political commitment from the officers in charge. However, considering that this means UPST have to greatly increase its budget (potentially more than 2x), it is hard to imagine this as an obtainable solution. Therefore, looking back and looking forward, it can be concluded that ITF Sunter construction is an idea that does not consider properly the financial capacity of the parties involved, in this case, DLH Jakarta and Jakpro.

Multiple eras project that the government is reluctant to guarantee

Referring to Pergub 33/2018, Chapter IV, Article 15, ITF Sunter will be operated by Jakpro for 25 years after finishing the construction. Due to the PLTSa business model, the government must also commit for 25 years. This means that Jakarta by default will be tied to the agreement unilaterally across 3-6 leadership eras.

The agreement will take the form of the commitment of tipping fees, PLTSa land concession, supporting programs, and others. Without these commitments, the business model will be significantly impacted and potentially stop the operation. Essentially, the government will have an intensive and prolonged resource commitment to operate the facility.

The commitment eventually cannot be agreed upon by the government, both at the provincial or central level. At the central level, especially with the issuance of Minister of Environment and Forestry Decree (PermenLHK) Number 75 year 2019 regarding Waste Reduction Roadmap by Producer, will create a conflict with PLTSa demand for waste to operate. The opposing path becomes one of the blockers to the government guarantee requested by financing institutions to approve a loan.

At the provincial level, locking the budget for multiple cabinets is a hard-to-justify agenda since the government sees that as putting themselves at a disadvantage - inflexibility. Other potential activities with a greater value will be denied by PLTSa which already secured its budget allocation. Moreover, the commitment is demanded without any certainty that the facility will be safe and reliable for the public, given its location which will be in the middle of the city.

SURAKARTA: RECKLESS IMPLEMENTATION AND DUBIOUS FINANCIAL SUSTAINABILITY

The Long History of TPA Putri Cempo

Waste management situation in Surakarta City

Surakarta City is considerably small when it comes to its waste generation contribution to the entire Central Java (#17 of 29 cities/regencies). However, the city has a per capita waste generation equal to Jakarta. This fact indicates a consumerist society and an urgent need for proper waste management. According to SIPSN, as of 2023, Surakarta City generates 152,974 tons of municipal solid waste or 419 tons per day. The figure is a 40% increase compared to 2021, which implies a significant change in the number of population and the socioeconomic quality.

| Year | Waste Generation (ton) |
|------|------------------------|
| 2021 | 109.297,92 |
| 2022 | 137.345,45 |
| 2023 | 152.974,67 |

Table 3. Waste Generation in Surakarta City 2021-2023¹⁹

In general, the waste composition in Surakarta City is dominated by organic waste, similar to other regions in Indonesia. However, the proportion is relatively smaller with

¹⁹ Kementerian Lingkungan Hidup dan Kehutanan, “Timbulan”, <https://sipsn.menlhk.go.id/sipsn/public/data/timbulan>, accessed on 14 April 2024.

a contribution of 43.82% to the total. On the other hand, recycling has the potential of up to 40% of the total waste generated. Combined, the figures imply that Surakarta City can treat up to 83% of its waste properly if there is a sufficient investment for proper organic and recyclables treatment. The implication will also translate that there is only less than 20% of the waste that can be used as a feedstock for PLTSa if organics and recyclables are treated properly.

| Type | Percentage (%) |
|-----------------|----------------|
| Food waste | 38,18 |
| Garden waste | 5,64 |
| Paper/cardboard | 13,64 |
| Plastic | 22,73 |
| Metals | 3,64 |
| Textile | 7,27 |
| Rubber | 0 |
| Glass | 0 |
| Others | 8,9 |

Table 4. Waste Composition in Surakarta City²⁰

The commencement of TPS Putri Cempo and the need for waste management alternative

TPA Putri Cempo commenced its operation in 1987.²¹ The facility is adjacent with 4 villages on each side (north, east, south, and west). TPA Putri Cempo is designed to operate until 2007 with 17 hectares of allocated area for sanitary landfill. However, until 2024, the facility still operates and is in a state of overcapacity. Since 2007, the facility has skewed from its supposed sanitary landfill to open dumping, which is already prohibited by the Gol based on Minister of Home Affairs Decree (Permendagri) Number 33 Year 2010.

The inadequate management situation created a domino effect such as leachate that runs into the nearby water body, GHG emissions, and a putrid smell from decomposition to the nearby communities. The poor waste management situation and the impacts it created became the regional government's justification to entertain PLTSa as a potential solution to manage Surakarta City's waste.

²⁰ Kementerian Lingkungan Hidup dan Kehutanan, "Komposisi," <https://sipsn.menlhk.go.id/sipsn/public/data/komposisi>, accessed on 14 April 2024.

²¹ Badan Penelitian dan Pengembangan Kota Surakarta, *Executive Summary Kajian Dampak Pembangunan Pembangkit Listrik Tenaga Sampah (PLTSa) di Kota Surakarta* (s.l.: s.n., s.a.), hlm. 3.

PLTSa idea development and the first tender

The PLTSa Putri Cempo facility started to enter the planning phase in 2013. In that year, the financial business case (FBC) was developed with the aid of ADB.²² The facility was then designed with a capacity of 460 tons per day, generates 7.1 MW of electricity, and requires a capital of 38 million USD to construct. The FBC was completed in November 2013 and followed up with the pre-qualification phase for potential partners in February 2014.

During the pre-qualification phase, no potential partners fulfilled the required criteria and therefore stopped the tender process. The project is then terminated due to the Surakarta City government declared that they are not willing to provide a tipping fee for the operator. According to the Infrastructure Reform Sector Development Program project report by ADB in 2017, the project is already written off from the list of Public Private Partnership (PPP) projects supported by ADB.

The assigning of PLTSa construction and the second tender

The PLTSa Putri Cempo project did not have any follow-up until 2016. The momentum for the project picked up again through Perpres Number 18 Year 2016 where Surakarta is designated as one of the implementation sites. With the assignment, the regional government conducted the second tender process for PLTSa Putri Cempo's strategic partner. In this process, the consortium of PT Solo Citra Metro Plasma Power (SCMPP) came out as the winner. The consortium is a joint venture between PT Pembangunan Perumahan (Tbk.) (PP) and PT Citra Metrojaya Putra (CMP).

PT SCMPP proposed a gasification technology as the approach for the PLTSa in their proposal. The processing capacity is 389 tons per day with 200 tons using waste from daily collection (fresh waste) and 189 tons from waste already dumped at TPA Putri Cempo (old waste). 10 MW (net) of electricity is expected to be generated where 8 MW of it will be purchased by PT PLN and the remaining 2 MW will be used for facility operations. The facility is planned to be constructed in the TPA Putri Cempo area on 2 hectares of land.

PT SCMPP's PLTSa plan was then followed up with the AMDAL by the Surakarta City DLH in 2018. This follow-up was also in response to the issuing of Perpres Number 35 Year 2018 on the construction of PLTSa in 12 sites. According to the assessment developed, 3 important points were noted. First, PLTSa violated all emission standards mentioned (SOx, NOx, and PM). Second, communities were not prioritized and the mitigation plan for the social and economic impacts is not well-elaborated as well as planned. Third, in the socialization process, the information delivered was partial and dishonest, thus leaving affected communities unaware of the full implications they will face and only discovering the impact they were not told before later.

²² ADB, "Indonesia: Infrastructure Reform Sector Development Program (Subprograms 1, 2, and 3, and an Infrastructure Project Development Facility)", hlm. 66.

| Parameter | PLTSa Putri Cempo ambient air quality (µg/m ³) | Ambient air quality standard Gov Decree 41/1999 (µg/m ³) | Ambient air quality standard Gov Decree 21/2021 (µg/m ³) |
|----------------------------|--|---|---|
| NO ₂ (per hour) | 663,3 | 400 | 200 |
| SO ₂ (per hour) | 1.493 | 900 | 150 |
| Debu (per 24 hour) | 381.4 | 230 | 230 |

Table 5. Ambient Air Quality Comparison between PLTSa Putri Cempo and Quality Standards

Financial close and the construction of the facility

PLTSa Putri Cempo secured financing from China Construction Bank (CCB) to construct the facility. Based on the latest information available, 16 million USD out of 23 million USD capital required to construct the facility has successfully liquidated from CCB. The loan return scheme will entirely rely on the electricity sales to PT PLN since no tipping fee will be paid to PT SCMPP.

With the secured loan, in 2019, PLTSa Putri Cempo construction started. Due to the pandemic in 2020, the construction was postponed and picked up again in 2021. The completion of the construction took place in mid-2023 and PT SCMPP continued their work as the facility's operator with a contract as the operator for 20 years.

Commissioning phase and facility operation

As PLTSa Putri Cempo is constructed, it entered the commissioning to ensure compliance on all aspects from installed specifications to operation & maintenance procedures. This phase kicked off before the inauguration of the facility took place in October 2023 and ran until February 2024. During this phase, PT SCMPP was still in the process of obtaining an operation suitability certificate (SLO) from the Ministry of Energy and Mineral Resources (MEMR). While the commissioning phase ran, complaints from nearby communities on PLTSa's operational activities started to surface, ranging from noise, and smoke, and affecting public health.

In February 2024, after the SLO was obtained, the facility shifted from commissioning to the full operation phase. As of 2024, of all 8 generators installed, only 2 operate. The remaining 6 generators that are yet to operate are planned to be activated progressively, however no clear roadmap on the timeline until all generators are active. Despite its status of fully operating, according to desktop research and interview investigation, no data archives on the operational activities that can be accessed, making it difficult to assess the facility's operational reliability and problem-solving accuracy.

Notable negative notes on the facility's management during the operation

Less than 1 year since PLTSa Putri Cempo is fully operational, several negative notes have been taken regarding waste treatment in the facility. The notes are as follows.

1. Waste import from Bali. PLTSa Putri Cempo is recorded to have received and treated waste from Bali that is indicated to be transported by PT Bali CMPP, the winner of the tender process as the licensed operator of 3 integrated waste treatment facilities (TPST) in Denpasar and is under the same ownership with PT SCMPP;
2. Land expansion beyond the agreed design. The approved design for PLTSa Putri Cempo was 2 hectares including an area for pre-treatment and residue storage, however, based on aerial observation, the area used expands due to the demand for larger pre-treatment and residue storage area;
3. Pre-treatment drying area is installed adjacent to the local community. The installation encourages pollution in the communities in the form of dispersed fly ashes from the drying process;
4. Inadequate residue treatment. There are 2 types of residue, the wastewater and the bottom ash.
 - a. Wastewater: tar and condensate from the treatment process are being disposed of in the Jengglong River that ends at Bengawan Solo River without a proper treatment process to comply with the standard on wastewater/ hazardous waste. Consequently, rivers are polluted, cannot be consumed for agriculture and farming practices, and pose harm to humans when in contact. The pollution is also recorded to have impacted Karanganyar Regency and escalation to the local environmental department has taken place.
 - b. Bottom ash: according to the laboratory test by the operator of PLTSa, the bottom ash is considered as a hazardous waste, thus a special treatment is required for processing and storing the waste. However, the bottom ash generated is only stored in an open space and ends up dispersed into the environment and local communities every day.
5. Removed economic opportunity for waste pickers. PLTSa Putri Cempo inevitably privatized the final disposal site area and drove away waste pickers who had been working in the area way before the facility existed. Although the issue was finally solved, because the waste supply needed to operate the plant, waste pickers are still on the losing side since their potential income has now shrunk due to the waste that goes straight to the processing area and smaller working space;
6. Reduced public health quality. Due to fly ashes, which is the treatment residue, local communities nearby directly exposed to it are suffering from coughing and asphyxiation. Tens of people suffering from coughs and rashes received free medical treatment after complaints on PLTSa were responded to by the local government.

Advocacy Notes on Surakarta

1. In 2020, local communities started the advocacy process to respective neighborhood heads on the construction activity, however no notifiable responses from this advocacy process;
2. In 2022, city-level advocacy process to the regional House of Representatives (DPRD), DLH Surakarta, and PT SCMPP took place, led by the waste pickers association with the main concern of economic opportunity loss due to privatization. The advocacy resulted in waste pickers regaining access to the facility with an agreed procedure;
3. In September 2022, there was an effort to hold a public hearing between communities and the mayor, however, the request was rejected and the DLH Surakarta was tasked to attend the hearing;
4. In March 2024, a public hearing between communities, DLH Surakarta, and PT SCMPP was held regarding the residue from the treatment process. It was disposed at the road access to a sacred grave and affected the local communities. The hearing resulted in the operator moving the residue from the road access;
5. In September 2024, there were 2 advocacy attempts, the first one towards the temporary mayor and the DPRD regarding the hazardous waste generated from the process and not treated in compliance with the standard. The second one was with mayor election candidates and temporary mayor by doing a field visit that eventually yielded nothing;
6. In October 2024, a public hearing between communities, the village office, city-level government, DLH Surakarta, and PT SCMPP took place as a follow-up to the complaint to the government on the pre-treatment and residue storage space that is placed adjacent to the local communities. The result was anti-climax with PT SCMPP's attempt to reduce the issue to a matter of nomenclature and interpretation, which does not solve the core problem and still causes health issues to the local communities.

Until the end of 2024, advocacy processes are still ongoing, especially with the regional election coming in November 2024. However, with the government's reactionary and reluctant approach, it is difficult to expect significant progress at the policy-making level.

Operating with a Question Mark

Since the issuance of Perpres Number 35 Year 2018, PLTSa Putri Cempo is one of the only two facilities that are built according to the regulation. However, 3 things are notably questionable regarding the construction.



Indicative poor governance since tender until operation

The first notable question of PLTSa Putri Cempo is the governance that can be seen in the tender process and the operation. During the tender process, even though it is difficult to obtain traces of the tender process such as evaluation metrics, the appointment of PT CMP is a decision that needs to be scrutinized. There are at least 2 points on the appointment of PT CMP that are worth highlighting.

The first point is the profile of the desired investor. PLTSa Putri Cempo as one of the pilot projects has the needs of an investor with a solid amount of experience regarding PLTSa, however, PT CMP do not have such a track record as far as desktop research goes. This put a higher risk profile for the project due to the poor technical experience of the investor.

The second point is the technology proposed. Given the scale of the processing and the potential impact it will yield, the evaluation of the technology should be more stringent according to the applicable standards. However, the result of the evaluation raises questions due to PT CMP's technology that violated all air quality standards during operations and the proposal that lacks a proper analysis of the social and economic impact. These discrepancies bring questions to the decision to win PT CMP.

Both points are supported by 2 running cases on the field regarding their performance. The first case takes place in Surakarta where as of 2024 PT CMP are not able to operate PLTSa up to the the agreed design and treat the processing residue properly to prevent environmental harm and public health problems. The second case is in Denpasar where PT Bali CMPP failed to operate TPST Kesiman Kertalangu and TPST Padangsembian

Kaja to treat the municipal solid waste to the point where they needed to send it to Surakarta City. As of September 2024, PT Bali CMPP have their contract with the Denpasar City government terminated as PT Bali CMPP are considered to have failed to perform during their operations.²³

Regarding its operations, the facility also shows inconsistencies and dangerous practices. As explained in the previous part, PLTSa Putri Cempo has now taken more space than what was designed to accommodate the unhandled incoming waste and the processing residue that PT SCMPP cannot handle properly. The technical incompetency shown by the operator also becomes the initial indication of poor governance since the planning phase that takes place now during the operation.

Technical incompetency becomes crucial because it happens at the implementation level, which means the impact will be felt by the local communities. The impact is proven by complaints, public hearing requests by communities regarding the hazardous waste that is not treated properly, and land conversion to store newly generated waste from Surakarta City. With the compromised public health and the initial goal of reducing waste at landfills barely answered, it is imperative to reevaluate the design agreed upon and the implementation on the field.

An oversimplified calculation that does not reflect reality

The second notable question is that PLTSa Putri Cempo relies entirely on electricity sales with the following calculation model.²⁴

- Electricity generated = 10 MW
- Revenue from electricity sales per kWh = 13.35 cents USD/kWh
- 1 USD = 18,000 IDR
- Total revenue from electricity sales to PLN per annum = 10,000 kW x 24 hours x 365 days x 2,400 IDR/kWh = 210 billion IDR
- Total revenue during 20 years of operation = 210 billion IDR x 20 years = 4.2 trillion IDR

With this model, lots of incoherent assumptions in the simplified model such as the currency conversion rate that is rated at 18,000 IDR. Using an alternative simple calculation model with the following assumptions.

- 1 USD = 15,000 IDR
- Designed capacity = 10 MW
- Capacity factor = 75%
- Levelized cost of electricity = 5-10 cents USD/kWh²⁵
- The ratio of electricity sold to PLN to internal use = 3:1

²³ Detik, "Habis Kesabaran Pemkot Denpasar ke PT Bali CMPP gegara Gagal Urus Sampah", <https://www.detik.com/bali/berita/d-7549099/habis-kesabaran-pemkot-denpasar-ke-pt-bali-cmpp-gegara-gagal-urus-sampah>, accessed on 15 October 2024

²⁴ Gatot Sutanto, "Kerjasama PLTSa Kota Surakarta", Materi Dialog Publik Polemik Urgensi PLTSa Sebagai Solusi Pengelolaan Sampah di Kota Surakarta, 21 Desember 2020.

²⁵ IRENA, "Renewable Power Generation Costs in 2023", hlm.187-188.

- Total days of operation per year = 360 days
- Electricity purchase value by PLN = 13.35 cents USD/kWh
- Operation lifetime = 20 years
- Total loan for construction = 50,000,000 USD

We obtain the following calculation.

| | Value | Unit |
|---|-------------------------|---------------|
| Actual electricity generated (Designed capacity x capacity factor x 1000 kW/MW) | 7.500 | kW |
| Total electricity to PLN (Actual electricity generated x electricity fraction to PLN / total) | 6.000 | kW |
| Total electricity to PLN per year (Total electricity to PLN x days of operation/year x 24 hours/day) | 51.840.000 | kWh/ tahun |
| Total electricity sales revenue per year (Total electricity to PLN per year x electricity purchase value x conversion rate USD:IDR) | 103.809.600.000 | IDR/ tahun |
| Total electricity sales during operation lifetime (Total sales revenue per year x operation lifetime) | 2,076,192,000,000 | IDR |
| Total outstanding loan - exclude interest (Total loan x conversion rate USD:IDR) | -750,000,000,000 | IDR |
| Revenue after loan payment | 1,326,192,000,000 | IDR |
| Lower estimate of operating expense during operation lifetime (Lower estimate operating expense/kWh x total electricity generated x total days of operation per year x 24 hours/day x currency conversion USD:IDR x operation lifetime) | -972,000,000,000 | IDR |
| Higher estimate of operating expense during operation lifetime (Higher estimate operating expense/kWh x total electricity generated x total days of operation per year x 24 hours/day x currency conversion USD:IDR x operation lifetime) | -1,944,000,000,000 | IDR |
| Earning before interest, tax, depreciation, and amortization (lower estimate of operating expenditure) | 354,192,000,000 | IDR |
| Earning before interest, tax, depreciation, and amortization (higher estimate of operating expenditure) | -617,808,000,000 | IDR |

Table 6. PLTSa Putri Cempo Basic EBITDA Analysis

Based on the simple breakdown above, PLTSa Putri Cempo will record an earning before interest, tax, depreciation, and amortization (EBITDA) between 354,192,000,000 IDR to -617,808,000 IDR during its 20 years of operation. Even in the scenario of the lower operating expense estimate, the facility's EBITDA will be less than 18 million IDR per year.

To sum it up, the PLTSa Putri Cempo business model is not feasible from the financial aspect. The lower estimate calculation uses the average levelized cost of electricity (LCOE) from IRENA, which makes sense in a case where the technology is already known to fit the landscape. However, if the technology is the first model or first application, usually the operating expense will be higher than the average.

There are 3 important notes regarding the financial setup. The first note is the loan payback scheme where interest will take place. The 50 million USD is the total loan needed to build, not the total outstanding needs to be paid along the agreed timeline. With that in mind, the remaining revenue PT SCMPP have after paying the loan to operate and take profit will be even less compared to the calculation model elaborated above.

The second important note is that the calculation model above assumes the facility will operate at a full scale right after the inauguration and by design generate 10 MW. This assumption is different from the field condition where as of October 2024, the facility is only expected to generate 5 MW and in reality only 1.6 MW where 1 MW of it is sold to PT PLN. These conditions mean in the past year, the energy generated is way below the projection, cumulative total energy production in the next 20 years is down by 50% from what was projected in the AMDAL, and mathematically skewed the financial projection by a big amount.

The third important note is the electricity purchase price agreed in the power purchase agreement for PLTSa Putri Cempo. Referring to Perpres Number 112 Year 2022, the determined purchase price for a biomass-based power plant, which is the nearest category to PLTSa, for 5-10 MW of production capacity is 9.86 cents USD/kWh in the first 10 years and 7.89 cents USD/kWh for year 11 until year 25. Depending on the signing date of the power purchase agreement, this means PLTSa Putri Cempo is potentially violating existing regulations and faces potential consequences including price adjustment. If the price adjustment takes place, PT SCMPP as the operator will have its revenue reduced by 26% for the first 10 years and 41% for the second 10 years relative to the currently agreed 13.35 cent USD/kWh.

The implementation adds more problems instead of solving problems

The last notable question is the development of the facility implementation that complicates waste management in Surakarta City. Aside from the design that deviates from the initial plan and the inadequate residue treatment, the fact that PT SCMPP imported waste from Bali and the waste management hierarchy does not apply is a significant note on its own. Both facts create a question of how PLTSa Putri Cempo can synergize with other waste management methods and its ability to answer the overcapacity issue of TPA Putri Cempo.

The first point is importing waste from Bali. In principle, the facility was built to handle waste within its region, thus to import waste from another island at a larger quantity compared to the amount of Surakarta's waste processed is a total nonsense. Moreover, referring to the process flow diagram of the facility, PLTSa Putri Cempo feedstock is supposed to be fulfilled by the mix of newly generated waste and waste at landfills. Keeping in mind as well that the facility is yet to fully operate, the need to import additional waste is completely unnecessary.

The decision to import waste from outside of Surakarta City is a decision that insults the spirit of sustainable waste management. Where waste management has to aspire to reduce the amount of waste generated, this decision instead increases the recorded amount generated and increases the workload. Importing waste is a questionable decision by PT SCMPP that warrants a need for further assessment of PLTSa Putri Cempo.

The second point is regarding the waste management hierarchy that does not apply at the final disposal site. Similar to other power plants in general, PLTSa requires a consistent stream of waste. Simply put, this demand will be against the hierarchy of waste management that strives to reduce waste generation. The waste demand eventually affects the environmental and socio-economic aspects. For the former aspect, the local government will struggle to run 3R-based programs since it will create uncertainties for PLTSa, either from the waste quantity or quality standpoint. From the latter aspect, waste pickers will have their livelihood threatened due to the significantly decreasing potential income. This is due to waste privatization, which in turn disables waste pickers from accessing the waste.

With both impacts in mind, the local government will face a mounting waste that will either stagnate or increase and an increased poverty rate due to decreased income in the informal sector. Even worse for the poverty issue, waste pickers are very prone to drop into the extreme poverty state since their status quo is already in the lower or vulnerable middle economy.

SURABAYA:

POOR TRANSPARENCY AND MULTIPLE NEGATIVE IMPACTS FOR COMMUNITIES

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TPA Benowo Transformation

Waste condition in East Java's largest waste generator

Based on SIPSN, during 2023, East Java generated 6.1 million tons of waste. This number was generated by 36 cities/regencies with Surabaya being the largest contributor at 647,016 tons (10.7%). Aside from its large contribution, the city also saw a growth in waste generation at 0.98% in 2023 relative to 2021. Referring to the same data source, it is worth noting that in 2019 and 2020, Surabaya waste generation peaked at 810,000 tons per annum. It is very likely there is a different methodology that caused the significant difference, however, the main point stands with Surabaya being the largest contributor in East Java up to 13.3%.

| Year | Waste Generation (tons) |
|------|-------------------------|
| 2019 | 811.860,24 |
| 2020 | 811.255,10 |
| 2021 | 650.614,62 |
| 2022 | 651.043,42 |
| 2023 | 657.016,64 |

Table 7. Waste Generation in Surabaya City 2019-2023²⁶

The waste composition in Surabaya City is dominated by food waste (55.48%). The overall share of domestic waste that can be treated with composting in Surabaya City is 57.73%, while 25.31% can be treated by recycling. This means more than 80% of the

²⁶ Kementerian Lingkungan Hidup dan Kehutanan, "Timbulan," <https://sipsn.menlhk.go.id/sipsn/public/data/timbulan>, accessed on 14 April 2024.

waste generated in Surabaya City can be treated with the 3R approach and does not require incineration if the management system prioritizes segregation at the source and infrastructures for composting and recycling can be provided adequately.

| Type | Percentage (%) |
|-----------------|----------------|
| Food waste | 55,48 |
| Garden waste | 2,25 |
| Paper/cardboard | 3,05 |
| Plastic | 22,01 |
| Metals | 0,25 |
| Textile | 5,75 |
| Rubber | 1,35 |
| Glass | 0,5 |
| Others | 9,36 |

Table 8. Waste Composition in Surabaya City²⁷

The start of TPA Benowo

In the years 2000 and 2001, the government of Surabaya City closed TPA Lakarsantri and TPA Sukolilo.²⁸ TPA Lakarsantri, which is 8.3 hectares wide, was closed due to reaching its capacity, while TPA Sukolilo which was 40 hectares wide was closed due to complaints from communities.²⁹ Due to the closing of both facilities, TPA Benowo was introduced in 2001.³⁰

The waste management system in Surabaya City covers sorting, collection, transport, treatment, and final processing.³¹ The system is supported by 190 material recovery facilities, 9 integrated material recovery facilities, 26 composting facilities, and 352 waste banks.³² Waste that are considered to be untreatable and have no economic value for waste banks will be disposed of to TPA Benowo uses an open dumping system and creates air pollution as well as leachate.³³ Despite all the infrastructure support, the amount of waste generated in Surabaya City keeps growing and getting out of hand

²⁷ Kementerian Lingkungan Hidup dan Kehutanan, "Komposisi," <https://sipsn.menlhk.go.id/sipsn/public/data/komposisi>, accessed on 14 April 2024.

²⁸ Ahmad Zakki Zunuha, "Permasalahan dan Pengelolaan Sampah Surabaya Tahun 2000-2015," *Avatara e-Journal Pendidikan Sejarah* Vol. 6 No. 2. (July 2018), page 278.

²⁹ Sarifah Hidayah dan Putri Fahimatul Hasni, *Melihat Tata Kelola Sampah di Surabaya dan Diskursus Zero Waste* (s.l.: Wahana Lingkungan Hidup Jawa Timur, 2020), page 1.

³⁰ *Supra note* 3, page 281.

³¹ Indonesia, *Peraturan Daerah Kota Surabaya Pengelolaan Sampah dan Kebersihan di Kota Surabaya*, Perda No. 5 Tahun 2014, Ps. 14.

³² United Nations Economic and Social Commission for Asia and the Pacific, *Rencana Aksi Pengelolaan Sampah Plastik Perairan di Kota Surabaya* [s.l.: s.n., s.a.], page 3.

³³ Alif Kurniawan, "Evaluasi Pembangkit Listrik Tenaga Sampah Menggunakan Metode Gasifikasi di Benowo Surabaya Jawa Timur," (Skripsi Sarjana Universitas Islam Sultan Agung Semarang, Semarang, 2023), page 18.

for the government. Therefore, the government of Surabaya City require an alternate solution to treat the waste downstream and reduce the load of waste that have to be dumped into the landfill.

Open auction for investors to manage TPA Benowo

As an effort to manage the waste downstream, in the year 2012, the government conducted an open auction for potential investors to invest and manage TPA Benowo. The auction process was followed by 4 candidates, including PT Sumber Organik (through its holding PT Navigat Energy) and Medco Energy. The main consideration for the preferred investor in this auction is the one with the least amount of tipping fee requested and the highest amount of investment committed. Through this process, the government determined PT Navigat Energy as the winner of the auction to build PLTSa Benowo with landfill gas collection and gasification technology.³⁴ During the process, Medco Energy filed a protest on the result, however, PT Navigat Energy still came out as the winner.

The partnership between the government of Surabaya City and PT Sumber Organik regarding the waste-to-energy facility was legalized under the cooperation agreement Number 658.1/4347/436.6.5/2012 and 88/JBU-SO/8/2012 on 8 August 2012. The cooperation is in the Build-Operate-Transfer (BOT) model, schemed for 20 years. PLTSa Benowo will have a working area of 37.4 hectares and a processing capacity of 1,000 tons of waste per day, with 400 tons done by gasification and 600 tons by the landfill gas system.³⁵

Electricity generated from PLTSa Benowo is planned to be at 2 MW through landfill gas capture and 12 MW from gasification.³⁶ Of the total 12 MW, 9 MW will be sold to PLN, 2 MW will be internally used for operations, and 1 MW as redundancy.³⁷ The partnership and construction project started way before Perpres Number 35 Year 2018 regarding the Construction Acceleration of Environmentally Friendly Waste-to-Energy Power Plants was issued.

In the cooperation agreement mentioned above, both parties agreed to apply a tipping fee scheme for waste management. The clause regarding the tipping fee can be found in Article 17 of the contract with a stipulation that the amount of waste that goes into the facility is set at a minimum of 1,000 tons per day. If the amount that enters is less than 1,000 tons, the government is still obligated to pay the tipping fee equal to

³⁴ Feby Meilina Suchahyo dan Eva Hany Fanida, "Inovasi Pengelolaan Sampah Menjadi Pembangkit Listrik Tenaga Sampah (PLTSa) oleh Dinas Kebersihan dan Ruang Terbuka Hijau (DKRTH) Surabaya," *Publika* Vol. 9 No. 2 (2021), page 44.

³⁵ Borhanudin Achmad Safi dan Mas Roro Lilik Ekowanti, "Kemitraan Pemerintah dan Swasta tentang Pengelolaan Sampah menjadi Tenaga Listrik dengan Program Zero Waste City di Pembangkit Listrik Tenaga Sampah/PLTSa Benowo, Surabaya," *Jurnal Aplikasi Administrasi* Vol. 2 No. 1 (May 2022), page 40, 42-43.

³⁶ *Supra* note 9, page 50.

³⁷ Lucky Wahyu P, *Assessment Proyek PLTSa Surabaya Melihat Praktik PLTSa dan Pandangan Masyarakat* (s.l.: WALHI Jawa Timur, s.a.), page 1.

1,000 tons. On the other hand, if the waste sent to the facility is more than 1,000 tons, the government have to pay accordingly. The contract also dictates that the amount of tipping fee will increase every year until the 20th year.³⁸ Based on the financial projection, the government of Surabaya City have to pay PT Sumber Organik nearly 73 billion IDR per year.³⁹ This is significantly one-sided where the government only receive 3 billion IDR per year from PT Sumber Organik for renting fees. The discrepancy will become a liability for the APBD.⁴⁰

Apart from tipping fees, both landfill gas capture and gasification facilities are also targeted to receive income from electricity sales to PT PLN. For landfill gas facilities, the selling value that will be received by PT Sumber Organik is 1,250 IDR per kWh or around 60,000,000 IDR per day (assuming 24 hours of operation, 2MW output). For gasification facilities, the sales value that will be received is 13.35 cents USD per kWh or around 324,405,000 IDR per day (assuming 24 hours of operation, 9MW output, capacity factor 75%, exchange rate 1 USD = 15,000 IDR).

Financing and construction phase

The construction of the Benowo PLTSa is funded through loans from the ADB and also funding entities from China. The total funding for the gasification facility is 54.2 million USD or equivalent to 704.4 billion IDR (assuming an exchange rate of 1 USD = 13,000 IDR in 2021).⁴¹ Not much can be found about the Benowo PLTSa funding process including the loan tenor and the interest rate applied during the repayment period.

For the construction period, the gas capture and gasification facilities were implemented in 2 different timelines. The gas capture facility began operating in 2014 while the gasification facility was inaugurated in 2019 and began operating in 2021 after being delayed by the pandemic.

PLTSa operational phase and the impact on local communities

The methods used in the operation of PLTSa Benowo are landfill gas collection and gasification. The first method has been carried out since 2015 where waste is collected and left for approximately three weeks to produce electrical energy.⁴²

The gasification method has been operating since 2020 where waste will be processed through combustion. This technology produces flammable syngas from the thermal

³⁸ Faizal Kurniawan dan Shintarini Kristine Setyobudi, "Klausula Tipping Fee dalam Kontrak Kerjasama Pemerintah dengan Swasta (Public-Private Partnership) Pengelolaan Persampahan," ADIL Jurnal Hukum Vol. 4 No. 1, page 42-43.

³⁹ Gyovany Manalu dan Muhammad Farid Ma'ruf, "Kerjasama Pemerintah Kota Surabaya dan PT Sumber Organik pada Program Pembangkit Listrik Berbasis Sampah di TPA Benowo Kota Surabaya," Publika Jurnal Ilmu Administrasi Negara Vol. 8 No. 2 (2020), page 8

⁴⁰ Direktorat Penelitian dan Pengembangan Komisi Pemberantasan Korupsi, "Kajian Sektor Kelistrikan: Pengelolaan Sampah untuk Energi Listrik Terbarukan," (kajian disampaikan pada Kajian Sektor Kelistrikan, Jakarta, 6 March 2020), page 15-16.

⁴¹ Industri, "Surabaya jadi kota pertama yang operasikan pembangkit listrik tenaga sampah", [https://industri.kontan.co.id/news/surabaya-jadi-kota-pertama-yang-operasikan-pembangkit-listrik-tenaga-sampah#:~:text=Adapun%20tarif%20listrik%20dari%20PLTSa,atau%20Rp%20704%2C4%20miliar](https://industri.kontan.co.id/news/surabaya-jadi-kota-pertama-yang-operasikan-pembangkit-listrik-tenaga-sampah#:~:text=Adapun%20tarif%20listrik%20dari%20PLTSa,atau%20Rp%20704%2C4%20miliar.). accessed on 7 November 2024

⁴² Supra note 9.

transformation of solid waste that is processed together with oxygen. Syngas has a composition consisting of carbon monoxide, hydrogen, and carbon dioxide. The gasification process requires a temperature of more than 600 degrees Celsius to heat solid waste. This technology also produces toxic substances in the form of solid and liquid materials, as well as charcoal waste (slag) and ash.⁴³ The waste from this technology also contains dioxins, mercury, and heavy metals that can pollute the air and waters around it⁴⁴ that can harm lungs, cause irregular heartbeats, and cause heart attacks and premature death.⁴⁵

Waste processed through the gasification process at PLTSa Benowo is household waste and/or waste similar to household waste. Household waste includes organic waste, plastic, metal, glass, and packaging.⁴⁶ With mixed waste used as gasification material, the risk of releasing toxic substances, acids, and tar from the gasification process is higher.⁴⁷

Residents around the Benowo PLTSa also felt the impact of the power generation process. Based on data from the Benowo Health Center, cases of acute respiratory infections (ARI), especially in children, increased significantly from 2020 to 2021. Residents also admitted that they had not received any socialization regarding the threat of waste burning at the PLTSa to health, especially due to the release of dioxin into the air. The government has regulated through Article 345 of Government Regulation No. 22 of 2021 that thermal processing with incinerators is required to have a standard efficiency of dioxin destruction and removal with a value of at least 99.99%.⁴⁸ Furthermore, monitoring through dioxin examinations should be carried out every 3 or 6 months. However, the cost of dioxin testing is very expensive and the infrastructure is still not available in Indonesia, so samples need to be sent abroad.⁴⁹

⁴³ Supra note 4, page 21.

⁴⁴ Neil Tangri dan Monica Wilson, *Waste Gasification & Pyrolysis: High Risk, Low Yield Processes for Waste Management* (s.l.: GAIA, 2017), page 9.

⁴⁵ Supra note 4, page 23.

⁴⁶ Supra note 13, page 44.

⁴⁷ Andrew N. Rollinson, "Fire, explosion and chemical toxicity hazards of gasification energy from waste," *Journal of Loss Prevention in the Process Industries* 54 (2018), page 279.

⁴⁸ Indonesia, Peraturan Pemerintah Penyelenggaraan Perlindungan dan Pengelolaan Lingkungan Hidup, PP No. 22 Tahun 2021, Ps. 345.

⁴⁹ Berita Anak Surabaya, "Ancaman Dioksin dari PLTSa dan Kenaikan Kasus ISPA Anak di Kelurahan Benowo," <https://kumparan.com/beritaanak-surabaya/ancaman-dioksin-dari-pltsa-dan-kenaikan-kasus-ispa-anak-di-kelurahan-benowo-1x3aZey08ZK/full> diakses pada 15 Mei 2024.



Advocacy Notes in Surabaya

Advocacy in Surabaya has been quite slow due to the lack of information circulating and also the public perception that either does not know about the PLTSa or even feels embraced during the construction and operation of the facility. Based on WALHI East Java's records, they are still in the research stage regarding the development of the PLTSa Benowo. The first exploration was carried out in 2021 with an AMDAL request to PT Sumber Organik for review. The AMDAL study efforts were then stopped because the request was rejected by the company based on the company's intellectual property rights. This exploration was continued with efforts to collect primary data through interviews and field observations. This effort did not produce many results because no party from PT Sumber Organik could be contacted and the facilities were not accessible to the public for whatever reason. The first exploration ended with an analysis of publicly available writings and journals related to PLTSa in general and related to PLTSa Benowo.

The second exploration was conducted in 2023 using an investigation method through the surrounding environment and the environment connected to the facility (collector). Through this investigation process, initial information was collected that provided indications of the operational activities of the Benowo PLTSa. The 3 investigation results that became notes related to the operation of the facility include:

1. Operation of facilities that were suspended during the FIFA U-17 World Cup due to concerns that operational activities would disrupt events taking place

- at the Gelora Bung Tomo Stadium and a distance of +/- 2 km from the PLTSa;
2. The flow of liquid waste from processing at the PLTSa goes to the Lamong River, where the processing method in the facility is unknown and whether it meets standards or not;
 3. Vehicle traffic related to salt production activities entering and leaving the Benowo TPA environment, where food production should not occur within the TPA environment.

These three notes are early indications of potential dangers arising from the facility. Although the public currently does not object to the existence of the Benowo PLTSa, there is a high possibility that this is due to ignorance of the waste or impacts resulting from processing activities. As of October 2024, assessment activities will continue to be carried out, however, with limited information circulating, it will still take time to be able to advocate for the Benowo PLTSa.

Minimum Transparency and Poor Facility Management

Despite being the first facility to be established and operated, PLTSa Benowo is also the facility with the least amount of information available to the public relative to the other 3 cases. This is a separate note because the feasibility and appropriateness of the facility are questions for related parties. 2 things that are of concern regarding PLTSa Benowo are the transparency of information and the overall management and facility governance.

First, regarding information disclosure. In the construction of the PLTSa Benowo, the Surabaya City government failed to carry out the mandate of the law regarding information disclosure, especially providing access to AMDAL documents. AMDAL documents are a vital instrument in efforts to prevent and control environmental damage. WALHI East Java submitted a request for AMDAL information for the Benowo PLTSa to the Surabaya City government, but this was rejected by them. The rejection was conveyed through a response letter from the Surabaya City government's data center which stated that the PLTSa AMDAL document was exempted because it was copyrighted. This response is not following the Law on Environmental Protection and Management (UUPPLH) and the Law on Public Information Disclosure.⁵⁰

The poor public participation is also indicated by the minimal socialization of health threats to residents living within a radius close to the PLTSa, as explained in the section above. In the planning and construction process of PLTSa, the local government should be able to invite more people through public consultation, socialization, seminars,

⁵⁰ WALHI Jawa Timur, "Kota Surabaya dan Kota Batu Darurat Keterbukaan Informasi Publik Sektor Lingkungan Hidup," <https://walhijatim.org/2022/10/12/kota-surabaya-dan-kota-batu-darurat-keterbukaan-informasi-publik-sektor-lingkungan-hidup/> accessed on 21 May 2024.

workshops, and/or discussions. This is important because the construction and operation of PLTSa have an impact on people's lives.

Second, regarding governance, there are 3 pieces of information that indicate poor and unconvincing governance at the Benowo PLTSa.

1. The first indication is the validity of waste processing and solid residue processing into concrete blocks. As of 2024, no evidence can be found that the ongoing process for waste processing and solid residue is running properly and does not cause side effects to the surrounding population.
2. The second indication is public health for the affected community and workers. Based on the results of tracing and observation, leachate produced from processing activities flows into the Lamong River and this residue has caused an employee to resign from his job due to exposure to leachate. In addition, there has also been an increase in cases of ARI in the area around the Benowo PLTSa based on reports from surrounding health facilities.
3. Last, there is the ongoing food production activity in the TPA environment. The facility area was historically a salt pond area before being used as a facility as it is today. However, even though it has become a TPA, salt production activities continue and have received an operating permit. The impact of this condition is that salt produced in the Benowo area has been detected to have a higher lead heavy metal content than the established standard due to exposure to leachate.⁵¹ Inappropriate land use that endangers the public like this should not happen and is a strong indicator of the weakness of good governance in the development and operation of the Benowo PLTSa.

From the Benowo PLTSa case, it can be understood the importance of transparency from the management and local government to ensure the appropriateness and feasibility of the facility. The analysis and identification that is currently underway are also very limited due to the lack of information that can be accessed by the public. Given that this facility has a lot of impact on the wider community, accountability and transparency should be implemented so that all parties get their rights.

⁵¹ Selly K. dan Sudarmaji "Hubungan Pencemaran Pb Lindi pada Tambak Garam Sekitar Tempat Pembuangan Akhir Sampah Benowo, Surabaya dengan Kadar Pb dalam Rambut Masyarakat Konsumen Garam", Jurnal Kesehatan Lingkungan, Vol.4, No.2, Januari 2008 : 21 - 30

BANDUNG:

**PROLONGED MISCONDUCT
AND HIGH RISK OF
BANKRUPTCY**



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Waste Emergency since 2005

Waste condition in Bandung City

Bandung City is the largest waste generator in Greater Bandung that covers 5 cities/regencies. According to SIPSN data, the waste generated in Bandung in 2023 is 1,766 tons/day, a 10.8% increase from 2022. The increase indicates a significant demographic shift in Bandung City's environment such as population and socioeconomic status.

In terms of waste composition, Bandung City is similar to the majority of areas in Indonesia with food waste as the main constituent at 44.5%. Plastics and papers come at the second and third at 16.7% and 13.1%. Based on these top 3, without having to rely on PLTSa, more than 60% of waste in Bandung City can be treated through composting and recycling facilities accordingly.

| Type | Percentage (%) |
|-----------------|----------------|
| Food waste | 44,51 |
| Garden waste | 3,98 |
| Paper/cardboard | 13,12 |
| Plastic | 16,7 |
| Metals | 0,9 |
| Textile | 4,75 |
| Rubber | 2,38 |
| Glass | 5,75 |
| Others | 7,91 |

Table 9. Waste Composition in Bandung City⁵²

Bandung, the sea of waste

In February 2005, Bandung City and Greater Bandung were in a state of waste emergency. The situation was triggered by TPA Leuwigajah that ceased to operate due landfill explosion and landslide in the facility. During the crisis, no collection activity took place, and waste was left rotting in the city. Putrid smell, maggots, and slums were the identity associated with the areas impacted by the situation.

Responding to the situation, the West Java government took an emergency response by opening a temporary final disposal site at Cicabe, which then moved to Sarimukti, Cipatat, West Bandung Regency. The emergency facility is now what we know as TPA Sarimukti and still receives waste as of October 2024. The active operation is due to TPA Sarimukti having its status changed from an emergency facility to a regional landfill in 2006.

Parallel to the reactive response to open an emergency disposal site, the Bandung City government started to develop a long-term plan to manage waste in the city. The design is oriented on the 3R concept in order to capture the value of disposed materials. The approach was taken so that Bandung City do not rely on the landfill to treat the waste generated.

From open tender, to direct appointment, back to open tender

The Bandung City government assembled a committee to plan the city's waste management in the long term. From the study, it was decided that the plan was to develop treatment facilities upstream and downstream. The big picture is then carried out as the benchmark during the investor selection led by the Bandung City government.

⁵² Kementerian Lingkungan Hidup dan Kehutanan, "Komposisi," <https://sipsn.menlhk.go.id/sipsn/public/data/komposisi>, accessed on 14 April 2024.

In April 2005, the selection process for waste management investors in Bandung City took place. In the selection, 16 proposals were received and evaluated by the committee. The parameters include technology, legal, finance, and socio-economy. The evaluation yielded 3 recommendations, 2 investors for upstream treatment, Forum RW and Koperasi Tani Bintang Artha, and 1 investor for downstream treatment, PT Enviro Green. Of all candidates, there are PT Internasional Bio Recovery and PT Hexa Pilar who will become the origin of PT BRIL. In the evaluation notes from the committee, PT Internasional Bio Recovery were not able to submit any form of information on the socio-economy aspect requested in the request for proposal.

The selection result was not followed up due to TPA Leuwigajah, the site for downstream treatment, being deemed to be not fit by the Gol. After the selection, in September 2005, PT Internasional Bio Recovery and PT Hexa Pilar formed a consortium that we now know as PT BRIL. The company then signed a memorandum of understanding (MoU) with PD Kebersihan Bandung (Bandung City's government-owned enterprise for waste management) 20 days after the company's establishment. In the MoU, it was agreed that PT BRIL would be the operator of the incineration facility with the responsibility of bearing all costs from construction until treatment and serve the right to charge a tipping fee to PD Kebersihan.

With the MoU as a guarantee, PT BRIL appointed Institut Teknologi Bandung (ITB) to develop the feasibility study (FS) and the AMDAL. The FS document with the site in Gedebage was developed in 2007 and followed by PT BRIL proposing the upgrade of the MoU into a memorandum of agreement (MoA) to PD Kebersihan. The request was forwarded to the mayor, who then consulted to Financial and Development Supervisory Agency (BPKP) and Bappenas. From the consultation, it was understood that the appointment of an investor of PLTSa has to go through an open tender process as regulated in Perpres Number 67 Year 2005. The consequence of this regulation is that PT BRIL cannot be unilaterally appointed as the investor for PLTSa without winning the open tender process.

In September 2009, responding to the zero probability of direct appointment, PT BRIL offered itself to PD Kebersihan to be appointed as PLTSa Gedebage project initiator. The request was approved and followed up by the mayor after receiving an instruction request from PD Kebersihan. In 2012, after a series of due diligence, PT BRIL was officially appointed as the project initiator with the compensation of an additional score of 9.6% during the open tender process. This means that during the open tender process that will be done for PLTSa Gedebage, PT BRIL are going to receive additional points as much as agreed during the proposal evaluation.

After undergoing a long process of 7 years, the open tender for PLTSa Gedebage finally took place. In August 2013, PT BRIL were declared as the winner of the tender based on Mayor Decree Number 658.1/Kep. 763-BPLH/2013. The investment was determined to be 562,483,000,000 IDR and the tipping fee at 350,000 IDR/ton.

Governance misconduct investigation by KPPU

In 2015, the Competition Supervisory Commission (KPPU) received a complaint case with the number 12/KPPU-L/2015 regarding “Violation Allegation on Article 22 Law Number 5 Year 1999 regarding Procurement of Business Entities through Open Tender for the Construction of an Environmentally Friendly Waste Treatment Infrastructure through Public Private Partnership Mechanism”. In the complaint, the reported parties consist of the committee for the open tender process in 2012; the then mayor of Bandung City 2003-2013, Dada Rosada; PT BRIL; and PD Kebersihan. The claim in this case was that there was a vertical conspiracy (PT BRIL and the then mayor of Bandung City) and a horizontal conspiracy (PT BRIL and PD Kebersihan) during the process of selecting the investor for PLTSa Gedebage. The result of the investigation was that KPPU decided the open tender process had indeed violated Article 22 of Law Number 5 the Year 1999 and the tender process that has been done is declared unlawful and has to be canceled.

PLTSa Gedebage today and waste management plan in Bandung City and West Java

As of 2024, PT BRIL are still legally the winner of the tender process and the regional regulation on the PLTSa Gedebage project is yet to be revoked. Even so, the Bandung City government have instructed PT BRIL to adjust the proposal that was approved. This is due to the proposal still using assumptions from 2013, which are already outdated and irrelevant in multiple aspects. In principle, the government still show willingness to support PT BRIL as long as the adjustment is exercised, however, resistance from communities will also persist as long as the regulation for the project is not revoked.

At the provincial level, PLTSa Gedebage is not the only facility planned to be built, in the downstream there is also PLTSa Legok Nangka in the area of TPPAS Legok Nangka. The project is a partnership between the West Java government and Japan through the Japan International Cooperation Agency (JICA). The facility is planned to serve Greater Bandung and Garut with a total capacity of +/- 2,000 tons per day. The construction of the facility is planned to be completed in the middle of 2026 and the target for the groundbreaking is set to take place in the middle of 2024.

Unfulfilled Rights to Information and Persistent Community Resistance

In its development, PLTSa Gedebage persistently faces resistance from local communities. Historically, the resistance can be traced back to 2006 starting from the ill-will of the developers in 2006.⁵³ At that time, locals were invited to attend an event

⁵³ Kompasiana, “Perjuangan Warga Gedebage dalam Menolak PLTSa”, https://www.kompasiana.com/mochamaddifasatriowicaksono8694/635919a729f19e2e3b77f222/perjuangan-warga-gedebage-dalam-menolak-pltsa#google_vignette, accessed on 16 July 2024

that they understood a public discussion on the construction. However, the signatures were misused as a prove of consent for the facility construction. The ill will become the start of resistance led by the community themselves and eventually impacted the development of the project in the long run.

Initially, communities cannot raise a comprehensive resistance, thus limiting activities to physical events such as demonstrations. As an example, communities block the construction of sporting facilities construction that were understood to be a part of the PLTSa construction.⁵⁴ As it progresses, CSOs join and help communities in demonstrations, capacity & capability building, and assistance during legal processes. Through the empowerment of the communities, a variety of approaches to stand against the project were developed and eventually succeeded in postponing the construction of PLTSa Gedebage.

After the capability building, several legal measures were taken by the communities. In 2008, locals filed a lawsuit to the Bandung city district court. Unfortunately, the process was aborted midway through the trial because the court determined that they (the court) could not decide on the case.⁵⁵ In 2017, an advocacy activity was recorded at the level of MA with a lawsuit filed by KPPU. The MA decided that PT BRIL won the case and determined that the open tender process in 2013 was legal.

Aside from explicit efforts, implicit efforts were also made by the locals. Griya Cempaka Arum (GCA), one of the housing complexes impacted, initiated a community composting system as an effort to provide an alternative solution. Another implicit form of resistance also comes in the form of public education led by local citizens through the approach of citizen science. The initiative helped build public understanding of the PLTSa issue and consequently brought wider public support to the communities on the case.

Even though communities consistently fought back against the plan, the response was not welcomed well by PT BRIL and the Bandung City government by not providing the rights to information for the public. At least there are 4 (four) counterproductive measures taken by both parties regarding public rights to information.

1. In 2007, a delegate from the Conference of Parties (COP) 13 that wanted to visit the PLTSa site was being deported;
2. The AMDAL document does not elaborate on the facility's negative impact that communities will have to face, thus no transparency to the impacted communities since the beginning;
3. In the public hearing held by a CSO, instead of being constructive, locals affected by the project received intimidation from other groups that also attended the event;

⁵⁴ Detik, "Warga GCA Hentikan Paksa Proyek Pembuatan jalan SOR Gedebage", <https://news.detik.com/berita-jawa-barat/d-1005819/warga-gca-hentikan-paksa-proyek-pembuatan-jalan-ke-sor-gedebage>, accessed on 16 July 2024

⁵⁵ Detik, "Setelah 6 Bulan, Hakim Tolak Gugatan Warga GCA", <https://news.detik.com/berita-jawa-barat/d-1032990/setelah-6-bulan-hakim-tolak-gugatan-warga-gca>, accessed on 17 July 2024

4. During the voting event at the DPRD, the event was crowded by groups known to be associated with and die-hard supporters of the mayor, rendering the voting to be biased and vouching for the construction of PLTSa.

Project's Poor Credibility and a Very High-Risk Financing Structure

Despite per 2024 PLTSa Gedebage project is yet to be revoked, no clarity for almost 20 years indicates a terrible project governance. Reflecting on the long history of the project, there are 3 things that can be noted during the procurement process until the (effort to) construct.



Tender governance ridden with malpractice and conflict of interest

Either during the first selection process in 2005 or the second in 2013, parties related to PT BRIL have been consistently showing signs of malpractice. Referring to the tender process chronology from 2005 to 2013, there are at least 8 points that can be highlighted during the tender process.

1. In the 2005 selection, the committee stated that PT Hexa Pilar Utama and PT International Bio Recovery were not being recommended by the committee,

- however, Dada Rosada and PT BRIL stated that both companies were the committee recommendations;
2. After the 2005 selection process, there were several requests for MoU from companies, however, PD Kebersihan and the mayor were only responsive to PT BRIL, which is a consortium of PT Hexa Pilar Utama and PT International Bio Recovery, until, until the MoU was signed between PT BRIL and PD Kebersihan on September 2005;
 3. After the Presidential Regulation Number 67 the Year 2005 was issued, the MoU between PT BRIL and PD Kebersihan for the implementation of PLTSa could not be continued because an open tender mechanism is mandatory, however, MoU was continued with 4 extensions until 2009;
 4. MoU was still extended despite PT BRIL's failure to accomplish the FS and AMDAL documents on time in 2006, contrary to the substance of the MoU where the agreement can be severed if one of the parties fails to perform their responsibilities for 6 months;
 5. PT BRIL proposed to become project initiator to PD Kebersihan while according to the regulation, the proposal has to be submitted to the president, governor, or mayor of the area, thus indicating a conflict of interest on the project;
 6. Compensation for the project initiator status has to be exclusively decided by the government independently, meanwhile, for PT BRIL, they were given the chance to propose the compensation that they prefer.
 7. During the due diligence process for the project initiator status, the due diligence committee member is one of the owners of PT BRIL, which violated the conflict of interest principles;
 8. During the 2012 open tender process, the committee was discriminative by not applying the same standard to every participant, thus resulting in different decisions for 2 or more similar cases

PLTSa Gedebage becomes a project with an overly stretched time consumption due to being ridden with the interests of certain parties. From the first day, the selection process started in 2005 until the appointment of PT BRIL in 2013, 8 years have been spent only selecting an investor. The prolonged selection is an opportunity cost because other efforts could have been made and yielded several results in 2024 in that time space.

Moreover, the cost of time because of the conflict of interest has rendered the study and preparation results obsolete. This element is crucial to notice because WtE is a growing technology, involves macro economy related to currencies, involves ever-changing policies, and depends on consumption behavior as time and interventions progress. Thus, whatever that has been determined in 2007, most likely will not be relevant in 2013 when the winner of the tender was determined and is already obsolete in 2024.

In relation to the conflict of interest that violated the procurement process, the cost of time also increases with the investigation by KPPU which eventually determined that the process was unlawful. That being said, not only the cost of time is high, but the

risk for the project to collapse is also very high due to the conflict of interest. Judging from the cost of time perspective, the project's political vulnerability, and the nature of PLTSa that easily becomes irrelevant over time, it becomes illogical to force PLTSa while other options that are more attainable can be fully implemented within the same period.

Malpractice in land procurement and obtaining locals' consent

Aside from the selection process, land procurement during PLTSa Gedebage development also raises a concern. There are 3 problems regarding the area that will be developed, which are.

1. The land owned by PT BRIL for PLTSa Gedebage status is for a housing complex, not for a public facility that includes PLTSa according to Bandung City spatial plan in 2004;
2. The land status is then altered to be eligible for the construction of a public facility. With the context of the environmental impact assessment and the FS that was done in 2008 and 2007, the shift indicates a conflict of interest;
3. There are attempts to manipulate locals through misuse of attendance records, blackmailing through affiliated groups, and bribing to obtain locals' approval for the construction and operation of the facility;

Based on the 3 points mentioned above, it can be inferred that administratively and socially, PLTSa Gedebage was being forced through means that violated the law.

In good project governance, a spatial plan is a reference point used by the project to determine the location of the activity, not the other way around, and becomes an instrument to misappropriate land. The misuse will create a chain effect such as compromised public health and poor transportation routes due to poor spatial distribution. Especially for the context of abuse of housing area, what will happen is what we see in PLTSa Gedebage, which is consistent rejection from the locals potentially impacted.

One of the main propellers of the PLTSa Gedebage failure is the resistance from the communities where they understand that PLTSa is a threat to public health and a form of government negligence in managing its region. With this sentiment, locals firmly believe their stance and are willing to escalate the issue to the highest level of court available. The resistance eventually influences the cost of the time and the economic cost of the project, making the project spend more time and resources to settle disputes that most likely will not be resolved.

Learning from the rejection in Bandung, PLTSa Gedebage cannot be seen as a capable solution as there is no guarantee that the technology will be safe and not detrimental to public health. At this point, the combination of time, finance, and lack of guarantee for the communities show that the facility is undeserving to be continued.

Reckless financial aspects

PT BRIL in its proposal provided a high-risk financial scheme that led them on a highway to bankruptcy. The analysis is based on metrics that are typically used to determine the financial health of a project in a certain sector. At least 3 metrics can be used as benchmarks according to a review by Erman Arif Sumirat.⁵⁶

First, the debt-to-equity ratio (DER) proposed by PT BRIL. The equation to measure DER is as follows.

$$\text{DER} = \text{Total debt} / \text{total equity}$$

Based on the table below, a comparison between the analysis by the Institute of Research and Community Service (LPPM) ITB, PT BRIL's proposal, and industry benchmarks are presented.

| Source | LPPM ITB | PT BRIL | eqvista.com (Industrial Operations) | eqvista. com (Waste Management) |
|--------|----------|---------|---|---------------------------------------|
| Ratio | 1,7 | 2,57 | 1,16 | 1,26 |

Referring to the equation above, the higher the DER, the higher the amount of debt being leveraged to finance the project. From the benchmarking above, it can be understood that PT BRIL took a very aggressive debt scenario with a ratio 2x of the industry average and 50% higher than LPPM ITB's recommendation. This financing scheme will put PLTSa Gedebage at a high default risk. The consequence of this scenario is the difficulty of obtaining funding due to a high-profile risk. From the operations side, a fixed business model and high potential earnings are mandatory to prevent the risk of payment default to the debtors.

The second metric is the predicted financial performance (Z). The formulas being used are as follows.

$$Z = (1.2 \cdot X1) + (1.4 \cdot X2) + (3.3 \cdot X3) + (0.6 \cdot X4) + (X5)$$

Where:

X1 = Working capital/total asset

X2 = Retained earnings/total asset

X3 = EBITDA/total asset

X4 = Market value of equity/liability (obligation)

X5 = Sales/total asset

⁵⁶ Erman Arif Sumirat, Review Aspek Finansial Proyek Pembangkit Listrik Tenaga Listrik Sampah (PLTSa) Gedebage yang Dilakukan PT Bandung Raya Indah Lestari (BRIL)" (s.l.: s.n., s.a)

From the formula, the following calculation is obtained.

| Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---------|------|------|------|------|------|------|-----|-----|------|------|
| Z | 0,87 | 1,29 | 1,19 | 1,11 | 0,99 | 1,25 | 1,3 | 1,4 | 1,47 | 1,61 |
| Minimum | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

From the calculation above, it can be seen that the projected financial performance of PLTSa Gedebage is consistent below the minimum recommendation. This means that the business model proposed by PT BRIL poses a risk of bankruptcy due to the following factors:

1. Too much debt taken;
2. No capital was injected during the operations;
3. Poor retained earnings ability; and
4. Revenue and sales stagnate/grow too slowly

The dangerous financial planning raises a question regarding PT BRIL and PLTSa's ability to operate as a business. Taking into account the Z value that is far below the minimum, a significant reevaluation of the business model and financial calculation is required. However, this procedure is practically impossible as it will count as post-bid and is a violation of the principles of the procurement process.

The third and the last is regarding the tipping fee. There are several references as follows.

| Source | Value (IDR) |
|---|-------------|
| TPA Sarimukti tipping fee | 298.000 |
| PT BRIL's initial proposal | 281.096 |
| Kepwal Bandung No. 658.1/Kep. 763-BPLH/2013 | 350.000 |
| YPBB and WALHI Jabar's recommendation | +/- 700.000 |

2 important points to be highlighted are as follows.

1. Irrelevant benchmark
According to LPPM ITB, PT BRIL made the TPA Sarimukti tipping fee its benchmark value in determining the tipping fee in their proposal. This is a mistake since there are fundamental differences in the approach used in both, thus making the cost structure significantly different. For example, in PLTSa, a fly ash bottom ash treatment facility is mandatory, while it is not in a landfill. The differences may prove to be fatal as tipping fee requirements for landfills do not reflect the expenses required for PLTSa.
2. The tipping fee is way below the recommended value
The first point is enforced by how far PT BRIL's proposal and the mayor's decree are relative to the recommendation. YPBB and WALHI Jawa Barat

recommended the tipping fee to be at 700,000 IDR/ton, while the mayor decree in 2013 decided the tipping fee at 350,000 IDR/ton. The 50% difference indicates a compromise on the processing facility to cut down costs. Despite no clarity yet if aspects are being compromised, changing design specifications outside of the agreement will count as malpractice and may yield fatal consequences such as environmental and public health damage.

Referring to the 3 metrics mentioned above, PLTSa Gedebage is nowhere near a profitable business model with a great risk of defaulting. Zero tolerance should be applied when assessing these risks. Bankruptcy or failure in operations will put Bandung City waste management in crisis and engine failure will prove to be costly for the public and environmental health in its surroundings. Moreover, in the bankrupt scenario, there is a legal process that needs to be done with a high resource cost as well.



RECURRING THEMES ACROSS CASES

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From all four cases, there are recurring themes across cases that highlight problems of PLTSa. The observed patterns are as follows.

1. Facilities that cannot adapt across time and programs:

- a. Jakarta: The government do not dare to provide certainty regarding cross-leadership contracts because the Sunter ITF has the potential to conflict with other programs such as the waste reduction roadmap by producers (PermenLHK 75/2019) and budget consumption which is an opportunity cost in the future.
- b. Surakarta: The facility is suspected of using waste from other areas to balance the composition of the waste so that it can be processed by the PLTSa.
- c. Bandung: Request from Bandung City government for a review process of the development scheme by PT BRIL because the proposal submitted in 2012 is no longer relevant to the context of 2024.

2. Cost intensive with a high default risk business model:

- a. Jakarta: The total capital and operational costs of the facility are beyond the financial capacity of Jakpro and DLH Jakarta, thus increasing the risk of the facility failing to operate.
- b. Surakarta: The revenue source relies solely on electricity sales that is very likely to fail to cover both capital and operational expenses.
- c. Bandung: 3 financial performance indicators are below the recommended value, which implies PLTSa Gedebage has a strong potential to fail financially/default during the operating period.

3. High governance complexity and difficulty to implement:

- a. Overall: All cases have poor quality in business, technical, and social aspects so implementation is not possible due to the low value relative to its cost for the government and society.
 - b. Jakarta: ITF Sunter is stalled due to the difficulty of finding a middle ground between stakeholders that can be agreed upon so that financial closing for project funding cannot be obtained.
 - c. Surakarta: Governance from the auction phase to operations has caused environmental and economic impacts in the field, where public health has been disrupted and scavengers have had their economic conditions disrupted as a precedent.
 - d. Surabaya: The complete failure to fulfill the right to public information and field findings related to food production activities, leachate processing, and the increase in ARI cases are indicators of the failure to manage implementation in Benowo.
 - e. Bandung: Poor auction governance has resulted in strong indications of malpractice in the project and many technical and land components have faced opposition from both the government and the community.
- 4. Accuracy to the problem being solved: in principle, all cases have organic waste composition as the most dominant waste. Carrying out the thermal process will be difficult because the condition of the waste is inadequate to be the capital of the PLTSa. This is coupled with the assumption that the waste that enters is mixed so that the potential for danger (explosion and poison) becomes high and the loss of potential benefits from materials with utility value such as recycled materials.**

These general patterns can be understood as things that drove the failure of PLTSas in Indonesia today and likely to be repeated. With the consistency of failure in planning and implementing PLTSa, it can be said that this facility is not feasible to implement. The problems synthesized above are better handled with other more capable alternatives than forcing the environment in Indonesia to be able to accommodate the blockers.

A SYSTEM APPROACH THAT IS FLEXIBLE, LOW-COST, AND ADDRESSING ISSUE PROPERLY

Reflecting on all the complications that arise, an alternative solution is needed that has more potential than PLTSa. There are at least 4 key elements that PLTSa cannot offer, namely flexibility - both in technology design and business model, low capital and operational costs, ease of implementation, and precise problem solving. Thus, a solution that can offer these four things is a solution that is worth pushing compared to PLTSa.

It is also important to understand the definition of a solution. Waste is a systematic challenge and systematic challenges cannot be solved with 1 infrastructure that is considered a silver bullet. In the context of waste management, a push and pull method is needed that is supported by enablers so that good management in accordance with the zero waste hierarchy can be achieved. Therefore, the solution must be seen as a system that at least involves aspects of regulation, culture, and infrastructure.

Regulation As the Push Factor

Regulation is a working tool that has the function of creating corridors and forcing. Regulation is a crucial component because it can maintain direction and consistency in running a good system. With regulation, every stakeholder (eg. waste generators, waste collectors, waste processors) can understand their duties and responsibilities either through incentive or disincentive mechanisms. It is hoped that through implementation and enforcement, actors in the system will adapt and move towards a zero-waste system.

Single-use plastic ban

Banning single-use plastic is a specific approach aimed at reducing the level of single-use plastic consumption in an area. In Indonesia, this ban is often directed to be more specific, such as for plastic bags (e.g. Bandung Mayor Regulation (Perwal) Number 37 Year 2019) and Denpasar Mayor Regulation Number 36 Year 2018). Some best practices that can be absorbed from this regulation are:

1. Targeting towards a specific type of waste that wants to be handled;
2. Using a transition principle that does not extremely prohibit from the start, but encourages transition (e.g. Perwal Bandung 37/2019 Article 8);
3. Applying incentive and disincentive, whether in monetary or non-monetary form (e.g. Perwal Bandung 37/2019 Article 13); and
4. Involving all stakeholders to play a role so it does not burden one of the stakeholders.

Organic waste delivery to final disposal site ban

The prohibition of organic waste from entering the landfill is a specific policy with the initial goal of reducing the amount of waste entering the landfill, especially organic, and the ultimate goal of encouraging proper processing of organic waste both at the individual (e.g. home composting) and communal levels at the city/district level. This policy is considered an example of a new policy in Indonesia, one of which is West Java, which has been implemented since January 1, 2024, for areas served by the Sarimukti TPPAS. This initiative has been successfully implemented in South Korea with 95% of the food waste produced being recycled⁵⁷ and several best practices on the implementation of this regulation are:

1. The policy includes clear technical procedures on how organic waste should be separated from other waste (e.g. in South Korea, there are special bins for organics);
2. The policy includes clear disincentive mechanisms for the public to discard organic waste (e.g. in South Korea, some areas have implemented a mandatory purchase system for biodegradable bags to accommodate organic waste and some charge per weight of waste disposed of);
3. The policy includes a clear reporting/recording mechanism for violations so that the public does not attempt to circumvent the system;
4. The policy synergizes with incentive-based policies for processing organic waste both on an individual and communal scale (e.g. local governments in South Korea provide support for urban farming activities that empower organic waste in the form of subsidies).

The important point regarding regulation is that this step serves as a foothold. Regulation will automatically fail without adequate enforcement and follow-up. The main actor of this element is the government at all levels as the person in charge. Therefore, some things that the government can do after creating regulations are:

⁵⁷ Knowledge Hub, "Solving the food waste disposal issue in South Korea", <https://knowledge-hub.circle-economy.com/article/22916?n=Solving-the-food-waste-disposal-issue-in-South-Korea> accessed on 6 November 2024

1. Budgeting the regional budget for monitoring and evaluation activities;
2. If necessary, form an ad-hoc team dedicated to ensuring enforcement and mapping out space for improving the quality of the policy;
3. Carrying out the function of monitoring and evaluating policy performance periodically; and
4. Refining policies following field findings and evaluation activities, either through complementary activities, cross-sector collaboration, or regulatory refinement.

Culture as the Pull Factor

If regulation is identical to the push factor (disincentive), then culture is its complement with the aim of making zero waste norm the new normal definition within the framework of society. In contrast to regulation which is external pressure, culture aims to form internal awareness so that society implements the zero waste principle of its own will.



Zero waste cities as the norm at the city/regency level

Zero Waste Cities (ZWC) is a behavioral change program that encourages a community/region to be able to independently manage their waste according to its type. This program was initiated by members of the Indonesian Zero Waste Alliance, but in principle, the city/district government becomes a collaborator and is also the target of its strengthening. This is so that the city/district government can also overcome the problems they face related to waste management such as high-cost requirements.⁵⁸

⁵⁸ Aliansi Zero Waste Indonesia, "Zero Waste Cities", <https://aliansizerowaste.id/zero-waste-cities/> accessed on 6 November 2024

In principle, there are 7 major stages in the implementation of ZWC⁵⁹, namely.

1. Mapping of areas and baseline of existing conditions in areas to be intervened;
2. System design;
3. System training and consultation;
4. Preparation of composting facilities and collection facilities;
5. Training for officers;
6. Door-to-door education;
7. Trial of door-to-door collection implementation; and
8. Monitoring and evaluation.

By implementing a system that adapts to the context of the field being intervened, it is hoped that the surrounding environment will be more accepting and the new culture will be more rooted in the area. Like most behavioral change programs, implementing this program to the point where behavioral change occurs will take years.



Reuse movement

Gerakan Reguna Ulang is a Dietplastik Indonesia program with a mission to form an ecosystem needed to encourage all parties to switch from consuming single-use products to reusable products. The target of this system is upstream to downstream, which means that not only consumers are encouraged, but also the upstream supply chain such as producers and distributors. By embracing all parties, it is hoped that the current status quo can move towards a more environmentally friendly and more emission-friendly direction.

⁵⁹ YPBB, "Zero Waste Cities", <https://ypbb.web.id/zero-waste-cities/> accessed on 6 November 2024

The intervention model used is a combination of bottom-up and top-down where in the bottom-up model the program is implemented in local governments to form a pilot model that can be adapted to other regions. After forming a prototype, a top-down approach can be carried out by involving stakeholders at the central government level and other related entities such as FMCG and the hospitality, restaurant, and cafe (horeca) industry.

Best practices from the implementation that has been carried out by Dietplastik include:

1. Education and socialization regarding fundamental understanding that is still misinterpreted. In the case of Dietplastik, the perception of the definition of reuse still often overlaps with recycling. Therefore, a dedicated work is needed to straighten out the understanding. In addition to fundamentals, another thing to be intensified in education is the value of benefits for stakeholders who want to switch.
2. Forming a strategic interest group as a forum to accelerate the adoption and exchange of information so that opportunities and chances can be utilized properly at all levels and challenges can be collectively addressed.

The important thing to remember from this element is the commitment to forming a consistent cultural change because this process tends to take time and the impact tends to be slow at the beginning. Implementing a behavior change campaign can be done in simple ways, but persistence will be the key factor of people's behavior changes. The government in collaboration with NGOs will play a key role in encouraging this behavior change. Key learnings to optimize the adoption of zero waste as a social norm are:

1. Having local cadres who can reach the community at a personal level over a long period;
2. Combining formal (e.g. official socialization) and informal (e.g. integrating norms into community events) approaches to introduce the culture;
3. Presenting zero waste culture as something that is accessible to everyone, not exclusive and too difficult to understand;

Infrastructure as the Enabler

The third element of this unity is infrastructure. This element has a role in enabling the community to translate mindsets and culture into concrete actions. If there is no infrastructure, then the community will experience limitations in implementation and trapped with options such as single-use packaging. Meanwhile, if infrastructure is available, then the community at least has the opportunity to implement a zero-waste culture in everyday life. There are 2 examples of infrastructure provisions that are already running that can be a reference model to be adapted in other regions in Indonesia.

Sustainable food system

The sustainable food system initiated by the Gita Pertiwi Foundation is a program with 2 levels of objectives. The first objective is to prevent the emergence of organic waste from food shrinkage and/or leftovers and the second objective is to reduce food waste by saving food through food sharing activities.



4 stakeholder groups must be present in this model, including:

1. Food donors: parties who have a significant impact on the emergence of organic waste and have access to food to share (eg. restaurants, hotels, catering, households, markets, farmer groups, etc.);
2. Food recipients: parties whose essential food needs have not been met due to lack of access or weak purchasing power (eg. orphanages, mental institution, retirement homes, scavengers, cleaners, poor communities, etc.);
3. Government: parties who have access to information, the ability to provide counseling, and the ability to organize related activities (eg. Regional Development Planning Agency (Bappeda), Food Service, DLH, Social Department (Dinsos), Health Department (Dinkes), etc.);
4. Educational institutions: parties who can encourage counseling consistently and adapt to local wisdom (eg. PKK, sharing communities, and religious leaders);

To run this program, the time costs required are 4-5 years which are divided into 5 major stages, namely.

1. Preparation stage: preparing a baseline of food waste and losses in the application area (quantity, type, origin, and quality);
2. Design stage: preparing a system and guidelines for education and operations of the food-sharing system;
3. System/model trial stage: implementing the system on a small scale where the main targets and implementation techniques can be supervised and monitored well against the concept that has been prepared;
4. Supervision and evaluation stage: monitoring the development of the system and formulating aspects that need to be developed, maintained, or replaced;
5. Development stage: forming a follow-up model based on field analysis obtained to improve the effectiveness of the existing system.

Based on the experience of the Gita Pertiwi Foundation, several best practices that can be adapted for the implementation of the sustainable food system concept are:

1. Food waste and loss prevention model: community-scale education program with specific education group targets so that delivery techniques can be adjusted to the profile of the education target (eg. ecological school with a child-friendly school canteen model);
2. Food loss and waste rescue model through food sharing:
 - a. Food rescue - rescue of food that is ready to eat or has a shelf life of less than 3 days;
 - b. Affordable access - purchase of food at a special price, for example, 50% of the normal price, targeting low-income communities (waste workers, scavengers) aims to build solidarity/empathy for food producers when food commodities prices fall, for example, farmer groups, livestock breeders;
 - c. Sharing display cases - places to share food in small quantities. Display cases are placed in busy locations with someone to attend, for example, markets, housing, places of worship, and public spaces. Attenders are responsible for ensuring the cleanliness & safety of food display cases as well as food layout & safety.

In terms of regulations and figures, this sustainable food system has achieved as follows.

1. The total food waste and loss prevented since 2020 until 2024 is 100 tons
2. Total food saved in 2023 is 35 tons
3. Mayor letter issuance on the implementation of the healthy canteen concept for the School/Madrasah Health Service (UKS/M) in educational units in Surakarta;
4. The formation of a Perwal and a mayoral decision letter regarding the roadmap and the Smart Food City Committee team where one of the indicators is the management of food waste and losses in Surakarta.



Community-scale integrated collection and composting facility service

The integrated collection and composting facilities service on a regional scale by Rumah Kompos Padangtegal (RKP) is a system that aims to prevent waste from ending up in the environment or landfill. Although at first glance it looks like a cultural component, the focus in this aspect is the provision of separate collection services and communal processing facilities. In simple terms, RKP divides its system into 3 stages, namely.

1. Education of the community and businesses/agencies about waste sorting & environmental preservation;
2. Collection/transportation of waste that has been sorted into 3 categories from the source;
3. Processing of collected waste, where organics become compost, recycling is further sorted for sale, and residue/leftovers are disposed of.

The stakeholders required to implement this facility on a regional scale, at least in the RKP case study, are as follows.

1. Government with the authority to regulate and implement (in the case of RKP owned by the traditional village): the government will have the function to implement regulations and collaborate in providing the necessary infrastructure. Thus, soft and hard infrastructure can be accessed to run the system;
2. Operational team: a group of professionals who will work primarily to collect/transport and process/sort both organic and recyclables;
3. Educator team: a group whose main function will be to carry out continuous education to create a target market that is proactive in sorting its waste.

In its journey, it takes 4 to 6 years from the initial education until a RKP operation to collect and process waste becomes stable. Some best practices that can be adapted are as follows.

1. Education: create understanding that RKP is an example of a waste processing facility & educational vehicle. Concept activities include:
 - a. Visits to facilities that operate according to daily conditions, equipped with a team that is ready & competent to conduct education + educational area to gather at the facility before the tour;
 - b. Educational collaboration with other parties for interactive & varied education method (amazing race, games etc.);
 - c. Actively campaigning through social media;
2. Transportation of sorted waste:
 - a. Implement sanctions if not sorted and not transported according to the regulations of the Traditional Village;
 - b. Also implement feedback loops/follow-ups for those who do not sort with direct warnings, via WA or through the traditional village head;
 - c. Implement a retribution system based on the volume of waste produced.
3. Processing:
 - a. Composting by sorting and chopping the material before entering the composting bin;
 - b. Advanced recycling sorting to increase the selling value of the material
4. Operational: building a sense of ownership of RKP as a whole to the operators, operators not only know & work on transportation & processing but are also provided with regular information about the RKP vision & mission, financial condition updates, sorting education & involvement, and public appreciation;
5. Full support from government elements: regulation, coaching, and funding.

