インドネシア国
公共事業・国民住宅省
東ジャワ州政府

インドネシア国
スラバヤ広域都市圏における
廃棄物広域管理計画調査プロジェクト

第一段階報告書

2021年４月

独立行政法人
国際協力機構（JICA）

国際航業株式会社

環境
JR
21-008

目次

表目次

図目次

略語

C/P	カウンターパート
F/S	フィージビリティ調査
GKS	Gerbangkertosusila（スラバヤ広域都市圏）
HHW	家庭ごみ
JCC	合同調整委員会
JICA	独立行政法人国際協力機構
KSB	共同協定
M/P	マスタープラン
MOU	覚書
PKS	協力協定
POS	住民意識調査
PUPR	公共事業・国民住宅省
R/D	討議議事録
SWM	固形廃棄物
TPA	最終処分場
TPS	廃棄物一時保管場所
TPST	統合廃棄物処理場
TS	中継基地
UAV	無人航空機
WtE	廃棄物からのエネルギー回収施設

写真

第 1 回 JCC（1）

第 1 回 JCC（2）

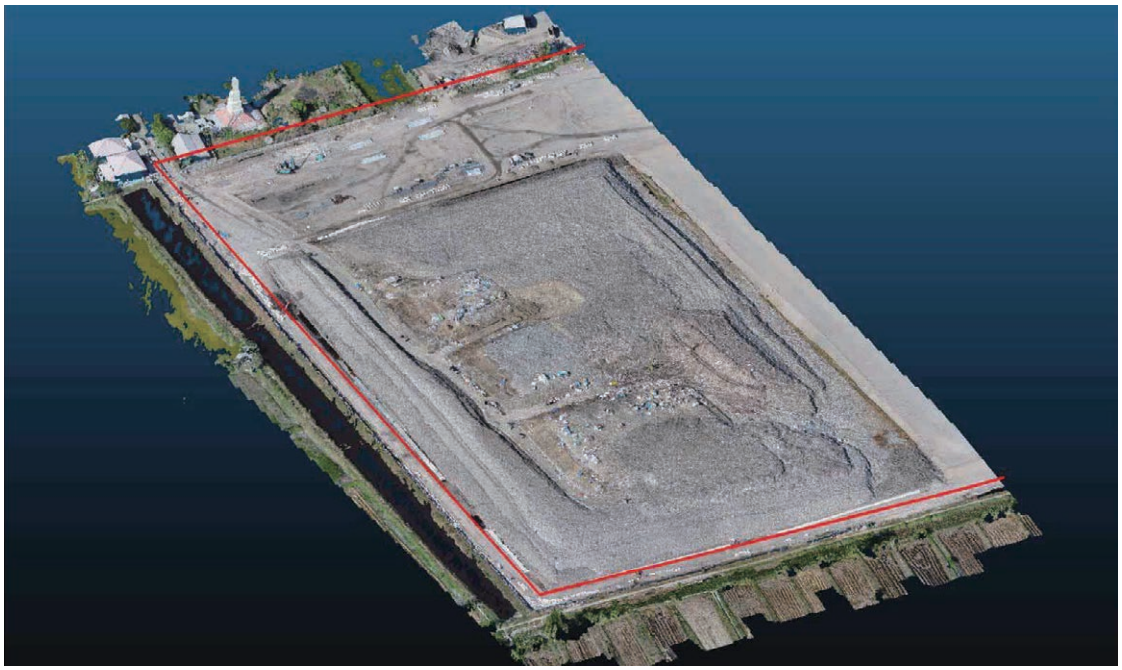
Dawarblandong 候補地（モジョケルト県）（1）
幹線道路からのアクセス

Dawarblandong 候補地（モジョケルト県）（2）

Dadapan 候補地（ラモンガン県）

Kutorejo 候補地（モジョケルト県）

Ngipik 最終処分場鳥瞰図（グレシック県）



Jabon 最終処分場鳥瞰図（シドアルジョ県）

Mojosari 最終処分場鳥瞰図（モジョケルト県）

Randegan 最終処分場鳥瞰図（モジョケルト市）

Tambakrigadung 最終処分場鳥瞰図（ラモンガン県）

Buluh 最終処分場鳥瞰図（バンカラン県）

ごみ銀行（モジョケルト市）

TPS のごみ圧縮装置（グレシック県）

TPS（グレシック県）

廃棄物デポ（移し替え場）（バンカラン県）

統合廃棄物処理場（ラモンガン県）

統合廃棄物処理場（シドアルジョ県）

ごみ量ごみ質調査（1）

ごみ量ごみ質調査（2）

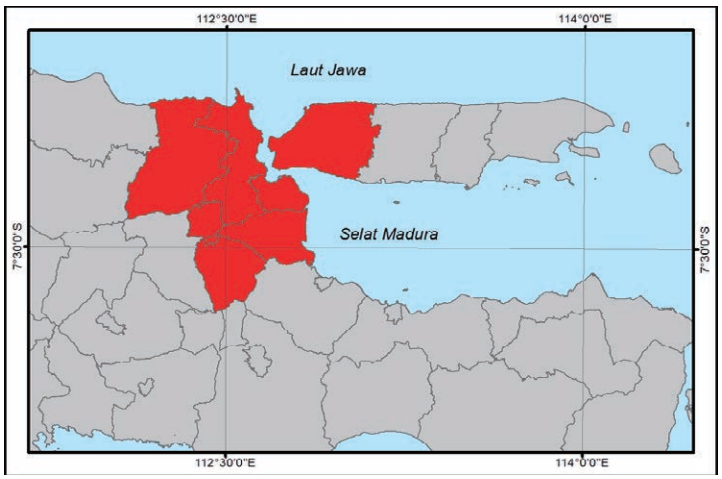
ごみ量ごみ質調査（3）

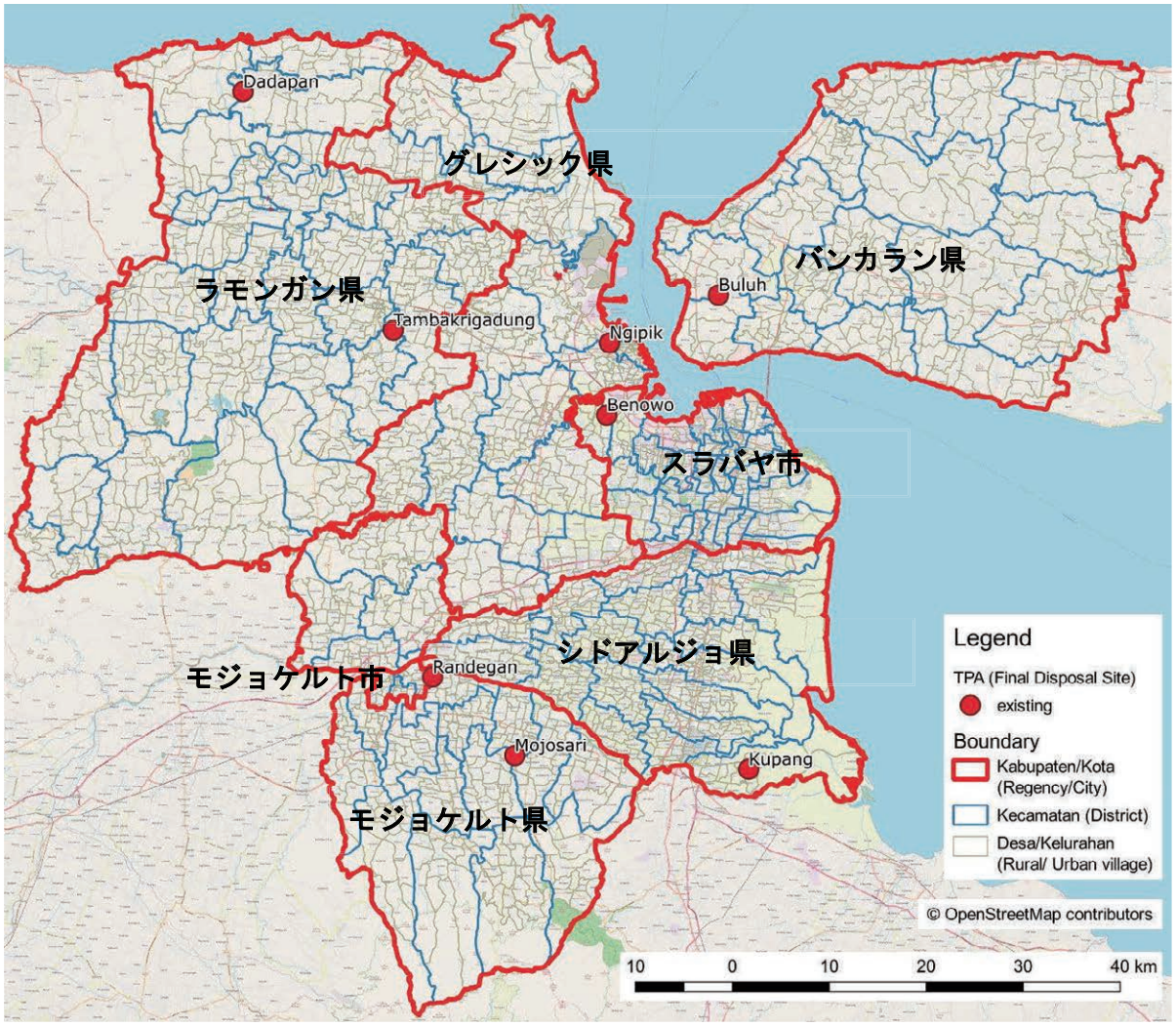
リサイクル調査

住民意識調査のための調査員トレーニング

水質調査

プロジェクト対象地域位置図





第 1 章　業務の概要

1.1　プロジェクトの背景

インドネシア国では、経済発展に伴って廃棄物の排出量が急増しており、多くの都市においては、収集サービスの向上や衛生的な最終処分の実施に苦慮している。また、廃棄物管理に係る行政能力も問題があり、廃棄物の収集率の低さや不法投棄の多さにも繋がっている。これら現状は深刻な環境・衛生上の問題を生み出しており、廃棄物管理の改善が重要な課題となっている。

インドネシア第二の経済圏である東ジャワ州のスラバヤ広域都市圏（以下、「本都市圏」という）は、2 市 5 県（スラバヤ市、モジョケルト市、グレシック県、ラモンガン県、モジョケルト県、シドアルジョ県、バンカラン県）[1]で構成されており、人口は 957 万人（2015 年）である。

「スラバヤ広域都市圏地域開発計画調査」に係る最終報告書（以下、「地域開発報告書」という）（JICA、2011）においては、本都市圏で発生する廃棄物について、350 万トン（2007 年）から 535 万トン（2030 年）に増加すると予測しており、今後の人口増と生活様式の変化による廃棄物の量と質の変化に対応する必要がある。また本都市圏の都市部における廃棄物の収集量 116 万トンのうち 99%は最終処分場へ搬入されているが、これが最終処分場の容量ひっ迫の一因となっており、廃棄物の減量化や最終処分場の計画的整備が求められている。

本都市圏のごみ質は有機物を多く含むため、堆肥化に取り組むことは減量化の方法として有効と考えられるが、最も普及しているスラバヤ市でも数%に留まっている。調査報告書では、廃棄物の排出量の増大に対処しない場合、広大な最終処分場(1,200 ha)を必要とするが、最終処分場用地の確保には限界があることから、3R（Reduce, Reuse and Recycle）の推進、中間処理の向上を通じて、最終処分場の延命化を図ることが必要であるとしている。

これらの課題に対して、調査報告書では州レベルにおける廃棄物管理マスタープランを策定し、（1）長期的解決策の検討、（2）広域最終処分場の整備、（3）3R の強化と焼却炉等の新技術の導入による廃棄物の削減、（4）廃棄物管理情報ネットワークの構築、（5）住民意識の向上と規制・制度の改善等、を提言している。

かかる背景の下、2009 年度に旧公共事業省（現、公共事業・国民住宅省。以下、「PUPR」という）は、本都市圏を対象とした廃棄物の広域管理計画を図るべく、我が国に対して技術協力の支援を要請した。当機構は、本要請に基づいて 2012 年と 2015 年に詳細計画策定調査を実施して、PUPR 等とプロジェクトの枠組みついて合意に至り、2018 年に討議議事録（Record of Discussions、以下「R/D」という）を締結した。

2019 年 8 月、JICA は本業務を実施するコンサルタントの入札を行い、国際航業株式会社を選定し、業務委託契約が交わされた。

1.2　プロジェクトの概要

本プロジェクトの概要は以下の通りであり、本業務はこのうち、成果 1 の活動を行い成果 1 の達成を目指すものである。

R/D での合意事項に従い、成果 2 以降の活動は優先自治体間の覚書（MOU）署名後に実施される予定となっている。

[1] インドネシアの地方行政の単位は、基本的には上位から州－県・市－郡－区・村となっており、県・市が家庭廃棄物および家庭類似廃棄物の管理を担う。

プロジェクト名　スラバヤ広域都市圏における廃棄物広域管理計画調査プロジェクト

上位目標　スラバヤ広域都市圏において進められる廃棄物広域管理の取組みがレビューされ、他地域への導入に係る示唆が得られる。

プロジェクト目標　スラバヤ広域都市圏においてマスタープランに基づく廃棄物広域管理の取組みが試行される。

成果１　スラバヤ広域都市圏の廃棄物管理の現状を把握・理解する。

1-1．文献調査
1-2．現状調査
1-3．最終処分場調査
1-4．制度調査
1-5．将来排出量予測調査
1-6．廃棄物処理に係る問題点、課題の抽出及び改善計画の立案
1-7．廃棄物広域管理地域（優先自治体）の設定
1-8．優先自治体間での MOU 締結に向けた自治体向け研修の検討と実施
1-9.1-7.で決めた優先自治体間と東ジャワ州との MOU 締結に向けた作業開始

成果２　スラバヤ広域都市圏の廃棄物管理に係るマスタープランを策定する。

2-1．廃棄物広域管理マスタープランの枠組みの策定
2-2．施設整備計画の策定
2-3．財務・運営計画の策定
2-4．市民協力促進案の策定
2-5．優先課題の選択
2-6．施設維持管理、人材能力開発計画の策定
2-7．環境社会配慮調査

成果３　マスタープランの実施に向けたプレ実現可能性調査を実施する。

3-1．優先プロジェクトの検討
3-2．概略事業費の積算
3-3．経済、財務分析
3-4．環境社会配慮調査
3-5．実施スケジュールの策定

成果４　実施機関においてマスタープラン策定、自治体間の連携能力強化を図る。

4-1．広域都市圏の自治体職員に対する OJT の実施
4-2．本邦研修の実施
4-3．定期的な情報共有体制の検討
4-4．定期的な情報交換を目的とした会議の開催

対象地域　東ジャワ州スラバヤ広域都市圏（2 市 5 県）

実施機関　PUPR 人間居住総局、東ジャワ州住宅・居住地域・生活環境局[2]

協力期間　2019 年 9 月から 2022 年 8 月（36 ヵ月）

対象廃棄物　家庭系廃棄物（家庭廃棄物および家庭類似廃棄物）（以下、単に「廃棄物」ともいう。）

[2] 東ジャワ州政府のR/D署名者は地方計画開発局であるが、実質的なプロジェクト活動は住宅・居住地域・生活環境局が中心となっている。なお、PUPRの人間居住総局、東ジャワ州の住宅・居住地域・生活環境局の英語名はそれぞれDirectorate General of Human SettlementおよびHousing, Residential Areas, and Human Settlements Officeである。

1.3　業務スケジュール

成果 1 のプロジェクト活動は次ページの図 1-1 に示すように実施された。コロナ禍のため、2020 年 3 月以降、短期専門家チームは現地に赴くことは出来なくなった。

パンデミックが発生した 2020 年 4 月、短期専門家チームはラマダン休暇後の 2020 年 6 月からプロジェクト活動を再開するよう準備をしていた。しかしパンデミックの終焉の見通しがなかったため、チームは作業スケジュールを変更し、成果 1 の活動を遠隔にて継続しつつ、10 月からインドネシアにおいて作業を再開する予定とした。

しかし予想に反して、パンデミックは長期にわたり、チームは再びスケジュールを変更してすべての成果 1 の活動を遠隔で実行する計画とした。最終的にプロジェクト計画は、2021 年 3 月に完了する予定に再編された。

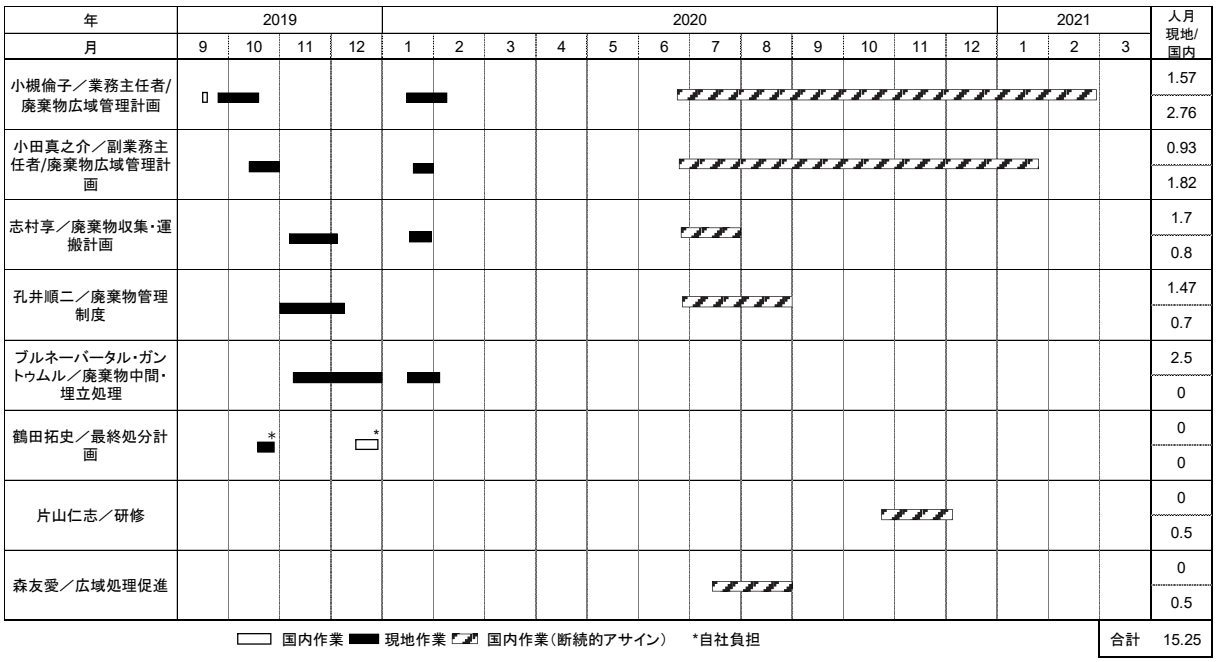
1.4　投入

1.4.1　日本側の投入

（1）要員

日本側からの要員面の投入として、短期専門家と業務調整員が派遣された。短期専門家の派遣実績を表 1-1 に示す。パンデミックの影響により、プロジェクトの後半に予定されていた現地での活動は国内での活動に変更された。

表 1-1 短期専門家の従事実績



業務調整員は長期専門家として JICA から派遣され、スラバヤに駐在する予定であった。しかし、インドネシア政府側での手続き遅延により、長期専門家派遣手続きが期待通りに進まず、2019 年 9 月から 2020 年 4 月初旬まで業務調整員のスラバヤでの滞在は断続的なものであり、その後はパンデミックのため国内で業務した。

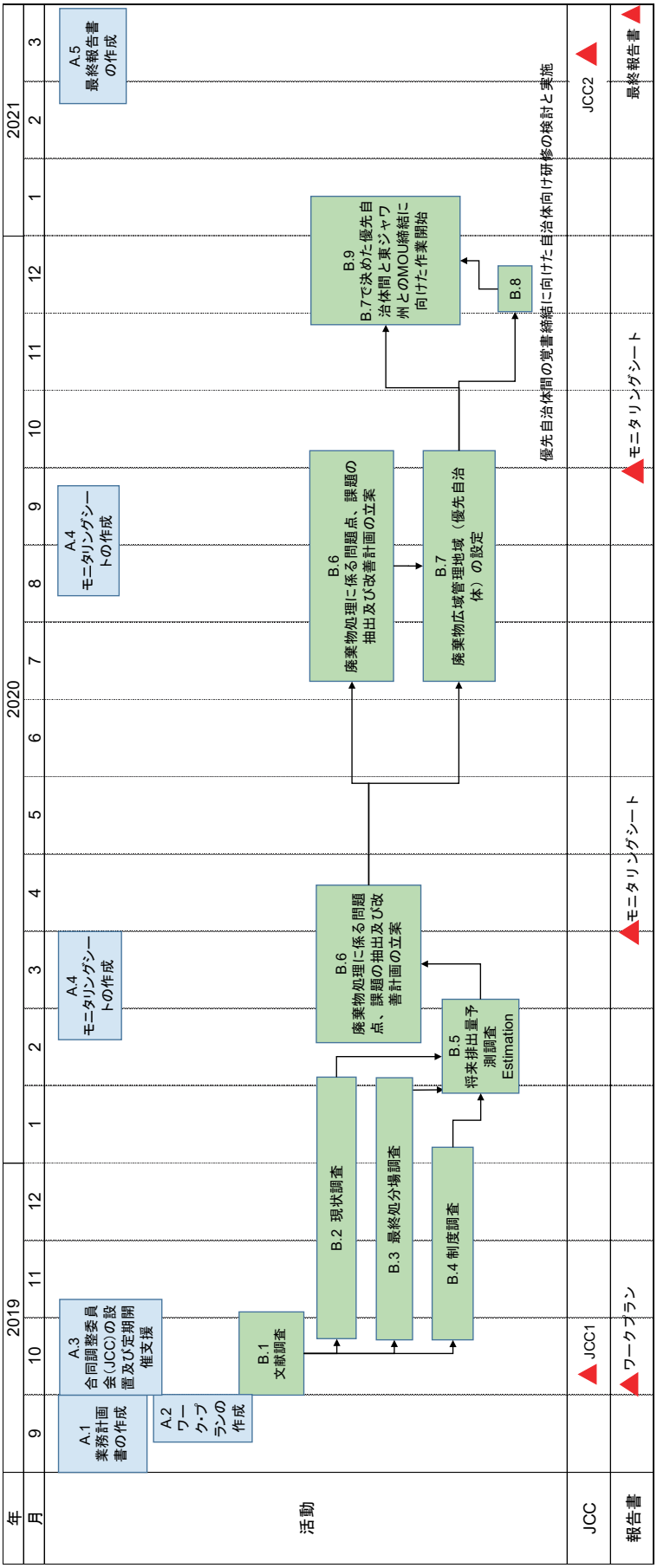


図 1-1 実施スケジュール

（２）機材

プロジェクト実施のため以下の機材を調達した。

- レーザープリンター1 台
- ノートパソコン 3 台

1.4.2　インドネシア側の投入

国レベルのカウンターパート機関（C/P）は、公共事業・国民住宅省（PUPR）であった。PUPR あるいはスラバヤにあるその地域事務所（Balai と呼ばれる）がプロジェクトで開かれる会議にはほぼ参加しており、不参加であった場合には会議資料や議事録を共有した。

地方での C/P は、東ジャワ州政府であった。とくにその住宅・居住地域・生活環境局の給水・環境衛生部は、廃棄物管理課長およびそのスタッフがプロジェクトのあらゆる面で重要な役割を果たした。短期専門家とプロジェクト対象地域内の自治体とのすべての会議の手配など、事実上、関連するすべての組織間の調整を行い、また、それら関連組織からプロジェクト第 2 フェーズへの関心を引き出すよう、プロジェクト活動の中心的な役割を担った。

東ジャワ州政府内の他の機関としては、主に以下の組織の職員がプロジェクト活動や会議に頻繁に参加した。

- 地方官房局
- 地方政府開発調整局
- 地域計画開発局
- 環境局

加えて、プロジェクト対象地域内の 6 自治体[3]の環境局および地域計画開発局は、情報を提供したり様々な観点において協議をしたりするなど、専門家チームと連携して活動した。

[3] プロジェクトの初期において、州政府はプロジェクト対象地域内の7つの全自治体に対しプロジェクトへの彼らの協力を求める文書を発出した。スラバヤ市はこれに対して2019年12月24日付で、広域施設はスラバヤ以外の自治体のために計画されると回答した。

第 2 章　活動実績

A.　プロジェクトの管理運営に関する業務

A.1　業務計画書の作成

契約締結後 10 日以内に、業務計画書を貴機構に提出した。

A.2　ワーク・プランの作成

ワーク・プラン案をとりまとめ、貴機構に説明した。貴機構より指摘されたコメントを踏まえて、契約締結より約 1 か月後を目途に最終案を完了させた。

ワーク・プランは第 1 回 JCC において C/P に説明し、内容について協議を行い合意を得た。

A.3　合同調整委員会（JCC）の設置及び定期開催支援

JCC の設置と運営、開催に係る支援を行った。開催時期と主要議題は以下のようであった。

JCC	開催時期	主要議題
第 1 回	2019 年 10 月	• ワークプランの説明・協議 • 関係自治体の担当機関の確認
第 2 回	2021 年 3 月 （予定）	• 次期フェーズで調査すべき廃棄物広域管理地域（優先自治体）に関する協議と承認

A.4　モニタリングシートの作成

2020 年 3 月にプロジェクトの成果 1 の活動進捗について、C/P 機関と共同で貴機構が規定した所定の様式でモニタリングシートをとりまとめ、貴機構に提出した。成果 1 のプロジェクト活動期間の延長に伴い、2020 年 9 月に 2 回目のモニタリングシートを作成し、同様に JICA に提出した。

A.5　最終報告書の作成

成果 1 に係る活動の実施内容および成果を取りまとめた最終報告書は、2021 年 2 月にその案を C/P に提示して意見を求めたうえで 3 月に最終化し JICA に提出した。

B.　2019 年 10 月～2021 年 3 月：　成果 1 に係る活動

B.1　文献調査（国内準備作業と現地作業）

文献調査では以下の分野に関連する報告書・情報を収集し、分析した。

1. 法令
2. 政策
3. 行政組織
4. 収集・運搬計画及びその現状
5. 中間処理・埋立処理
6. 排出量予測
7. 不法投棄
8. 民間企業
9. NGO・ドナーによる支援
10. 本都市圏の社会経済状況
11. 環境管理、環境政策関連
12. 各自治体の財務

文献調査に当たって、各自治体に以下のような資料の提供を求めた。

- 社会経済統計
- 廃棄物管理に関する計画・方針・政策文書および財務データ
- Jakstrada（各自治体の廃棄物管理の政策と戦略）に示されている排出量や Reduction 率、Handling 率の目標値の根拠

- 直近の Jakstrada 報告書
- 所有している廃棄物管理施設の種類・名称・位置・規模・運営状況
- 新規に計画している廃棄物管理施設の種類・名称・位置・規模・計画進捗状況

B.2　現状調査

プロジェクトの前半には、いくつかの実地調査が実施された。なお、東ジャワ州はスラバヤ市に短期専門家チームによる調査の受け入れを求める手紙を送ったが、市からそれを了承するとの回答は得られなかったため、スラバヤ市では以下の現地調査は実施されていない。代わってチームは、入手可能な文書を検討することにより、スラバヤ市の固形廃棄物管理の状況を調査した。

実地調査の方法と結果を以下に示す。調査の詳細は、添付資料２に報告されている。

B.2.1. ごみ量調査

家庭ごみの発生原単位を算出するため、ごみ量調査を行った。

実施体制：短期専門家の指導の下、調査補助員が短期専門家の用意した車輌を使って回収し、計量等を行う。

サンプル数：各自治体において都市部と郊外部のそれぞれ収集地区と未収集地区から、高所得者と低所得者それぞれ 5 世帯を選定する。計 40 世帯からのサンプルを 7 日間（8 日間採取するが、データとして採用するのは 2 日目から）集め、合計 280 サンプルとする。

ごみ量データ：以下に示す 4 種類のごみのデータを収集した（HHW は家庭ごみの意）。

HHW 1. 家庭で HHW から回収されたもの：市場価値のある HHW で、家庭で分別され、リサイクル業者（民間企業、個人、ウェストピッカー）に販売または提供されるか、ごみ銀行に持ち込まれるもの。

HHW 2. 家庭でリサイクルされた HHW：家庭で再利用またはリサイクルされた HHW。このカテゴリーには主に、堆肥化された有機廃棄物、燃料として使用される可燃性廃棄物、および家畜の飼育に利用される食品廃棄物が含まれる。

HHW 3. 収集のために排出された HHW：自治体あるいは民間の収集業者が提供する廃棄物収集サービスによって収集される HHW。このカテゴリーには、TPA に輸送されるために世帯自身が TPS/TPS-3R[4]に排出する HHW が含まれる。

HHW 4. 管理されない HHW：上記の 3 つのカテゴリに分類されない HHW。これには、家庭で燃やされたり埋められたり、何も処理されずに投棄される廃棄物が含まれる。

結果：一人 1 日あたりの上記 HHW 1～HHW 4 の重量は以下のように算出された。

[4] TPSは廃棄物一時保管場所であり、都市廃棄物はここから最終処分場等へ運搬される。TPS-3RはTPSの一種で、資源ごみを分別して保管したりコンポスト化をしたりするなどのリサイクル機能を有す。

表 2-1 対象自治体の廃棄物発生率(g/人/日)

自治体	エリア	HHW1	HHW2	HHW3	HHW4	合計
モジョケルト県	郊外	0	45	0	280	325
	都市部	1	2	334	9	346
	小計	**1**	**24**	**162**	**149**	**336**
モジョケルト市	都市部	3	7	321	24	355
	小計	**3**	**7**	**321**	**24**	**355**
バンカラン県	郊外	13	9	19	216	257
	都市部	8	1	339	50	397
	小計	**11**	**5**	**154**	**146**	**316**
ラモンガン県	郊外	26	57	241	29	354
	都市部	37	27	303	9	376
	小計	**32**	**42**	**273**	**19**	**366**
シドアルジョ県	郊外	3	5	29	220	257
	都市部	31	54	286	0	370
	小計	**16**	**29**	**154**	**113**	**312**
グレシック県	郊外	4	2	217	14	237
	都市部	3	0	242	102	347
	小計	**3**	**1**	**229**	**55**	**288**

B.2.2. ごみ質調査

ごみ質調査はごみ量調査で得られたサンプルを用いて、物理組成分析（湿ベース）を行った。

実施体制：短期専門家の指導の下、調査補助員が実施する。

サンプル数：都市部と郊外でのサンプルそれぞれ 7 日間、合計 14 サンプルとする。

結果：ごみ質は次のような結果となった。

表 2-2 自治体ごとの廃棄物の物理的組成

ごみの種類	モジョケルト県			モジョケルト市			バンカラン県		
	郊外	都市部	合計	郊外	都市部	合計	郊外	都市部	合計
ガラス瓶	0.0%	0.5%	0.3%		0.7%	0.7%	0.0%	1.7%	0.9%
ガラス、投棄、石等	1.0%	0.7%	0.8%		0.8%	0.8%	2.4%	1.7%	2.0%
台所ごみ	63.3%	70.1%	66.9%		67.8%	67.8%	50.6%	53.9%	52.3%
缶	0.0%	0.6%	0.4%		0.7%	0.7%	0.2%	0.2%	0.2%
その他金属	0.2%	0.1%	0.1%		0.2%	0.2%	0.3%	0.5%	0.4%
その他	2.3%	3.3%	2.8%		2.4%	2.4%	3.2%	2.4%	2.8%
段ボール	0.4%	0.6%	0.5%		0.5%	0.5%	0.4%	0.3%	0.4%
その他の紙	6.8%	5.8%	6.3%		7.3%	7.3%	7.9%	10.7%	9.3%
ハードプラスチック	1.2%	1.2%	1.2%		1.8%	1.8%	0.9%	2.0%	1.5%
ペットボトル	2.9%	1.8%	2.3%		2.1%	2.1%	6.2%	3.0%	4.5%
ソフトプラスチック	8.0%	7.7%	7.8%		9.2%	9.2%	8.1%	9.7%	8.9%
ゴム、革	0.7%	0.8%	0.8%		0.7%	0.7%	0.3%	0.2%	0.3%
繊維	1.7%	0.8%	1.2%		0.7%	0.7%	1.0%	1.0%	1.0%
木・草	11.3%	6.1%	8.5%		5.0%	5.0%	18.4%	12.5%	15.3%
合計	100.0%	100.0%	100.0%		100.0%	100.0%	100.0%	100.0%	100.0%

ごみの種類	ラモンガン県			シドアルジョ県			グレシック県		
	郊外	都市部	合計	郊外	都市部	合計	郊外	都市部	合計
ガラス瓶	0.1%	0.0%	0.0%	0.0%	0.4%	0.2%	0.0%	0.1%	0.0%
ガラス、投棄、石等	0.4%	0.6%	0.5%	0.2%	0.9%	0.6%	3.0%	1.1%	1.8%
台所ごみ	61.8%	57.1%	59.3%	58.7%	54.3%	56.1%	61.3%	69.2%	66.4%
缶	0.1%	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	0.1%	0.2%
その他金属	1.1%	0.5%	0.8%	0.4%	0.7%	0.6%	0.1%	0.3%	0.2%
その他	9.9%	11.4%	10.7%	11.0%	5.9%	8.0%	10.1%	6.8%	8.0%
段ボール	0.7%	2.6%	1.7%	0.3%	1.1%	0.8%	1.1%	0.5%	0.7%
その他の紙	6.8%	8.9%	7.9%	9.3%	10.7%	10.1%	5.6%	6.2%	6.0%
ハードプラスチック	2.6%	3.0%	2.8%	1.4%	4.8%	3.4%	1.6%	1.6%	1.6%
ペットボトル	3.6%	3.6%	3.6%	3.2%	2.5%	2.8%	2.3%	1.7%	1.9%
ソフトプラスチック	8.3%	8.5%	8.4%	11.5%	8.9%	10.0%	11.2%	7.8%	9.0%
ゴム、革	0.0%	0.4%	0.2%	0.3%	0.1%	0.1%	0.2%	0.5%	0.4%
繊維	1.7%	0.9%	1.3%	0.9%	2.0%	1.5%	0.8%	0.8%	0.8%
木・草	3.0%	2.6%	2.8%	2.7%	7.7%	5.6%	2.5%	3.5%	3.1%
合計	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

対象 6 自治体の結果を平均すると、以下の通りであった。

表 2-3 廃棄物の物理的組成の平均

ごみの種類	郊外	都市部	合計	合計
台所ごみ	59.2%	62.9%	61.5%	61.5%
木・草	7.8%	5.7%	6.5%	6.5%
段ボール	0.6%	1.0%	0.8%	8.6%
その他の紙	7.2%	8.1%	7.7%	
ハードプラスチック	1.6%	2.3%	2.0%	13.8%
ペットボトル	3.8%	2.4%	2.9%	
ソフトプラスチック	9.1%	8.6%	8.8%	
缶	0.1%	0.3%	0.3%	0.6%
その他金属	0.5%	0.4%	0.4%	
ガラス瓶	0.0%	0.5%	0.3%	1.4%
ガラス、投棄、石等	1.4%	0.9%	1.1%	
ゴム、革	0.3%	0.5%	0.4%	0.4%
繊維	1.3%	1.0%	1.1%	1.1%
その他	7.2%	5.4%	6.1%	6.1%
合計	100.0%	100.0%	100.0%	

B.2.3. タイムアンドモーション調査

廃棄物収集車輌のルートと所要時間を計測し、収集作業の実態を把握した。なお、モジョケルト県においては新型コロナのパンデミックの影響により調査の機会が得られなかった。

実施体制：短期専門家の指示の下、調査補助員が調査を行う。GPS ロガーをごみ収集車両に取り付け、時間と場所のデータを取得する。

調査対象収集ルート：各自治体で 2～3 ルートを選定する。アームロール車とダンプトラックとが使われている場合はいずれのタイプも調査対象とする。

結果：調査結果を以下にまとめる。

表 2-4 タイムアンドモーション調査の結果（アームロール車）

	アームロール車 (6 m³)			
	グレシック県	ラモンガン県	シドアルジョ県	モジョケルト市
トリップ平均所要時間	01:26:23	01:14:08	04:28:03	01:23:29
トリップあたり積載時間	00:09:12	00:20:31	00:37:55	00:09:23
トリップあたり最長積載時間	00:38:41	01:06:49	01:33:17	00:22:11
トリップあたり最短積載時間	00:03:07	00:03:41	00:21:56	00:02:46
トリップあたりごみ量	1,012.5	*1,800.0*	3,090.0	3,366.7
変動係数	0.42	-	0.36	0.23
トリップあたり平均距離	31.2	12.3	77.3	16.7
平均時速 (km/hour)	28.1	18.3	23.6	14.8

表 2-5 タイムアンドモーション調査結果（ダンプトラック）

	ダンプトラック (8 m³(ラモンガンのみ 6 m³))			
	ラモンガン県	シドアルジョ県	モジョケルト市	バンカラン県
トリップ平均所要時間	01:32:38	05:04:19	01:53:14	00:58:33
トリップあたり積載時間	00:09:17	00:49:31	00:48:43	00:16:35
トリップあたりごみ量	*2,400.0*	2,360.0	4,180.0	*2,400.0*
変動係数	-	0.23	-	-
トリップあたり平均距離	14.4	85.9	12.4	61.1
1分あたり積載量 (kg/minute)	*129.3*	19.7	36.5	*31.5*
平均時速 (km/hour)	18.6	23.0	11.9	20.6
トリップあたりTPSの数	2	1	1	4.6

斜字体は、最終処分場にトラックスケールがなくトラックの容積から概算した重量を使って算出されているため、注意が必要。

- ダンプトラックとアームロールの 1 回のトリップあたりの平均時間は、約 2.25 時間、 シドアルジョのデータを除くと 1.5 時間であった。
- アームロールの場合、TPS でのごみの積載に要する時間は作業効率を考慮するための指標の 1 つとなりうる。実際には通常、アームロールの積載時間は車両の機構によって単純に決定され、安定しているはずである。しかし、4 つの自治体の平均積み込み時間には相違がある。個々の自治体ごとに見ても、最大値と最小値との差の大きさが示すように積載時間はトリップによって開きがある。
- スケジュール通りの運行を行うため、積載時間は安定させることが望ましい。積載時間が長くなった場合はその理由を報告して対策を講じる必要がある。
- ダンプトラックは、単位時間あたりの廃棄物量が重要となる。この観点からは、バンカランは極端な値となっている。ただし、バンカランの TPA にはトラックスケールがなく、トラックに積載される廃棄物量が過大評価されている可能性があるため、この数値には注意が必要である。
- 単位時間あたりの廃棄物の量は、個々の条件により左右され、標準的な数値を示すことはできない。標準的な数値を把握できるよう、同様の方法で定期的にデータを収集することが望ましい。このことは、収集作業の管理に有効である。
- 同じトラックのタイプの場合、6 自治体のコンテナのサイズは同じであるが、1 回のトリップあたりの廃棄物量は異なっている。基本的には 1 回のトリップでの収集ごみ量が多いほど効率が良いと言える。2 つの自治体がアームロールで 3,000kg を超える廃棄物量を記録し、1 つの自治体がダンプトラックで 4,000kg を超える廃棄物量を記録した。これは 500kg / m3 に相当する。

- このような例外的な廃棄物データは、日常業務で検出する必要がある。そのようなデータがでる原因には人的または機械的なエラーの可能性もあるが、そのようなエラーがない場合は車両に損傷を与える可能性があるため、そのような過載積は回避する必要がある。
- 積載量がばらついている。データのばらつきを示す標準偏差を取ると、グレシックとシドアルジョで大きくなっている。すなわち、トラックの積載容量に比して廃棄物を少量のみ運ぶトリップがあったことを意味する。TPS などの廃棄物収集ポイントの場所は、各トリップがトラックの容量を効果的かつ十分に活用できるように計画する必要がある。標準偏差が大きいことは、TPS などの廃棄物収集ポイントの再配置の必要性を示唆している可能性がある。

B.2.4. リサイクル調査

大手リサイクル業者へのヒアリングにより、総資源ごみ回収量を推計した。

実施体制：短期専門家の指導の下、調査補助員が実施する。

聞き取り業者数：21 社

結果：　訪問企業がリサイクルした資源の量は以下のとおりである。スラバヤ市に所在するリサイクル会社の調査はできなかったため、結果は定量的にではなく、定性的にのみ見る必要があるが、ごみの組成比率（B.2.2 参照）は、紙 8.5%、プラスチック 13.8%となっている一方で、リサイクルされる品目としてはプラスチックよりも紙の方が多くリサイクルされるとの結果となっている。

表 2-6 リサイクル調査の結果

	プラスチック	紙	金属	ガラス	合計	調査した事業所数
資源調達先	トン/日	トン/日	トン/日	トン/日	トン/日	
グレシック県	12.4	26.0	0.2	0.0	38.6	4
バンカラン県	9.4	20.1	0.3	0.0	29.8	3
モジョケルト県	12.6	11.6	0.2	0.0	24.4	4
モジョケルト市	3.0	1.6	0.1	0.0	4.8	1
スラバヤ市	27.7	38.2	0.8	0.0	66.7	0
シドアルジョ県	17.9	60.2	10.8	0.0	88.8	6
ラモンガン県	12.3	31.8	6.7	0.1	51.0	3
合計	95.2	189.6	19.1	0.2	304.1	21

B.2.5. 住民・事業者意識調査

廃棄物管理の習慣や自治体が行う廃棄物管理事業に対する意見などを、住民および事業者に対しヒアリングして調査した。

実施体制：短期専門家の指導の下、調査補助員が実施する。

サンプル数：7 自治体それぞれ住民 300（商業地区 75、都市部 150、郊外 75）、事業者 100。

結果：主要な調査結果は以下の通りである。

- 廃棄物のリサイクルを実践している世帯は、17%（バンカラン）から 52%（ラモンガン）であった。リサイクル可能な資源を買取人やごみ銀行に販売することが、リサイクルの主たる形態となっている。
- 一部の地域では、公共のごみ収集サービスが不足しているため、不適切な方法（燃やす、空き地や水路への廃棄など）が家庭で最も一般的なごみ処理となっている。同じような不適切な廃棄物処理の傾向は、事業者の中にも見られる。
- ラモンガンを除いて、廃棄物サービスの対価に関する条例がある。しかし、84%から 97%の世帯が、地方自治体に料金を支払っていないと回答している。
- TPA について知っている世帯の割合は 4%から 67%まで大きな開きがあった。
- 一般世帯と事業者の双方が、TPS の数を増やして収集サービスをより頻繁に行うことを求めている。支払意志額は月額 10,000 ルピアまでとの回答が 3 つの自治体で、10,000 ルピアから 50,000 ルピアとの回答が他の 3 自治体で、最も多かった。ほとんどの事業体は、廃棄物管理の改善にさらに支払う意志を表明した。

B.3　最終処分場調査

最終処分場調査は、既存処分場と新規処分場とで実施した。

B.3.1.既存最終処分場の調査

i)　既存処分場内及び周辺の水質調査

実施体制：サンプリング場所は、各自治体 C/P とともに決定した。水のサンプルは東ジャワ州環境局分析室に送られ、環境大臣令 2016 年 No.59 に示されているリストから特に重要なものとして抽出した pH、BOD、COD、浮遊物質、全窒素、水銀、カドミウムの分析が行われた。
サンプル数：6 自治体それぞれの主要 TPA6 か所から 3 サンプルずつ（可能な限り、1 つは処理後の浸出水、1 つは浸出水が放出される水路の上流、もう一つはその下流）採取した。アクセスが困難であるなど現場の状況によっては、代わりとなる場所からの採水となった。
結果：

- モジョケルト県とモジョケルト市では、処理された浸出水は基準に完全には適合していなかったが、敷地より外へは排出されておらず植物の散水に使用されていた。モニタリング井戸では汚染は見られなかった。
- シドアルジョ県では、貯留地に流れ込む浸出が採取され、基準を満たしてはいなかったが、新しい衛生埋立地が隣接して建設されている関係で、既存の TPA の浸出水処理施設がその機能を十分に発揮できない状況だったことが影響している。新しい衛生埋立地の新しい浸出水処理施設において、既存の TPA からの浸出水を処理することが強く推奨される。
- ラモンガン県とグレシック県では、浸出水処理施設を改善する必要があるが、そのことは実際にそれぞれの自治体の C/P に認識されており、システムの改善に向けて取り組んでいる。

ii)　既存処分場の残余年数の推計

各自治体が使用している既存処分場（複数ある場合は日処分量の最も多い処分場）の残余年数の推計を行った。

実施体制：最終処分計画担当の短期専門家が行う。

手順：1. UAV によって処分場を空中撮影して処分場の標高データを入手する。
2. 最終処分に利用していくエリアや高さの上限を自治体担当者との協議により決める。場合により複数のケースを想定する。
3. 施設整備に関する法令（2013 年 PUPR 省令第 3 号）に基づき、最終高さ、斜面傾斜、小段配置などを設定する。
4. 埋立可能容量を算出する。
5. 既存の処分場における現在および将来の処分量の推定。将来の推計では、2 つのケースを想定した。すなわちケース 1 は、現在と同じように廃棄物を収集して処分する現状維持ケース、ケース 2 は、Jakstrada の目標が 2025 年に達成され（つまり、70%の処理と 30%の削減）その廃棄物管理の状態が維持されるケースである。
6. 残余年数を推定する。

結果：推計された残余年数は以下の通りである。

表 2-7 TPA の残余年数

	ケース	処分場面積等	残余容量 (m^3)	残っている期間	
				ケース 1	ケース 2
TPA Buluh, Bangkalan	ケース A	1.9ha	14,151	2020年5月まで	2020年5月まで
TPA Jabon, Kab Sidoarjo	ケース A	Height=12m	304,073	2021年6月まで	2021年6月まで
	ケース B	Height =15m	437,919	2022年5月まで	2022年3月まで
TPA Randegan, Kota Mojokerto	ケース A	Area A	46,586	2021年7月まで	2021年7月まで
	ケース B	Area A + B	168,007	2026年3月まで	2026年9月まで
	ケース C	Area A + C	152,450	2025年8月まで	2026年1月まで
	ケース D	Area A + B + C	273,871	2030年3月まで	2031年3月まで
TPA Desa Belahan Tengah, Kab Mojokerto	ケース A	5 areas used individually	22,707	2021年8月まで	2020年6月まで
	ケース B	5 areas used integrally	39,905	2023年1月まで	2020年12月まで
TPA Tambakrigadung, Lamongan	ケース A	Height =12m	22,218	2021年1月まで	2021年1月まで
	ケース B	Height =15m	29,534	2021年6月まで	2021年6月まで
TPA Ngipik, Gresik	ケース A	Area A + B	171,420	2022年11月まで	2022年12月まで
	ケース B	Area A + C	232,362	2024年1月まで	2024年1月まで

- バンカランの TPA Buluh の残余年数は最短であるが、上記分析の後、すでに閉鎖された。
- シドアルジョの TPA Jabon の残余年数はそれほど長くはないが、その隣接地に新しい衛生埋立地が建設中である。
- モジョケルト市は、新しいエリアの取得が最も重要である。
- モジョケルト県の現 TPA の残余年数はあまり長くはないが、新しい TPA の建設が開始されようとしている。
- ラモンガン県の TPA Tambakrigadung の残余年数は短く、現在の敷地を可能な限り活用し、北部の 2 番目の TPA を効率的に利用することが望まれる。
- グレシック県 TPA Ngipik の残余年数は短い。グレシック県は単一の TPA に廃棄物が集中しないように、廃棄物管理をなるべく発生源近くで管理することを方針としているが、これには合理性があり推進されるべきである。

B.3.2. 新規最終処分場の調査

広域利用の候補となりうる最終処分のための 3 つの計画地があり、それぞれ以下のような土地であることが分かった。

表 2-8 広域利用候補地

名前	Dadapan, ラモンガン県	Dawarblandong, モジョケルト県	Kutorejo, モジョケルト県
土地所有	ラモンガン県	・現在は林業公社（国営企業） ・代替地を用意することで州と土地所有権を交換	モジョケルト県
面積	3 ha（拡張可能とみられる）	57 ha	4 ha（拡張可能とみられる）
状況	・自区内処理処分場予定地. ・既存の自区内処理用処分場のすぐそば	・東ジャワ州による有害廃棄物処理施設予定地 ・環境影響評価（AMDALと言われる）のプロセス中	・自区内処理処分場予定地 ・処分場としての計画上の必要プロセスは完了 ・2020年中の建設の見込み

B.4 制度調査

短期専門家は、広域廃棄物管理に関し従うべき規制、標準的な計画手順、交渉プロセス、他の広域廃棄物管理の実施において採用されたコスト共有システムなどの情報を収集し、分析した。その調査結果は、添付資料３にまとめている。ここでは、明らかとなった重要なポイントをいくつか示す。

- 内務大臣令 2009 年 No.22、地域協力のための技術ガイドラインの規制は、廃棄物管理セクターだけでなく、あらゆる政府の課題におけるすべての地域間協力を規定する。このなかでは、KSB と PKS と呼ばれる地域間協力の合意署名のステップが最も重要である。
- KSB は共同協定であり、地域協力の取り組みを開始する際に署名される。PKS は、協力内容を定める協力協定である。
- PUPR は、廃棄物管理と排水処理の分野をカバーする広域インフラ管理を準備するためのガイドラインを発行している。これは基本的に上記の内務大臣令にそって、より具体的に手順を説明したものである。
- 広域最終処分では、施設のユーザー間で費用負担を共有の仕組みが作られる。負担する費用は 2 種類あり、一つは施設運営のための費用、もう一つは TPA に隣接する地元住民のための補償を施設受入自治体が払うための費用である。

B.5 将来排出量予測調査

B.2.1 に示したように廃棄物は、（i）リサイクルのために第三者（ごみ銀行含む）に提供/販売される廃棄物、（ii）主に堆肥化によって家庭でリサイクルされる廃棄物、（iii）収集のために排出される廃棄物、および（iv）適切に管理されていない廃棄物、の 4 つに分類されると考えられる。この分類は、家庭ごみと家庭類似ごみの両方に適用される。

廃棄物量調査の結果と各自治体の Jakstrada 報告書に記載されているデータを活用することにより、現在の廃棄物の流れを把握した。

また、現在の廃棄物の流れに基づいて、TPA の残存年数分析で行った 2 つのシナリオ、すなわち現状の廃棄物の流れが維持されるケースと Jakstrada の目指す通り 2025 年に 70%の処理と 30%の削減が達成されるケースを想定して、将来の廃棄物の流れを推定した。

次の図は、各自治体の現在の廃棄物の流れとケース 1 およびケース 2 の場合の将来の廃棄物のフローである。このようなごみフローの分析方法は、添付資料２で説明している。

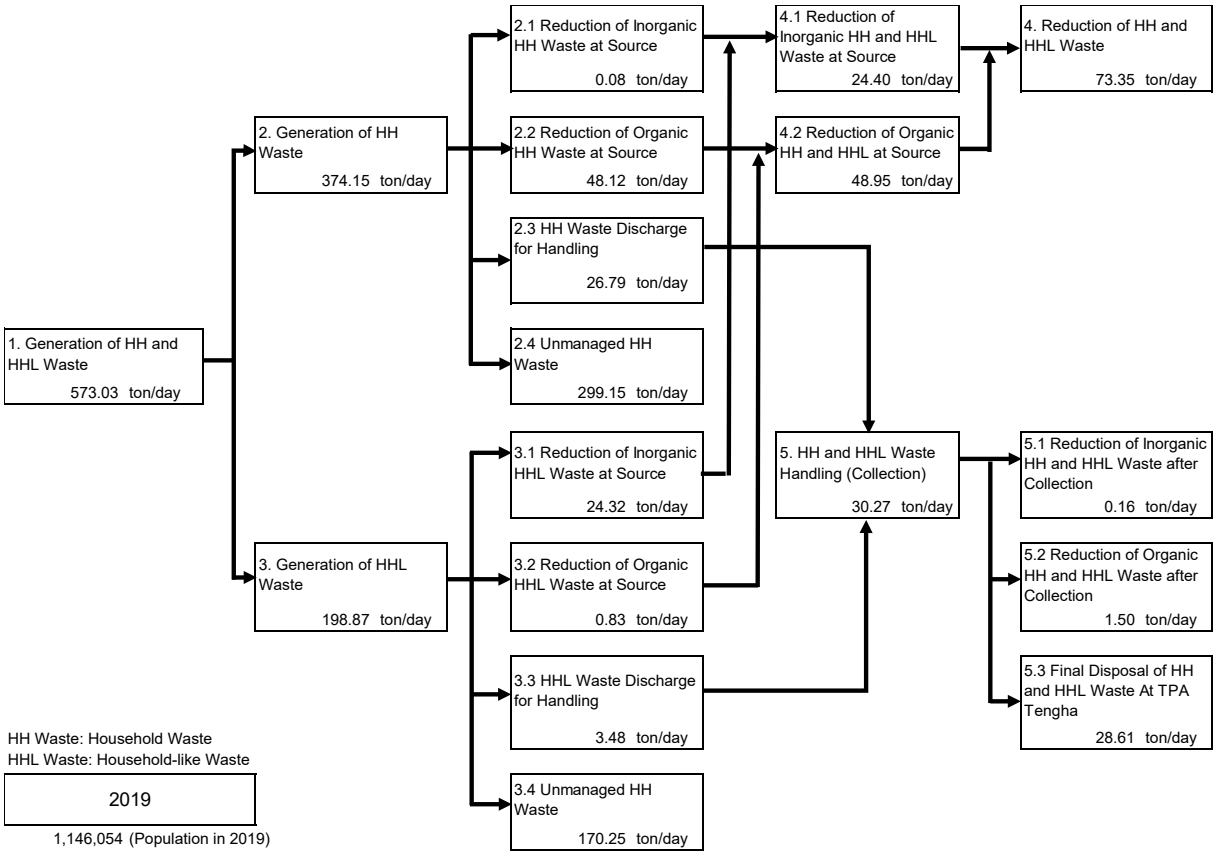


図 2-1 モジョケルト県の現在のごみフロー

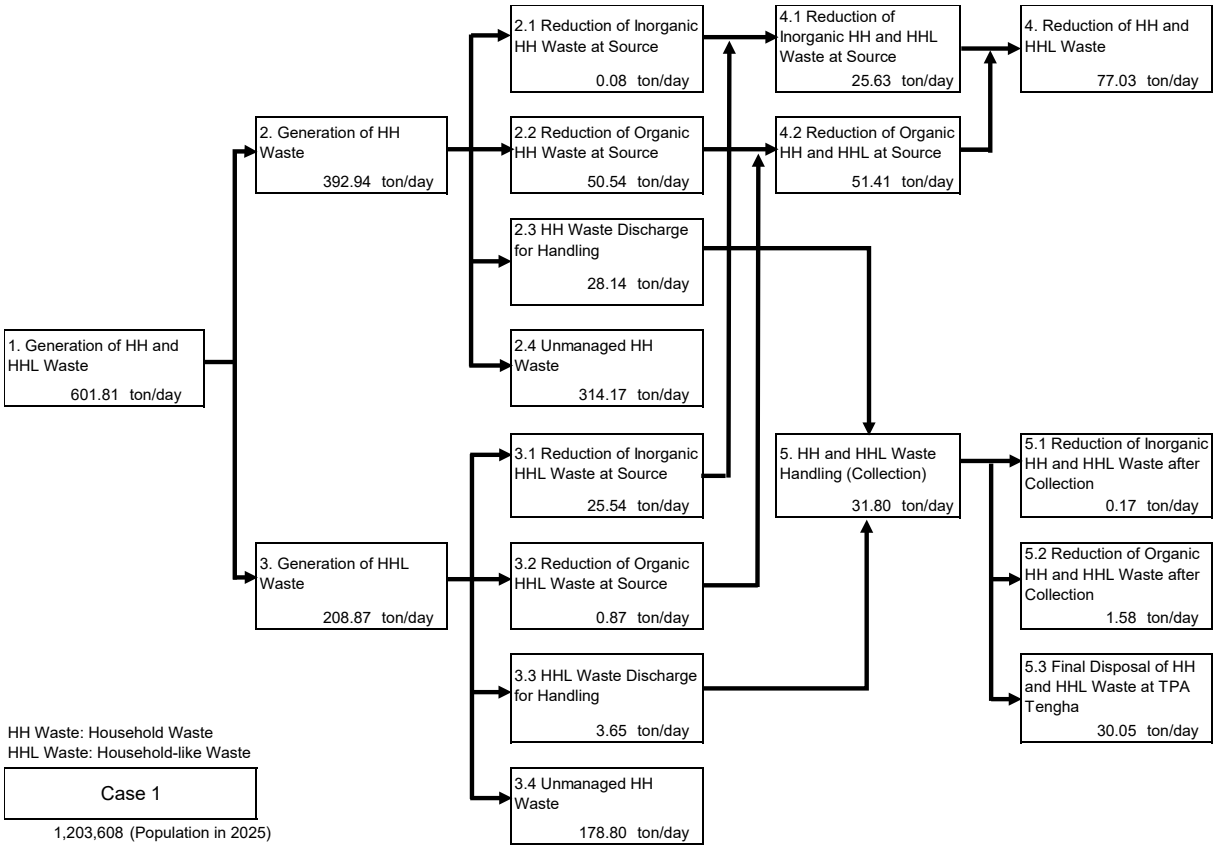


図 2-2 モジョケルト県の将来のごみフロー (ケース 1)

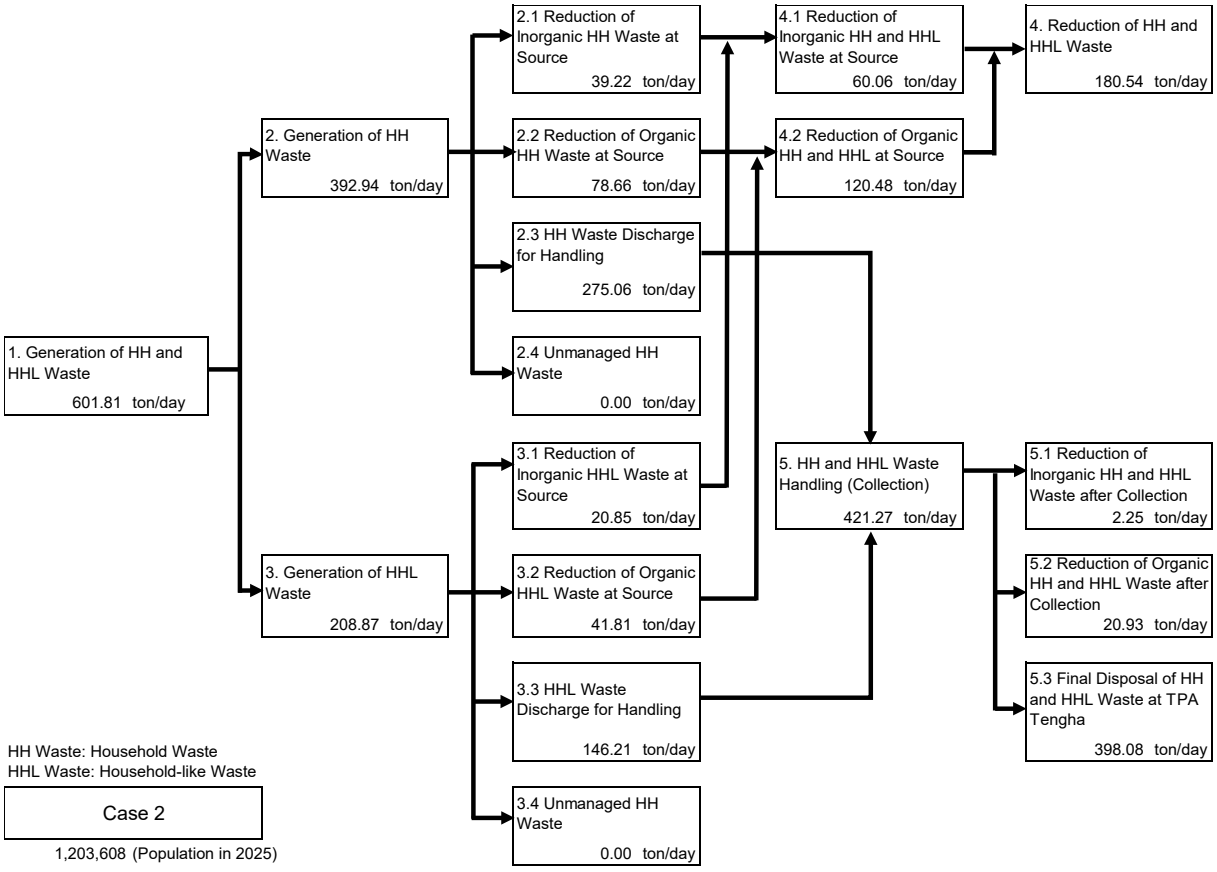


図 2-3 モジョケルト県の将来のごみフロー (ケース 2)

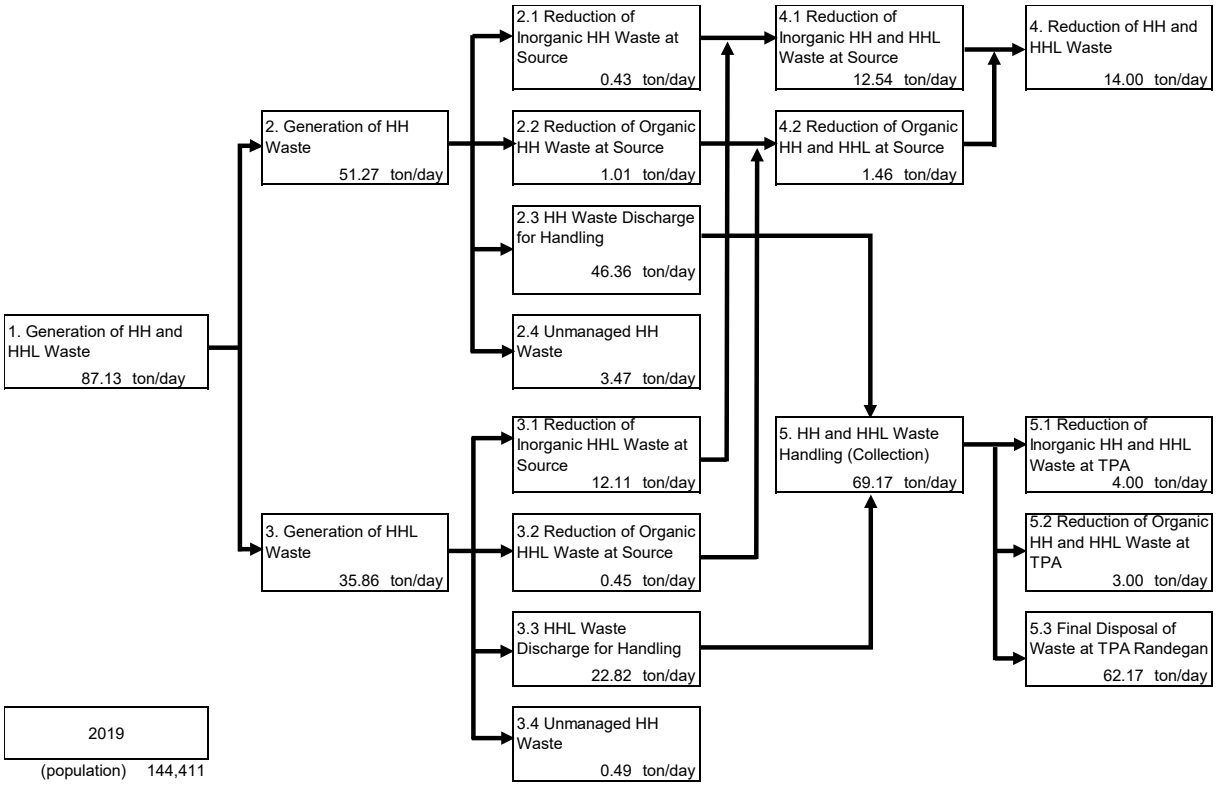


図 2-4 モジョケルト市の現在のごみフロー

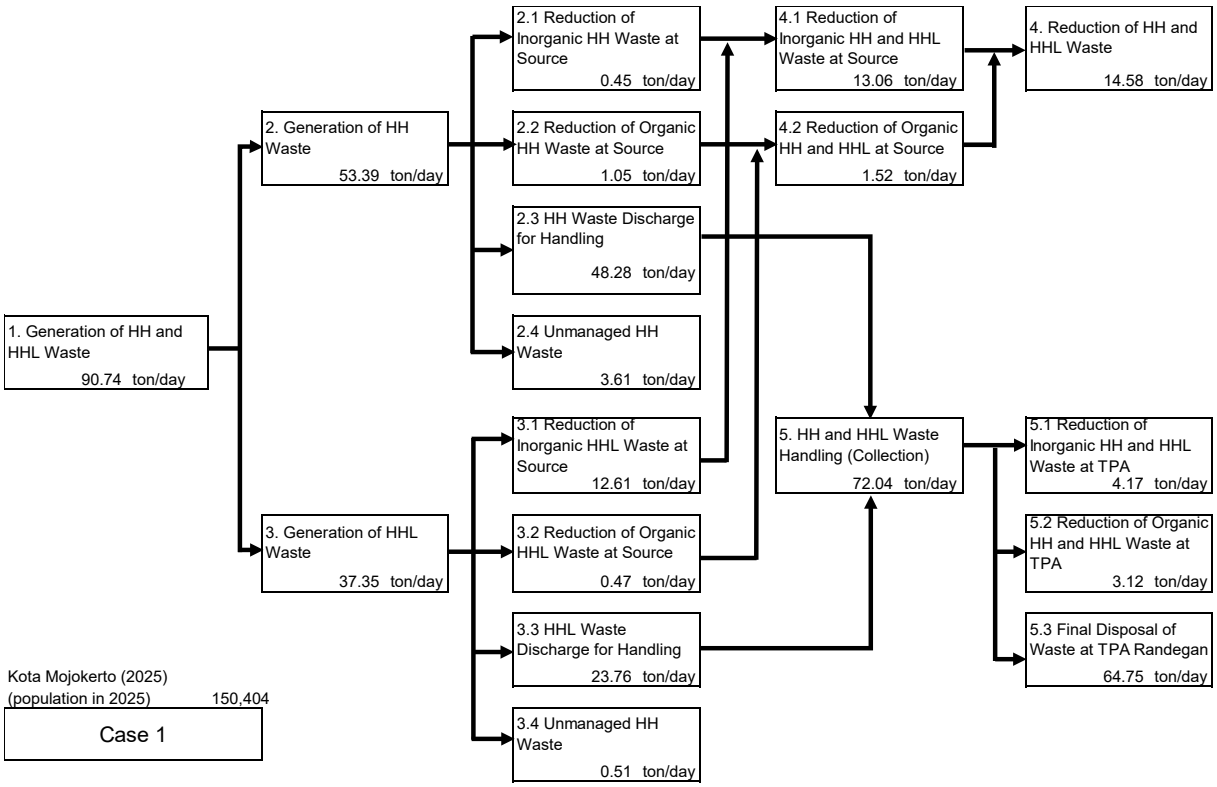


図 2-5 モジョケルト市の将来のごみフロー (ケース 1)

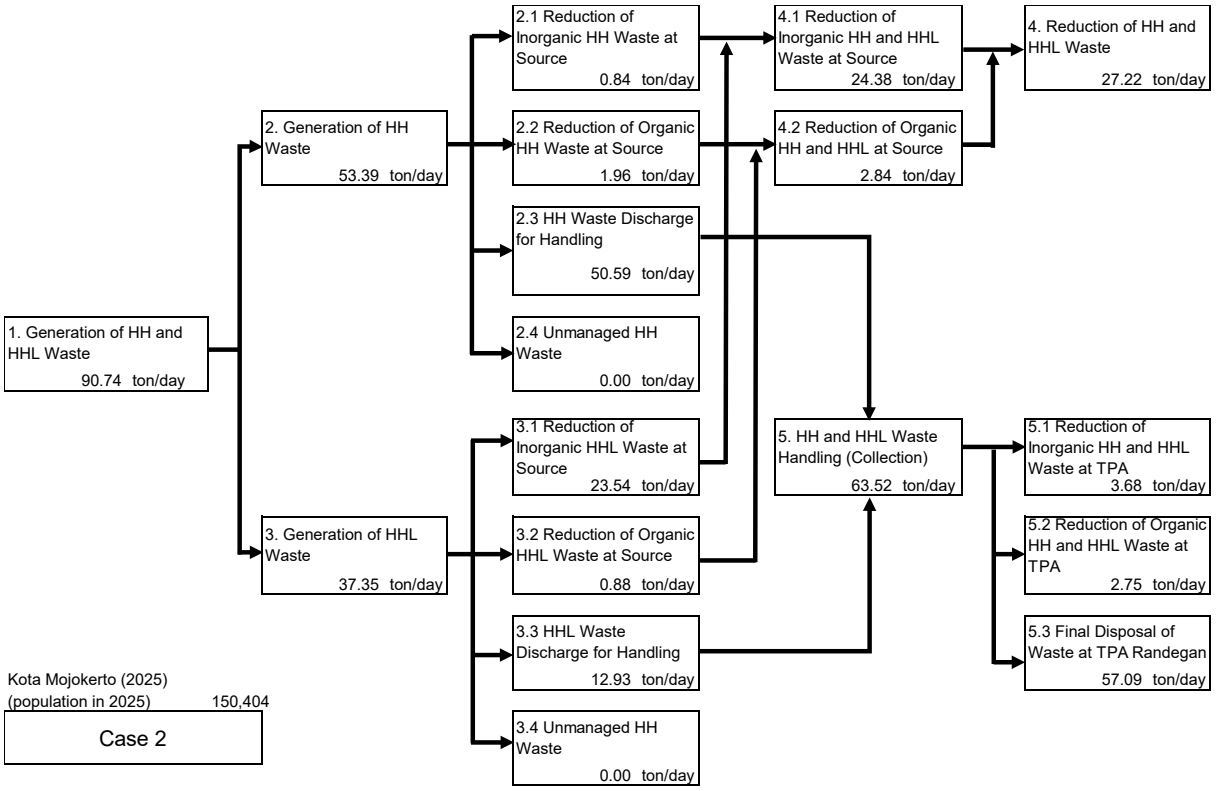


図 2-6 モジョケルト市の将来のごみフロー (ケース 2)

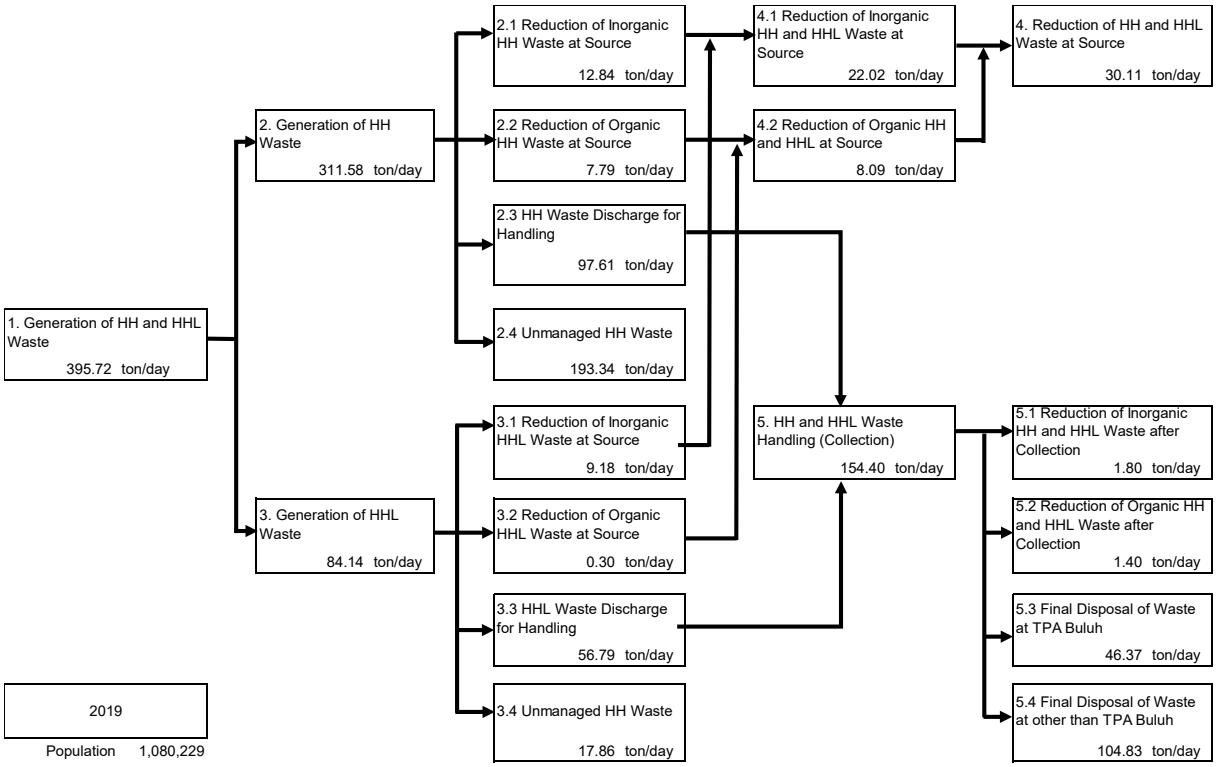


図 2-7 バンカラン県の現在のごみフロー

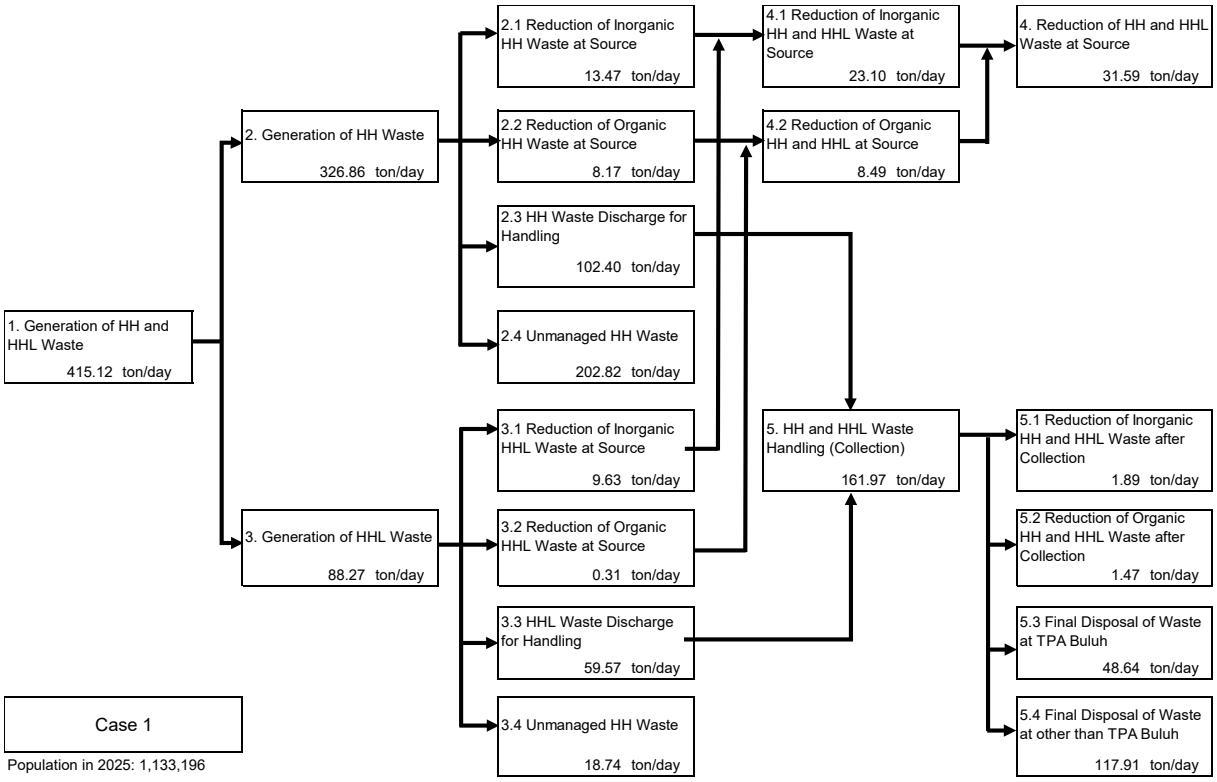


図 2-8 バンカラン県の将来のごみフロー (ケース 1)

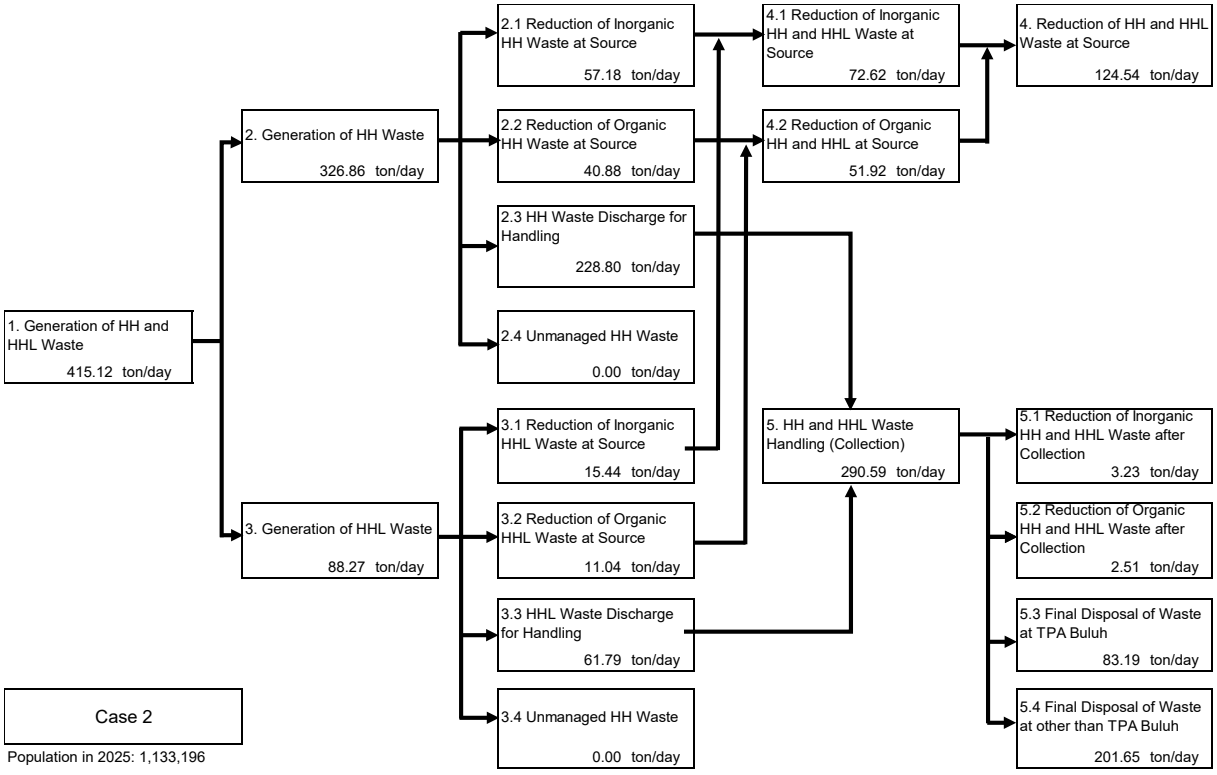


図 2-9 バンカラン県の将来のごみフロー (ケース 2)

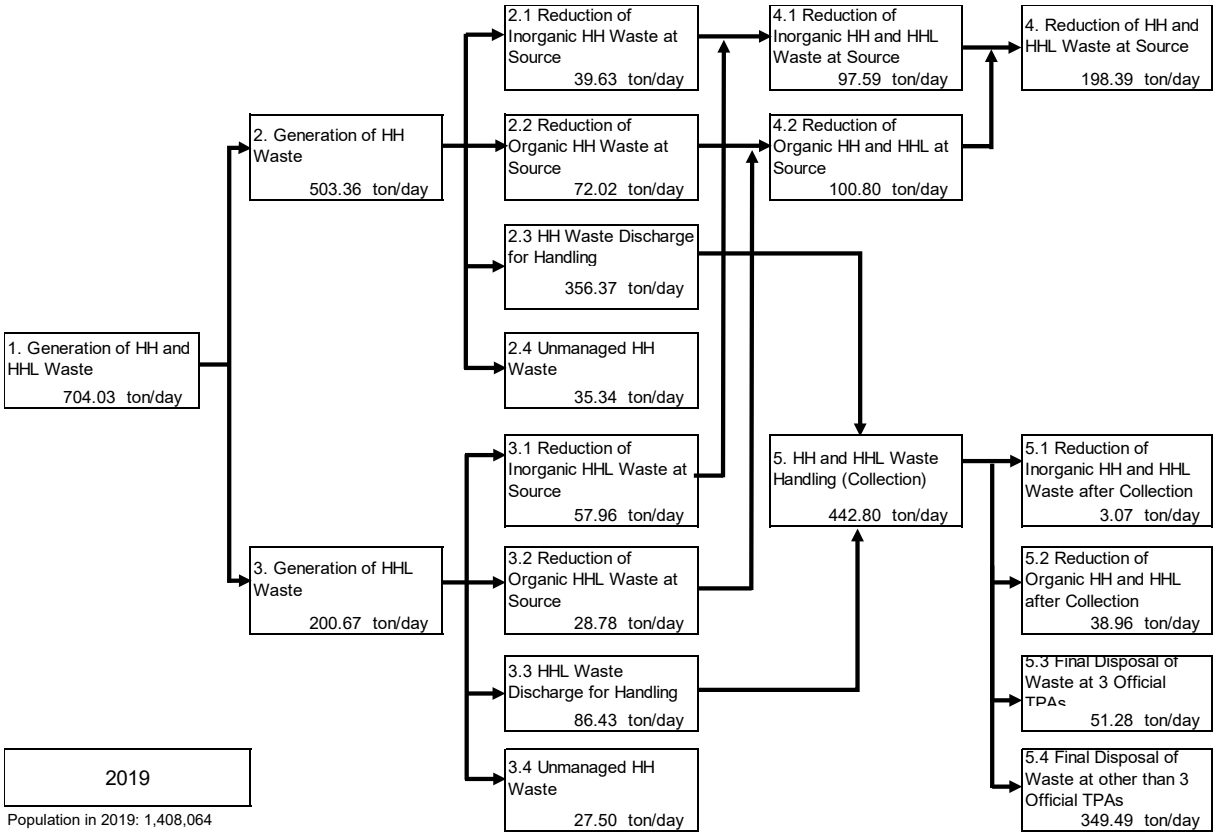


図 2-10 ラモンガン県の現在のごみフロー

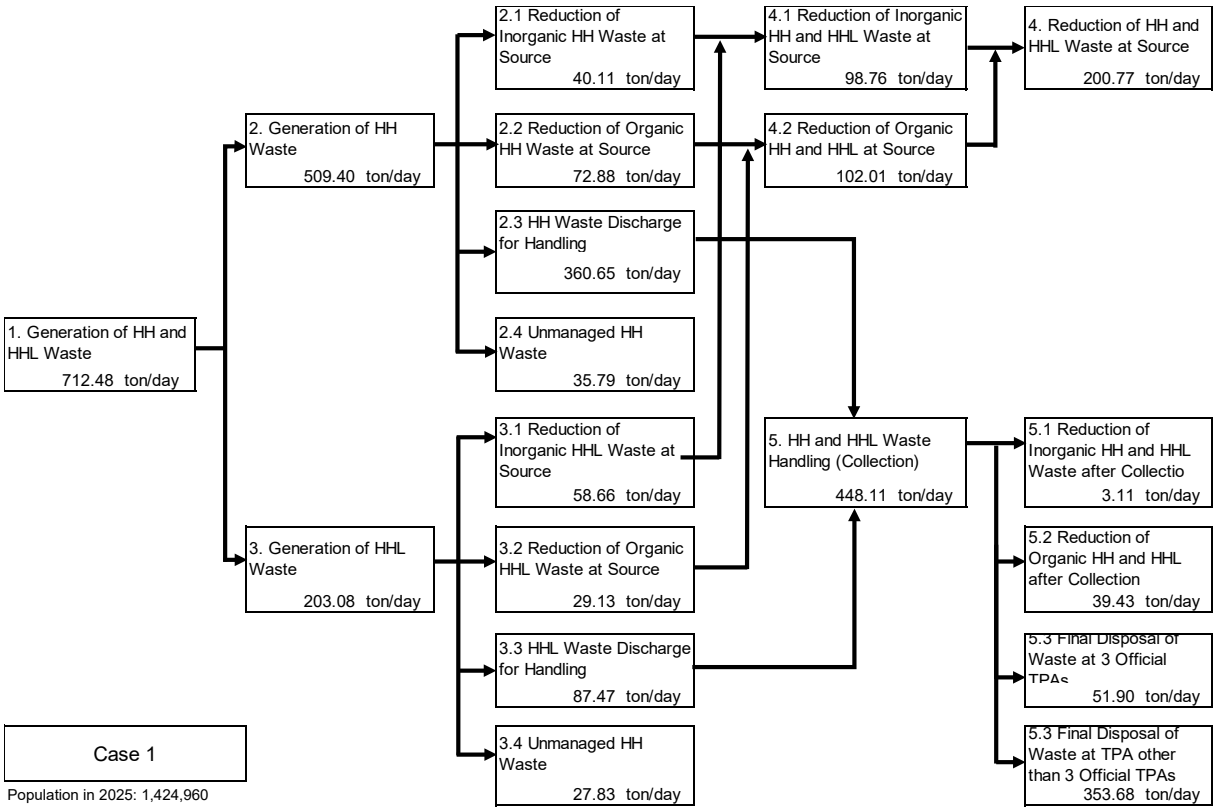


図 2-11 ラモンガン県の将来のごみフロー (ケース 1)

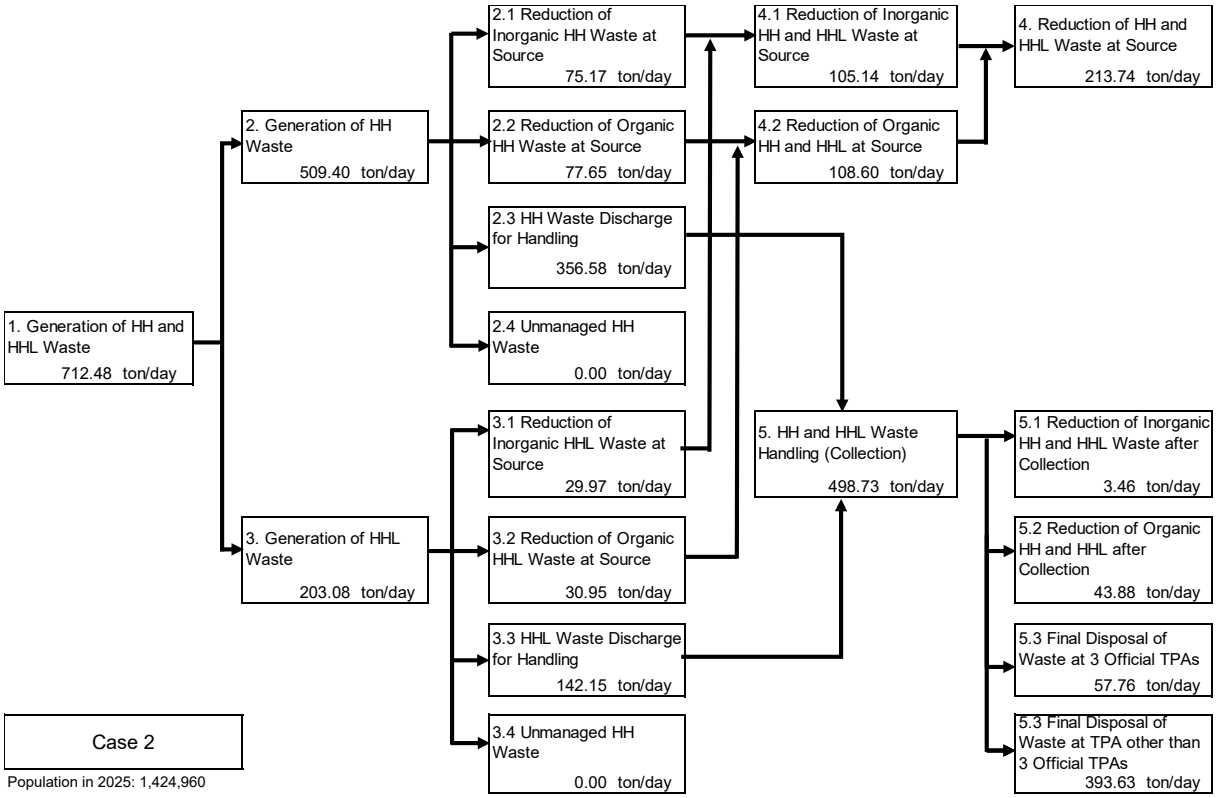


図 2-12 ラモンガン県の将来のごみフロー (ケース 2)

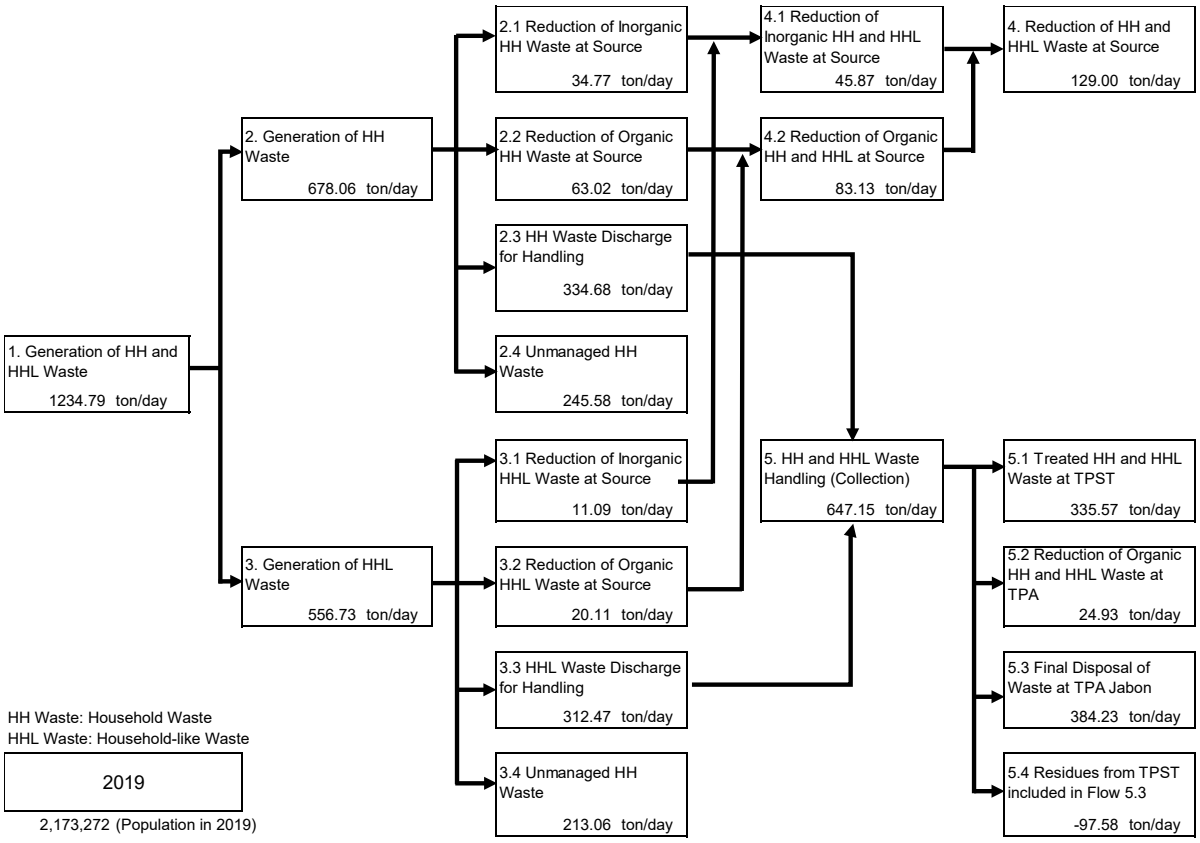


図 2-13 シドアルジョ県の現在のごみフロー

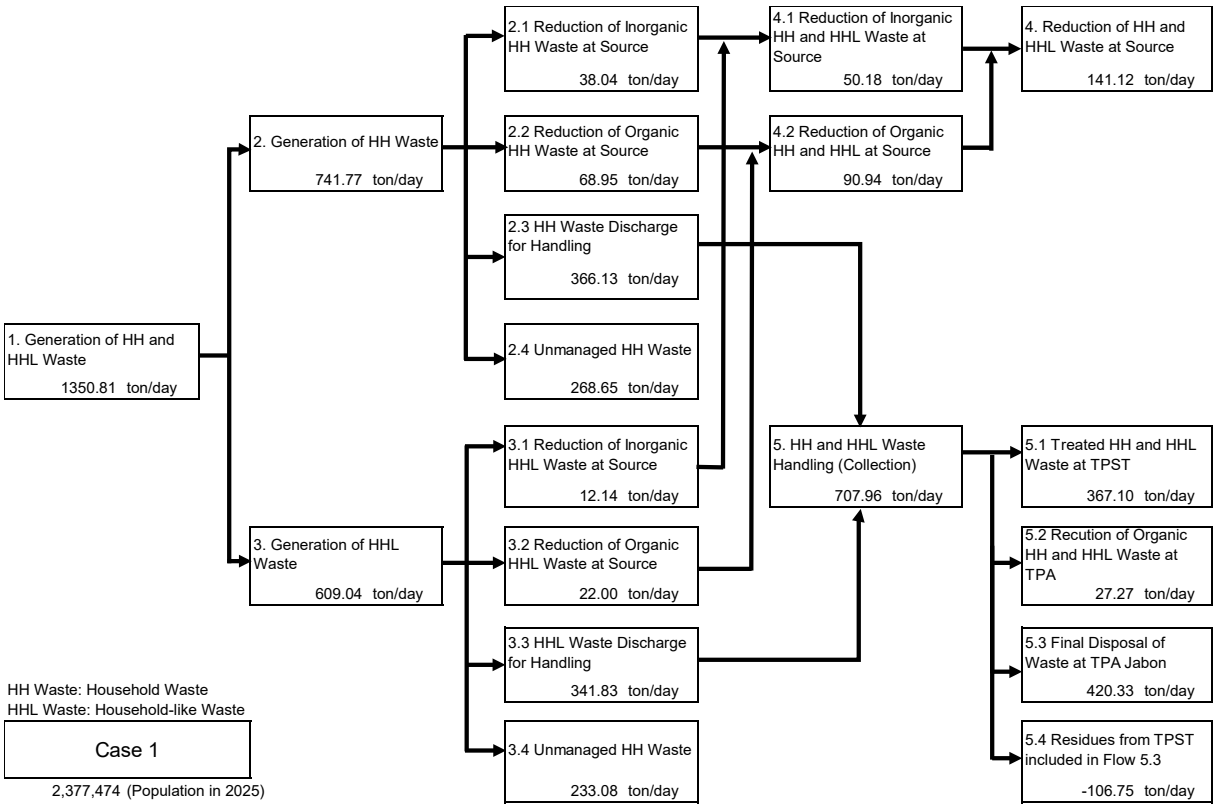


図 2-14 シドアルジョ県の将来のごみフロー (ケース 1)

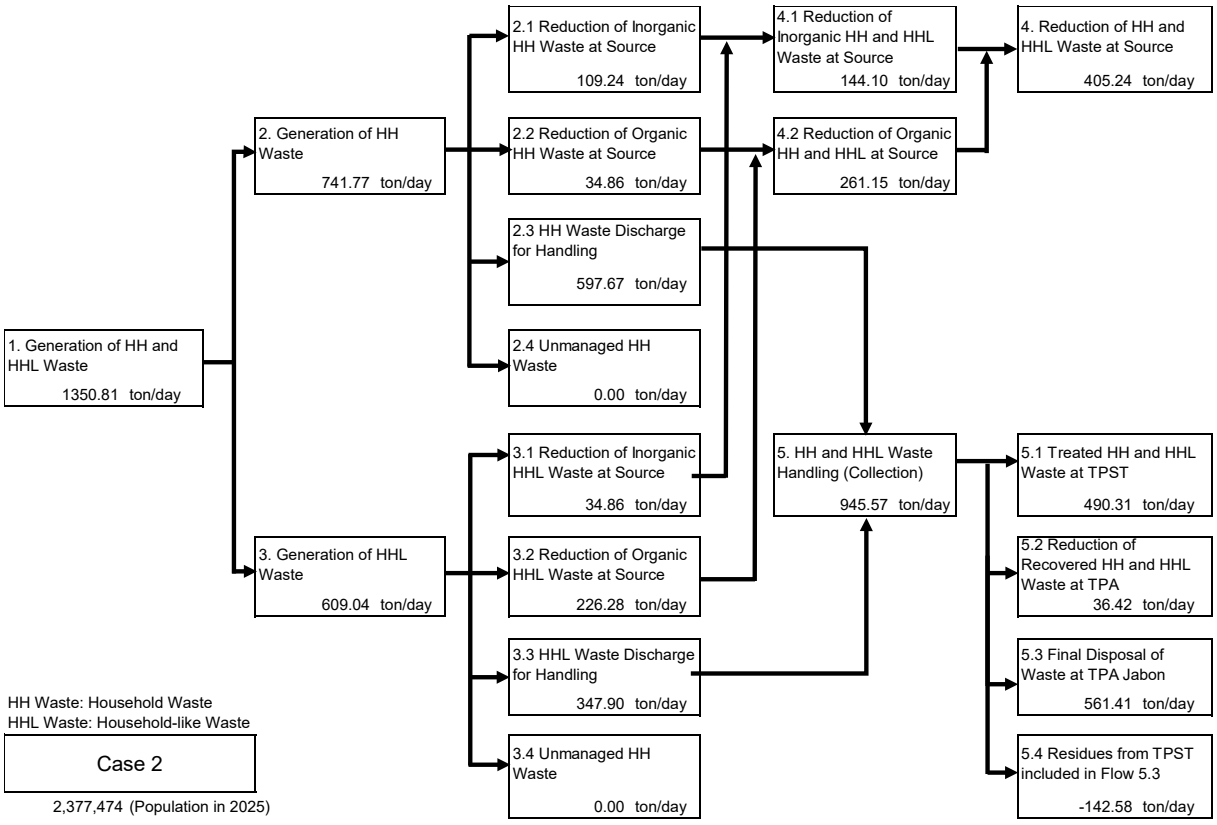


図 2-15 シドアルジョ県の将来のごみフロー (ケース 2)

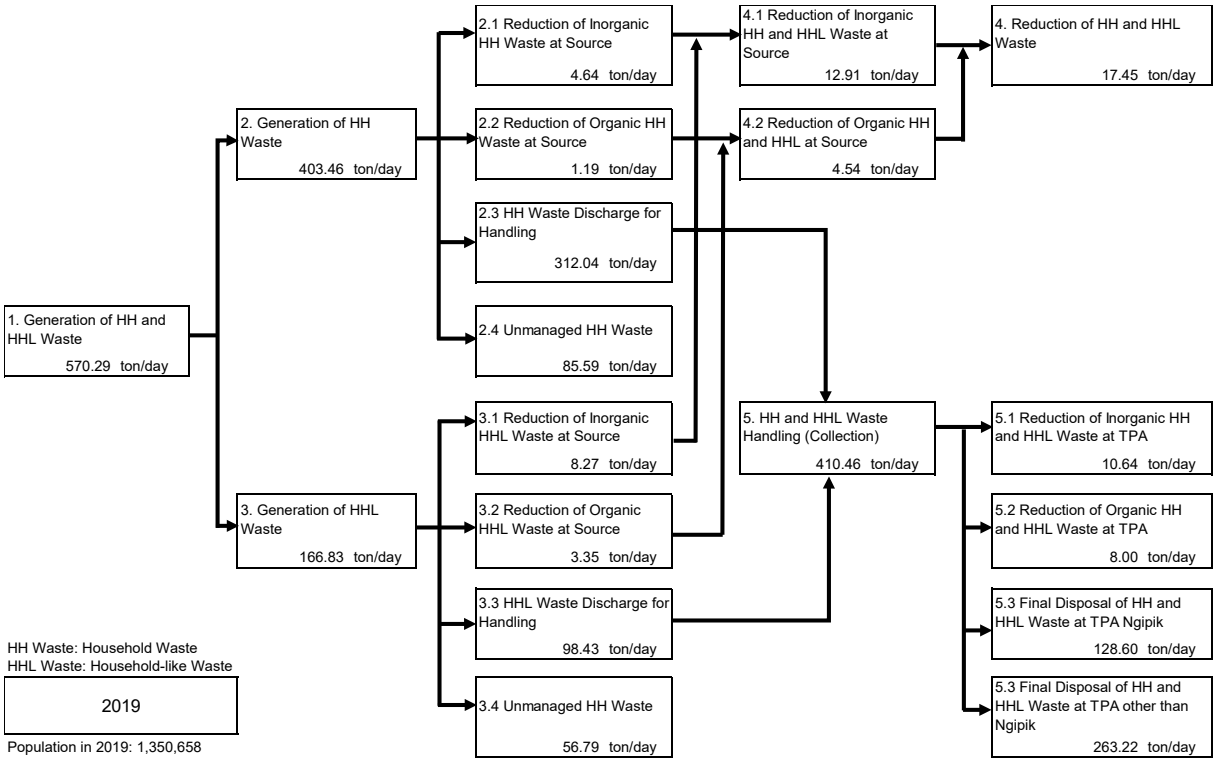


図 2-16 グレシック県の現在のごみフロー

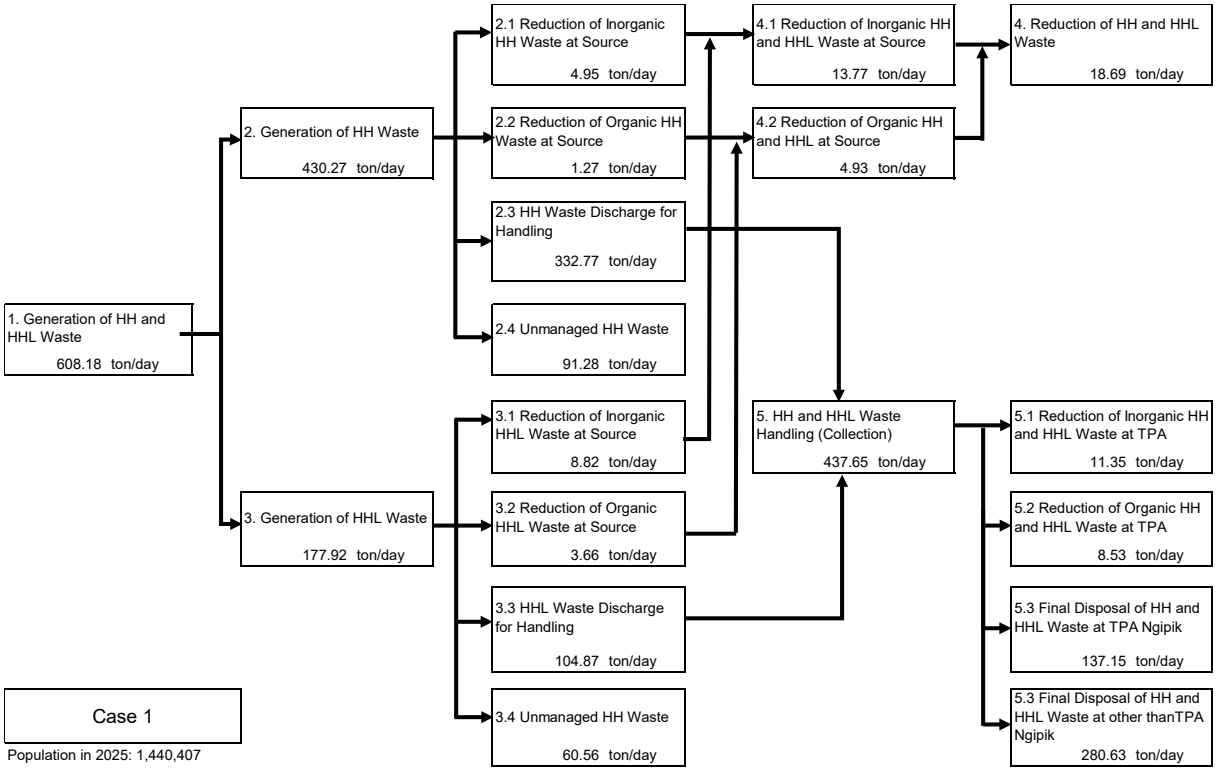


図 2-17 グレシック県の将来のごみフロー (ケース 1)

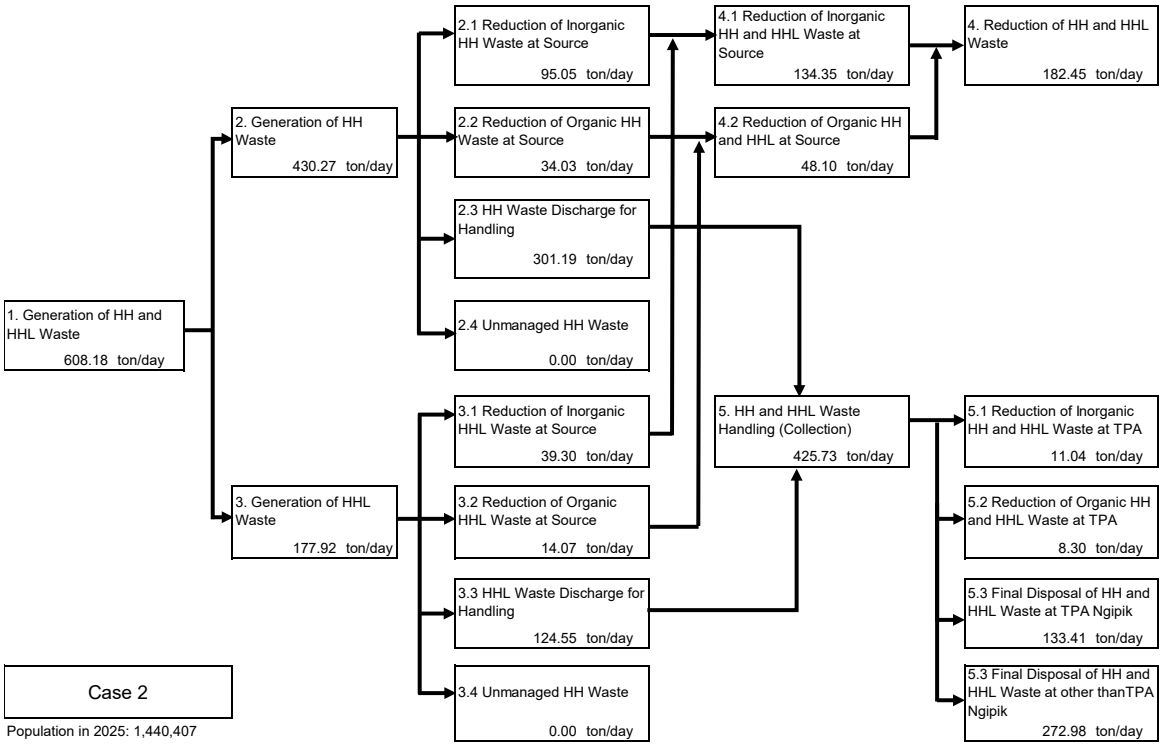


図 2-18 グレシック県の将来のごみフロー (ケース 2)

B.6 廃棄物処理に係る問題点、課題の抽出及び改善計画の立案

B.6.1. 廃棄物処理に係る課題の抽出

インドネシア政府は、100-0-100 と呼ばれるプログラムの実現を推進してきた。これは、飲料水への 100%の普遍的なアクセス、スラム地域の撲滅（0%）、適切な衛生設備への 100%のアクセスを指し、最後の点は廃棄物管理問題も含むものである。

廃棄物管理方針は、2017 年の大統領令第 97 号による家庭ごみと家庭類似ごみの取り扱いに関する国家政策と戦略（Jakstranas、末尾の nas は「国の」の意）に、さらに明確に規定された。廃棄物削減目標は 30%、廃棄物処理目標は 70%と定められており、いずれも 2025 年までに全自治体で達成するとの目標となっている。2008 年の廃棄物管理法第 18 号の廃棄物管理に関する用語の定義と使い方から、Jakstranas ではまず、家庭やコミュニティなどの廃棄物発生源が廃棄物の発生を制限し、廃棄物を再利用し、あるいはリサイクルすることにより廃棄物の 30%を管理し、次に地方自治体が残りの廃棄物を収集して処理する必要があると解釈できる。

そのため、全国の自治体が作成する廃棄物管理方針である Jakstrada（末尾の da は「地方の」の意）では、おしなべて削減 30%、処理 70%を目標としている。それらをどう達成するかは、すべての自治体、そしてプロジェクト対象地域の自治体にとっても例外なく、最優先の課題である。

こうした状況において廃棄物の広域管理を考えると、中心となるべき論点は、家庭や地域社会の参加によって発生源の周辺で行われる 30%の削減目標の達成ではなく、70%の処理目標の達成に対して広域処理がいかに貢献できるかという点にある。

次の表は、各自治体の Jakstrada 達成報告書に記載されている廃棄物処理率と、廃棄物フロー分析の中で短期専門家チームによって計算された廃棄物処理率を示している。一部の自治体では 2

つの数字がかなり近いが、そうでない自治体も見られる。また、自治体の中の具体的な地域事情が反映されていない自治体全体の平均値であるため、必ずしも廃棄物処理の状況を代表的に表せているわけではない。

表 2-9 ごみフロー分析と Jakstrada 達成報告書に記載の廃棄物処理率

自治体	モジョケルト県		モジョケルト市		バンカラン県	
情報源	ごみフロー分析	Jakstrada 達成報告書	ごみフロー分析	Jakstrada 達成報告書	ごみフロー分析	Jakstrada 達成報告書
処理率（%）	5.3	4.23	79.4	71.4	39.0	18.65
自治体	ラモンガン県		グレシック県		シドアルジョ県	
情報源	ごみフロー分析	Jakstrada 達成報告書	ごみフロー分析	Jakstrada 達成報告書	ごみフロー分析	Jakstrada 達成報告書
処理率（%）	62.9	73.05	72.0	52.77	52.41	54.16

廃棄物処理の状況をさらによく理解するために、短期専門家チームは、自治体による廃棄物処理の出発点ともいえる TPS（廃棄物一時保管場所）の位置に注目して分析を試みた。

以下は、TPS の場所を示すプロジェクト対象地域の地図である。本図が明確に示しているように、TPS の場所は都市化した地域とよく呼応している。これは、効率的な廃棄物収集のためにできるだけ多くの人々にサービスを提供するよう、TPS が配置されていることを意味する。しかし、換言すれば、家庭ごみと家庭類似ごみの管理に関する 2012 年の政府規則 No.81 が TPS の要件の 1 つを「市民にとっての良好なアクセス」としているにもかかわらず、都市部以外の人々は最も近い TPS までかなりの遠距離を移動する必要があるということでもある。

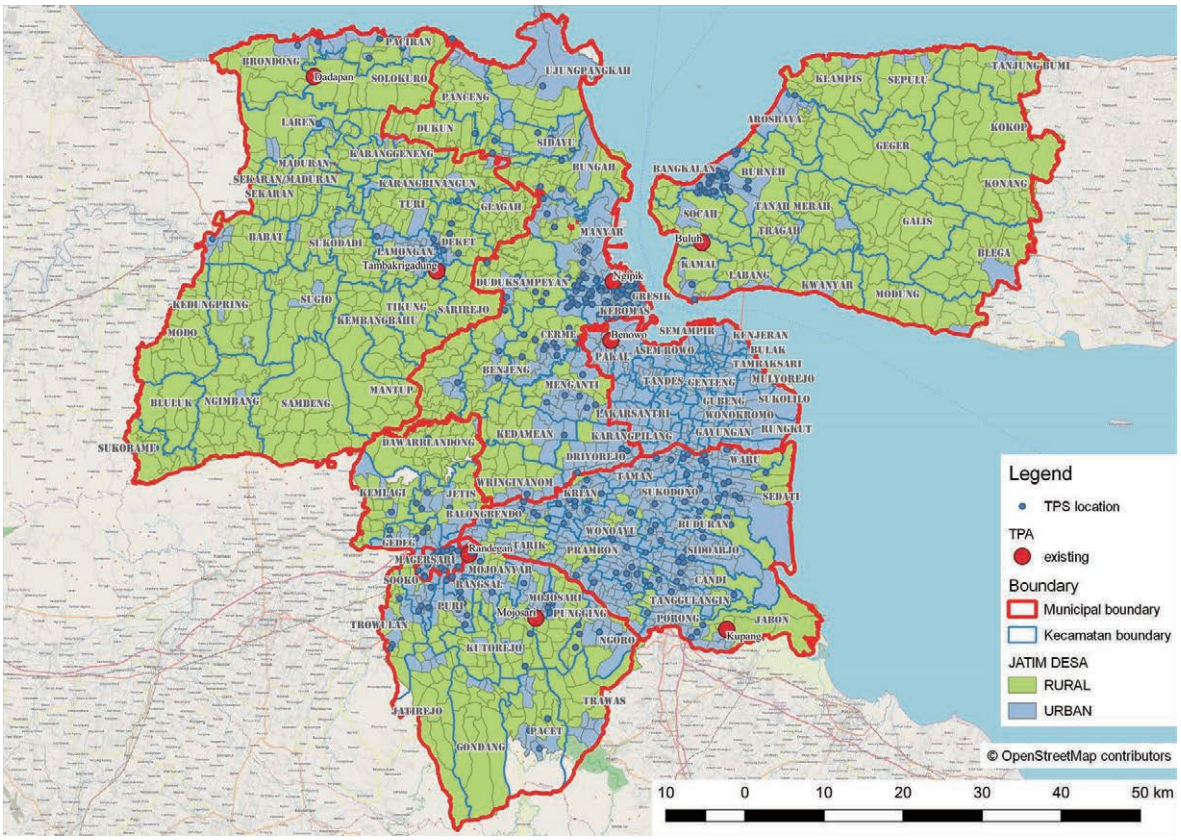


図 2-19 TPS 位置図

さらに、この TPS の偏在は、偏った廃棄物収集率を招く可能性がある。短期専門家チームは、住民意識調査（POS）から得られたデータを利用してこの点を検討した。

POS の質問票では、リサイクルまたは再利用されていない廃棄物の管理のために TPS を使用するかについて尋ねている。また、回答者の居住地の場所も確認した。これらの情報をもとに、TPS の利用状況と住宅から最寄りの TPS までの距離との関係を、表 2-10 に示すように分析した。

表 2-10 TPS を利用する人口の比率と TPS までの距離

TPS からの距離	**0-1 km**	**1-2 km**	**2-3 km**
グレシック県	88.6 %	45.5 %	57.1 %
シドアルジョ県	90.1 %	80.9 %	63.2 %
TPS からの距離	**0-1 km**	**1-2 km**	**2-5 km**
モジョケルト市*	91.7 %	-	-
モジョケルト県	22.1 %	38.3 %	17.9 %
ラモンガン県	74.7 %	62.3 %	37.9 %
バンカラン県	32.2 %	7.7 %	0.0 %

*モジョケルト市には TPS が比較的密に存在し、TPS から 1 km 以上離れている POS の回答者がいなかった。

行政による廃棄物の収集サービスは TPS に一時保管された廃棄物に対して提供されるため、TPS を使用する世帯の割合は、ごみ処理率、あるいはごみ収集率とみなすことができる。この率を図 2-20 に示す 6 つの自治体のすべての TPS に適用することにより、ごみ収集サービスを利用している人口とごみ処理率（=ごみ収集率）は次のように推計される。

表 2-11 各自治体のごみ収集サービスを利用する人口とごみ処理率

	2019 年の人口	ごみ収集サービスを利用する人口	ごみ処理率（ごみ収集率）
モジョケルト市	143,377	124,087	86.5%
モジョケルト県	1,136,259	207,485	18.3%
ラモンガン県	1,404,679	315,496	22.5%
グレシック県	1,335,698	617,267	46.2%
シドアルジョ県	2,140,100	1,689,126	78.9%
バンカラン県	1,071,199	38,266	3.6%

ごみ収集率は、自治体レベルではなく自治体の下の郡のレベルでも算出することができ、その結果は B.7 節において利用する。

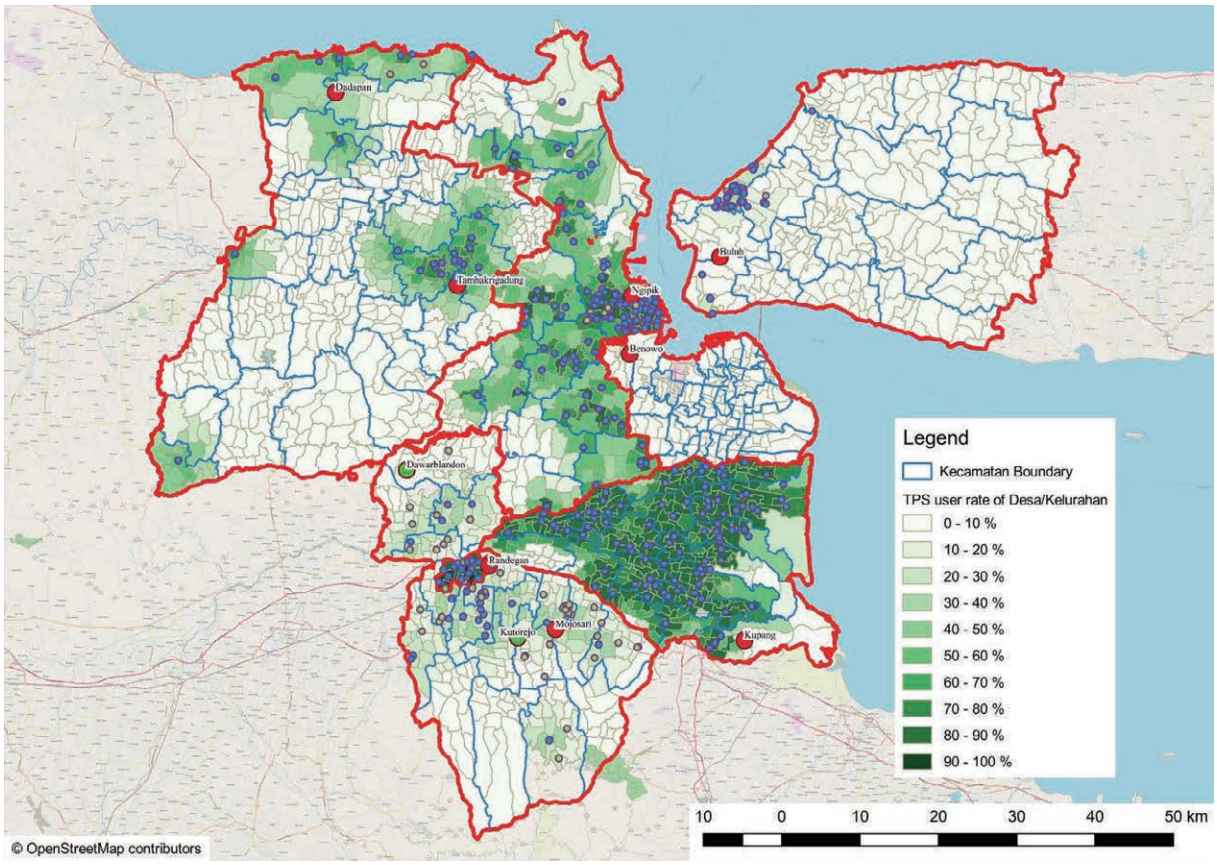


図 2-20 郡ごとのごみ処理率（ごみ収集率）

処理率 70%を達成するには、上図で色が薄い郡における廃棄物管理を改善する必要がある。

現在の最終処分場の残余年数分析の結果（B.3.1 節参照）と合わせてみると、プロジェクト対象地域における主要な課題は以下であると考えられる。

- ごみ収集率の低いエリアにおける廃棄物処理の改善
- モジョケルト市のための廃棄物処分容量の確保

B.6.2. 改善計画の立案

上記の広域処理によって対処すべきと考えられる課題、および広域処理の最終処分施設の立地候補を考慮すると、廃棄物処理率の低い地域と最終処分場の残余年数の少ない地域に役立つ広域廃棄物管理システム地域 SWM システムとしての対策が提案される。

広域廃棄物管理施設を候補地に立地することを想定して広域廃棄物管理システムを計画すると、廃棄物処理率の低い地域の一部において廃棄物処理の改善を見込むことができる。広域廃棄物管理がもたらす効果は、20km という距離を過度の財政的費用を伴わずに廃棄物を運搬できる経験的目安として考えると[5]、以下の表のように示すことができる。

[5] 15-20kmという運搬距離は、中継輸送導入の際の条件の一つと考えられている。これは、20kmまでの輸送は自治体に過度な財務負担を与えないであろう目安になることを示唆している。参考文献として以下が挙げられる。「廃棄物ハンドブック」廃棄物学会、1997年; “SOLID WASTES, Engineering Principles and Management Issues, McGRAW-HILL Book Company”; 「開発途上国における廃棄物管理改善技術協力のあり方に係る調査報告書」JICA、2007年。

表 2-12 広域廃棄物処理システムの提案とその効果

	北部システム	中部システム	南部システム
広域施設の候補地	Dadapan	Dawarblandong	Kutorejo
開発の効果	• 処分場での衛生的な運営 • 次におけるごみ処理率の改善 - ラモンガン北部 - グレシック北部	• モジョケルト市の最終処分地の確保 • 次におけるごみ処理率の改善 - モジョケルト県北部 - シドアルジョ西部 - ラモンガン南部 - グレシック西部と南部	• モジョケルト市の最終処分地の確保 • 次におけるごみ処理率の改善 - モジョケルト県 - シドアルジョ西部 - グレシック南部

上記の対策案をより効果的なものとするため、付帯施設をさらに提案すると、広域処理システムがより広範な地域の人口をカバーすることができる。具体的には、各システムに対して次のような付帯施設が考えうる。

- 北部システムのためのグレシック県の北部における中継基地（Transfer Station, TS）
- 中部システムのための現在の TPA Randegan における廃棄物発電（Waste to Energy, WtE)施設
- 南部システムのための現在の TPA Randegan における廃棄物発電

以上をまとめると、広域廃棄物管理システムとして合計 6 つのオプションが考えられる。

表 2-13 広域廃棄物管理システムのオプションの提案

	北部システム	中部システム	南部システム
オプション 1: 最終処分場（TPA）中心のシステム	N-1 • Dadapan での TPA	C-1 • Dawarblandong での TPA	S-1 • Kutorejo での TPA
オプション 2: 中継基地や廃棄物発電を活用したシステム	N-2 • グレシック県北部の TS • Dadapan での TPA	C-2 • Randegan での WtE • Dawarblandong での TPA	S-2 • Randegan での WtE • Kutorejo での TPA
ホストとなる自治体	ラモンガン県	モジョケルト県	モジョケルト県
利用者となりうる自治体	グレシック県	モジョケルト市 グレシック県 ラモンガン県 シドアルジョ県	モジョケルト市 グレシック県 ラモンガン県 シドアルジョ県

B.7 廃棄物広域管理地域（優先自治体）の設定

提案された改善策を基に、広域廃棄物管理システムの対象範囲を次のクライテリアにより設定した。

- 郡単位でエリアを設定する。
- 次の条件を満たす郡を対象地域に含める。
  - 新規施設から 20km 以内。
  - 既存の施設よりも新規施設の方が近くなる場合（ただし残余年数の乏しい TPA Randegan を有するモジョケルト県の場合を除く）

次のページより、広域廃棄物管理システムの対象範囲及びその他の関連した分析結果を、北部システム、中部システム、南部システムの順に示す。各システムについて、それぞれ 2 つのオプションの対象範囲を示す 2 つの図を提示し、続いての表には、対象範囲内の郡から広域管理施設に運搬される廃棄物の量を示す。廃棄物の運搬量は、現在の廃棄物管理状況に基づいて、（i）人口、（ii）廃棄物収集率（%、図 2-20）、および（iii）廃棄物最終処分率（g /人/日、TPA での廃棄物最終処分量を廃棄物収集サービスの利用人口（表 2-11）で割ったもの）を掛けて算出されたものである。

さらに、広域廃棄物管理システムによる経済的な便益把握の一つの指標として、現在および広域廃棄物管理システムが実施されていると仮定した場合における、廃棄物量（トン）と距離（キロメートル）の積を計算したもの（単位：トンキロ）を示した。計算の便宜上、WtE から TPA への廃棄物輸送には 1/10 の係数を、中継基地から TPA への廃棄物輸送には 1/3 の係数を掛けている。

なお、図 2-21 から図 2-26 に示している広域システムの対象エリアは、上記のクライテリアで設定したものであるが、実際の自治体の収集サービスは郡単位に行われているわけではない。3 つのシステム案には変わりはないが、それぞれが対象とするエリアは、収集サービスの起点である TPS の配置、道路の状況、ごみの収集量などを次期フェーズでさらに調査した後、最終的に設定される。

(1) 北部システム

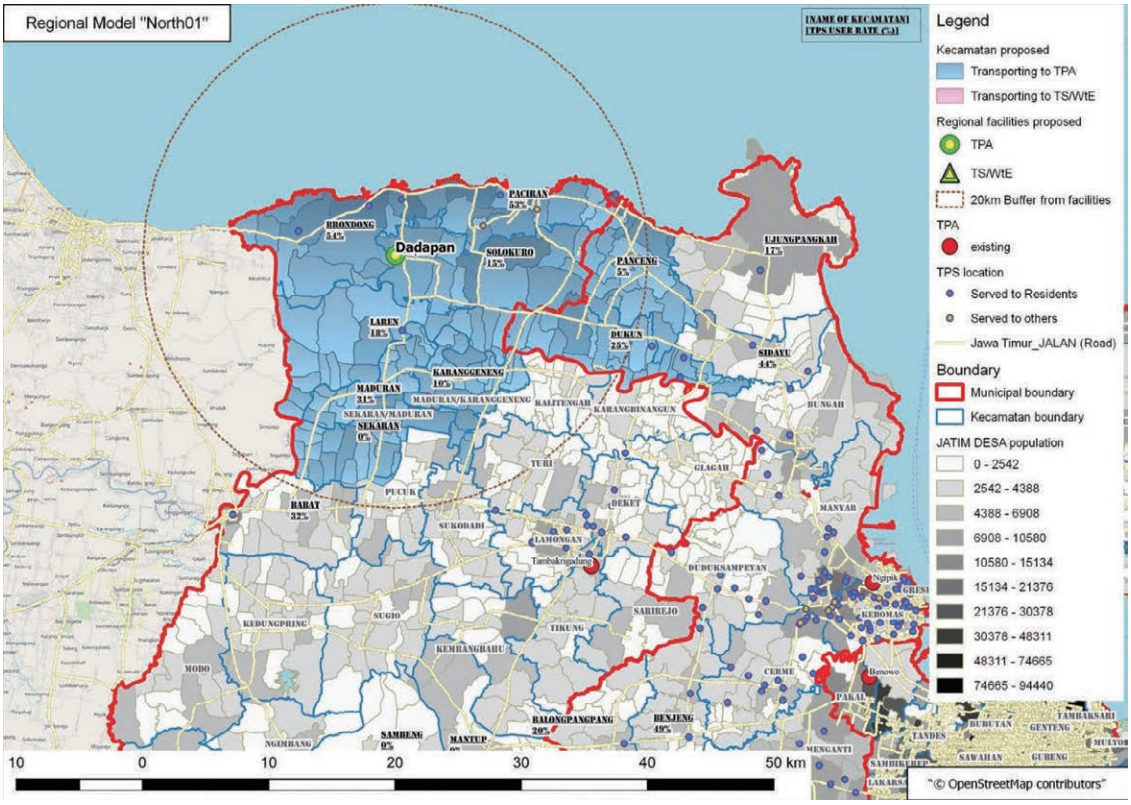


図 2-21 北部システム・オプション1の設定エリア (N-1)

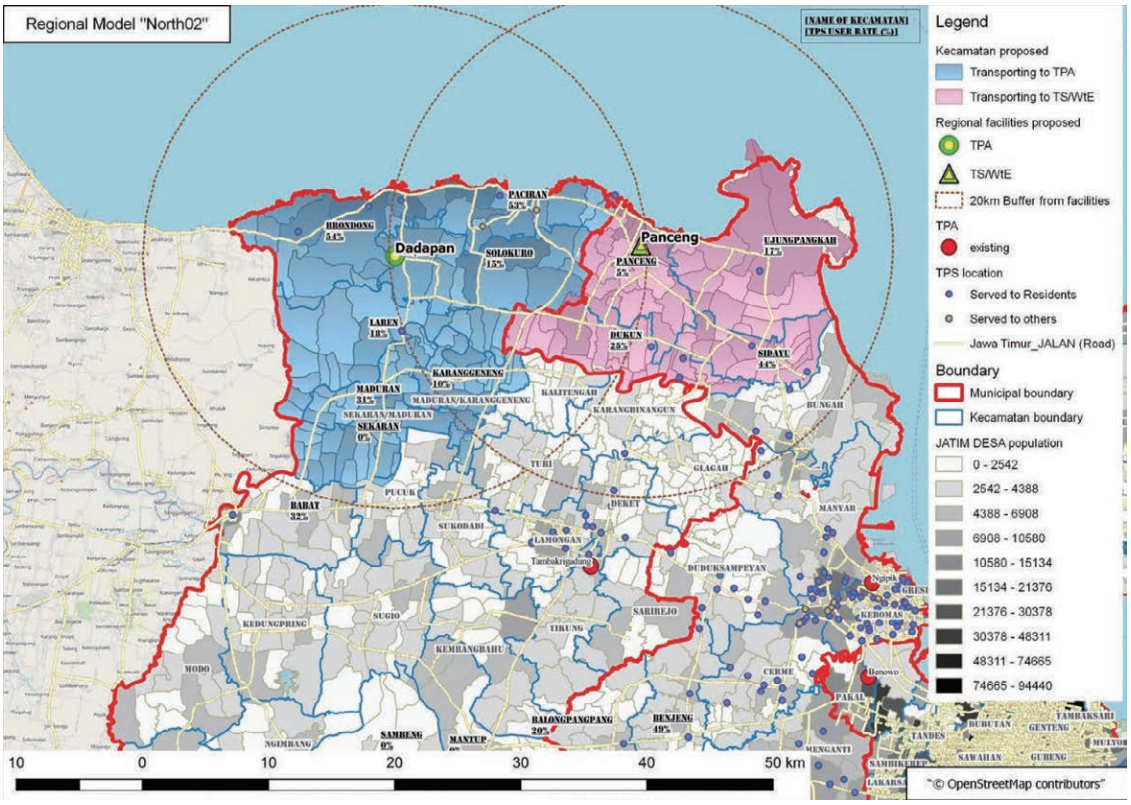
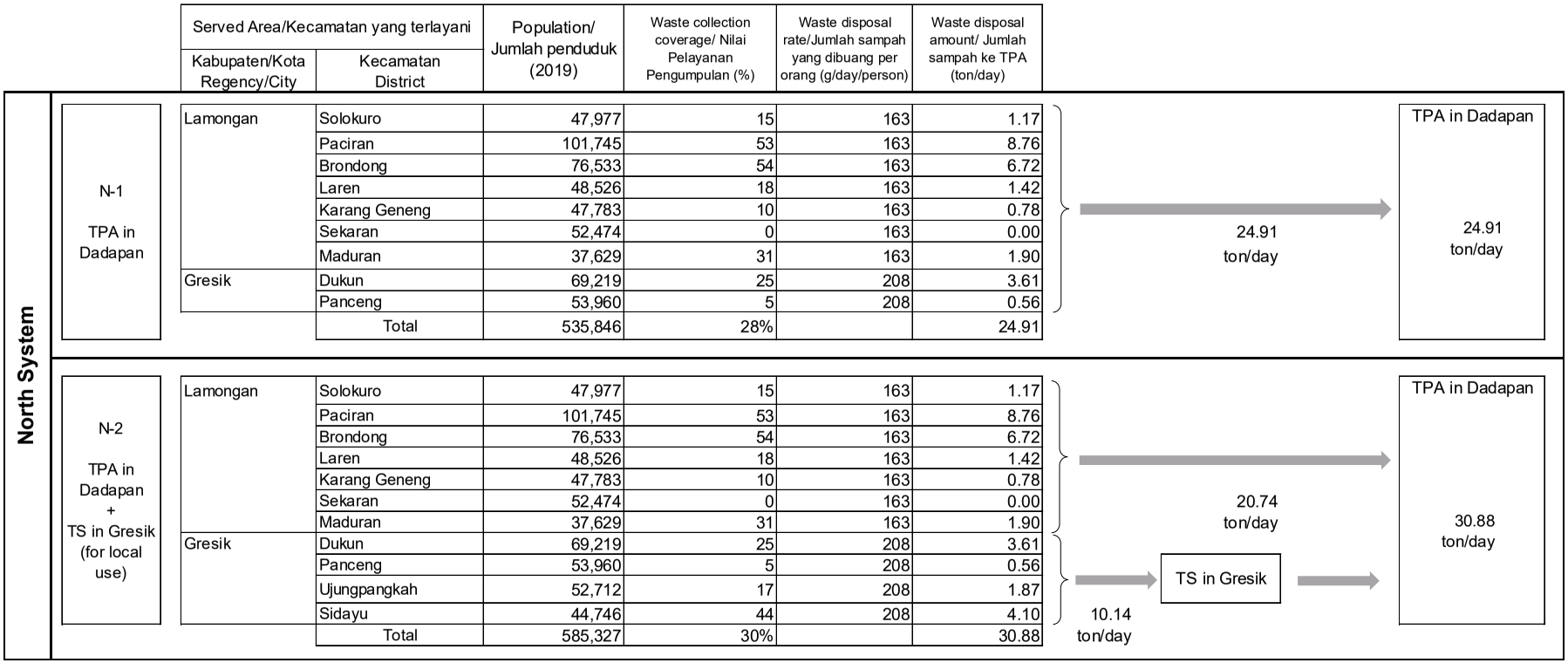


図 2-22 北部システム・オプション2の設定エリア (N-2)



	Served Area/Kecamatan yang terlayani		Population/ Jumlah penduduk (2019)	Waste collection coverage/ Nilai Pelayanan Pengumpulan (%)	Waste disposal rate/Jumlah sampah yang dibuang per orang (g/day/person)	Waste disposal amount/ Jumlah sampah ke TPA (ton/day)
	Kabupaten/Kota Regency/City	Kecamatan District				
N-1 TPA in Dadapan	Lamongan	Solokuro	47,977	15	163	1.17
		Paciran	101,745	53	163	8.76
		Brondong	76,533	54	163	6.72
		Laren	48,526	18	163	1.42
		Karang Geneng	47,783	10	163	0.78
		Sekaran	52,474	0	163	0.00
		Maduran	37,629	31	163	1.90
	Gresik	Dukun	69,219	25	208	3.61
		Panceng	53,960	5	208	0.56
		Total	535,846	28%		24.91
N-2 TPA in Dadapan + TS in Gresik (for local use)	Lamongan	Solokuro	47,977	15	163	1.17
		Paciran	101,745	53	163	8.76
		Brondong	76,533	54	163	6.72
		Laren	48,526	18	163	1.42
		Karang Geneng	47,783	10	163	0.78
		Sekaran	52,474	0	163	0.00
		Maduran	37,629	31	163	1.90
	Gresik	Dukun	69,219	25	208	3.61
		Panceng	53,960	5	208	0.56
		Ujungpangkah	52,712	17	208	1.87
		Sidayu	44,746	44	208	4.10
		Total	585,327	30%		30.88

表 2-14 北部システムの廃棄物量

	Served Area/Kecamatan yang terlayani		Population/ Jumlah penduduk (2019)	Waste disposal amount/ Jumlah sampah ke TPA (ton/day)	A. Current transport distance/ Jarak ke TPA eksisting (km)	Transport distance in case of Regional System/ Jarak transportasi dalam hal Sistem Regional (km)			Transport savings/ penghematan biaya transport (km) A-D	Transport savings (%) A-D
	Kabupaten/ Kota	Kecamatan				B. Direct Transport to/ Transportasi Langsung ke TPA/TS/WtE	C. Transport from TS/WtE to TPA/ Dari TS/WtE ke TPA	D. Overall/ Jumlah (TS: B+C/3 WtE: B+C/10)		
North System										
N-1 TPA in Dadapan	Lamongan	Solokuro	47,882	1.17	14	14		14	0	0.0%
		Paciran	101,543	8.76	14	14		14	0	0.0%
		Brondong	76,381	6.72	15	15		15	0	0.0%
		Laren	48,429	1.42	6	6		6	0	0.0%
		Karang Geneng	47,688	0.78	6	6		6	0	0.0%
		Sekaran	52,370	0.00	6	6		6	0	0.0%
		Maduran	37,554	1.90	6	6		6	0	0.0%
	Gresik	Dukun	68,480	3.61	29	26		26	3	10.3%
		Panceng	53,384	0.56	31	24		24	7	22.6%
		Total	533,711	24.91	386.4 ton-km			371.6 ton-km	14.8 ton-km	3.8%
N-2 TPA in Dadapan + TS in Gresik (for local use)	Lamongan	Solokuro	47,882	1.17	14	14		14	0	0.0%
		Paciran	101,543	8.76	14	14		14	0	0.0%
		Brondong	76,381	6.72	15	15		15	0	0.0%
		Laren	48,429	1.42	6	6		6	0	0.0%
		Karang Geneng	47,688	0.78	6	6		6	0	0.0%
		Sekaran	52,370	0.00	6	6		6	0	0.0%
		Maduran	37,554	1.90	6	6		6	0	0.0%
	Gresik	Dukun	68,480	3.61	29	16	25	24.3	4.7	16.1%
		Panceng	53,384	0.56	31	14	25	22.3	8.7	28.0%
		Ujungpangkah	52,150	1.87	30	13	25	21.3	8.7	28.9%
		Sidayu	44,269	4.10	22	13	25	21.3	0.7	3.0%
		Total	582,248	30.88	532.6 ton-km			492.0 ton-km	40.6 ton-km	7.6%

表 2-15 北部システムのトン・キロベースの便益

(2) 中部システム

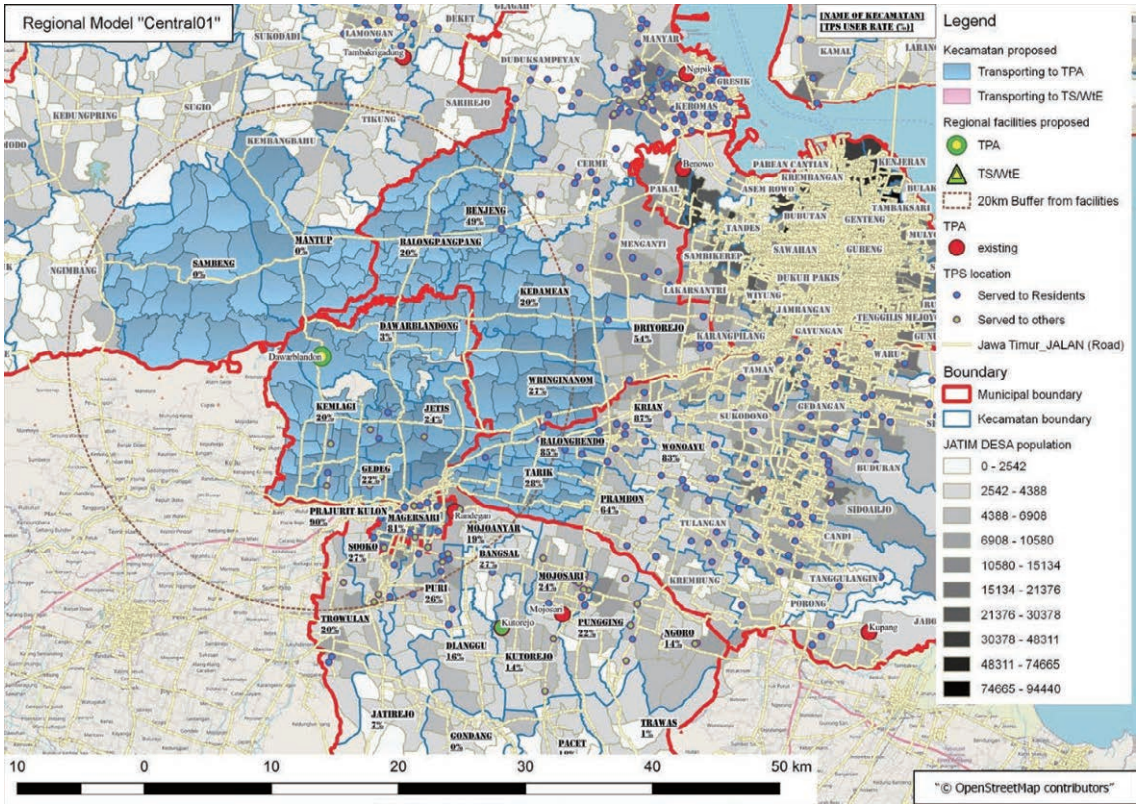


図 2-23 中部システム・オプション1の設定エリア (C-1)

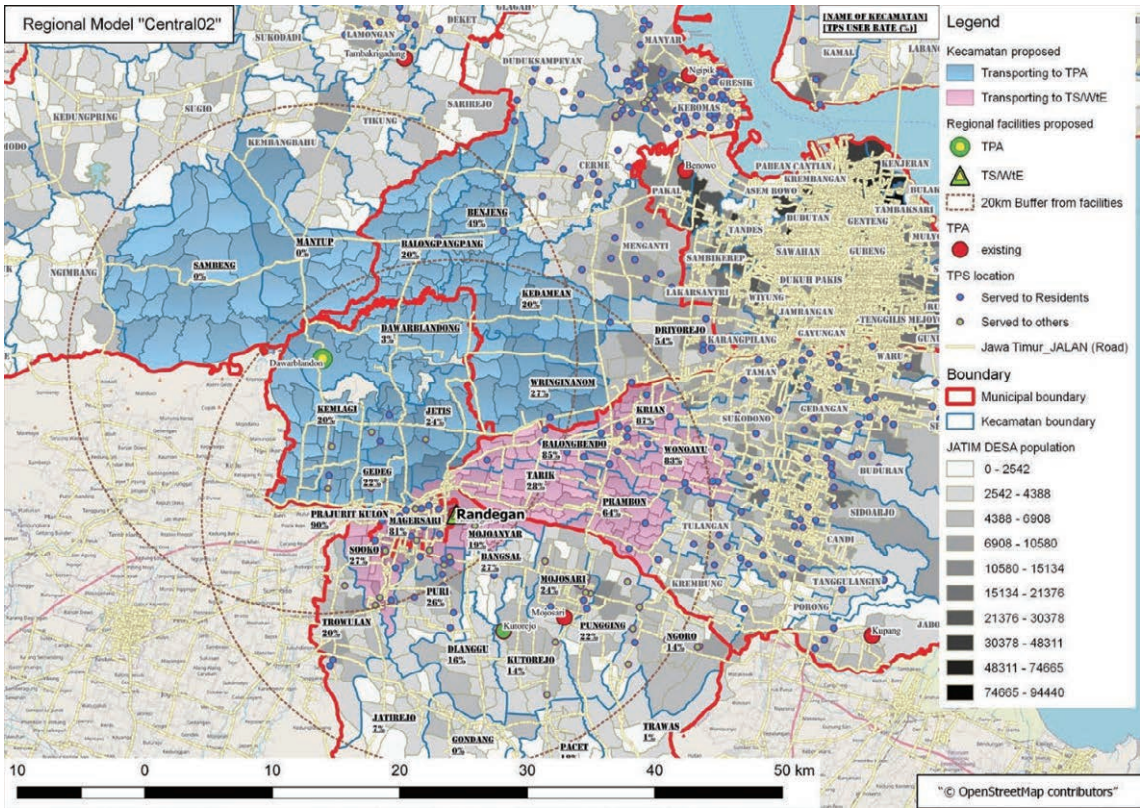
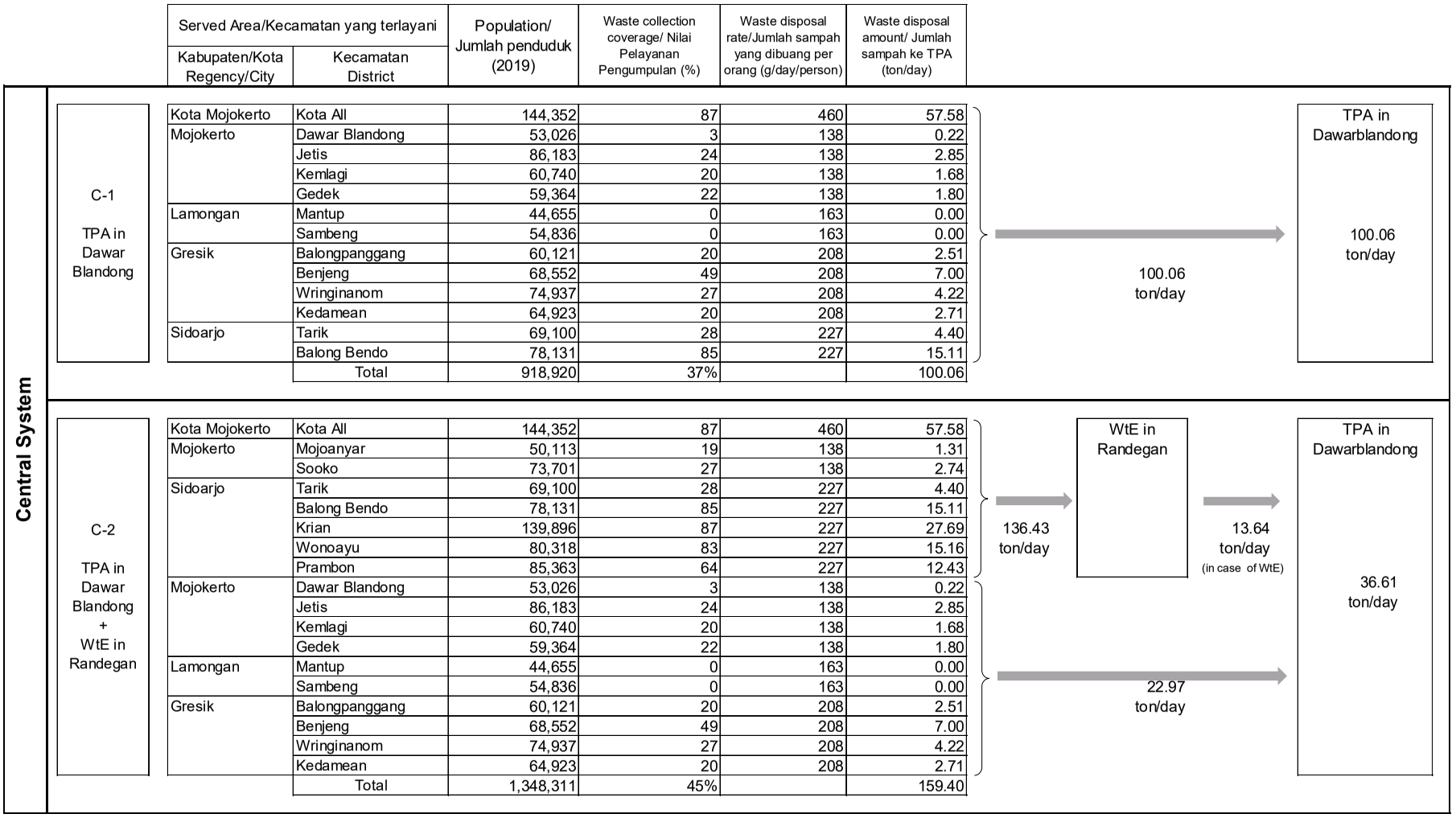


図 2-24 中部システム・オプション2の設定エリア (C-2)



Served Area/Kecamatan yang terlayani		Population/ Jumlah penduduk (2019)	Waste collection coverage/ Nilai Pelayanan Pengumpulan (%)	Waste disposal rate/Jumlah sampah yang dibuang per orang (g/day/person)	Waste disposal amount/ Jumlah sampah ke TPA (ton/day)
Kabupaten/Kota Regency/City	Kecamatan District				
Kota Mojokerto	Kota All	144,352	87	460	57.58
Mojokerto	Dawar Blandong	53,026	3	138	0.22
	Jetis	86,183	24	138	2.85
	Kemlagi	60,740	20	138	1.68
	Gedek	59,364	22	138	1.80
Lamongan	Mantup	44,655	0	163	0.00
	Sambeng	54,836	0	163	0.00
Gresik	Balongpanggang	60,121	20	208	2.51
	Benjeng	68,552	49	208	7.00
	Wringinanom	74,937	27	208	4.22
	Kedamean	64,923	20	208	2.71
Sidoarjo	Tarik	69,100	28	227	4.40
	Balong Bendo	78,131	85	227	15.11
	Total	918,920	37%		100.06
Kota Mojokerto	Kota All	144,352	87	460	57.58
Mojokerto	Mojoanyar	50,113	19	138	1.31
	Sooko	73,701	27	138	2.74
Sidoarjo	Tarik	69,100	28	227	4.40
	Balong Bendo	78,131	85	227	15.11
	Krian	139,896	87	227	27.69
	Wonoayu	80,318	83	227	15.16
	Prambon	85,363	64	227	12.43
Mojokerto	Dawar Blandong	53,026	3	138	0.22
	Jetis	86,183	24	138	2.85
	Kemlagi	60,740	20	138	1.68
	Gedek	59,364	22	138	1.80
Lamongan	Mantup	44,655	0	163	0.00
	Sambeng	54,836	0	163	0.00
Gresik	Balongpanggang	60,121	20	208	2.51
	Benjeng	68,552	49	208	7.00
	Wringinanom	74,937	27	208	4.22
	Kedamean	64,923	20	208	2.71
	Total	1,348,311	45%		159.40

表 2-16 中部システムの廃棄物量

	Served Area/Kecamatan yang terlayani		Population/ Jumlah penduduk (2019)	Waste disposal amount/ Jumlah sampah ke TPA (ton/day)	A. Current transport distance/ Jarak ke TPA eksisting (km)	Transport distance in case of Regional System/ Jarak transportasi dalam hal Sistem Regional (km)			Transport savings/ penghematan biaya transport (km) A-D	Transport savings (%) A-D
	Kabupaten/ Kota	Kecamatan				B. Direct Transport to/ Transportasi Langsung ke TPA/TS/WtE	C. Transport from TS/WtE to TPA/ Dari TS/WtE ke TPA	D. Overall/ Jumlah (TS: B+C/3 WtE: B+C/10)		
Central System										
C-1 TPA in Dawar Blandong	Kota Mojokerto	Kota All	143,377	57.58	3	18		18	-15	-500.0%
	Mojokerto	Dawar Blandong	52,595	0.22	28	9		9	19	67.9%
		Jetis	85,482	2.85	28	9		9	19	67.9%
		Kemlagi	60,246	1.68	30	8		8	22	73.3%
		Gedek	58,881	1.80	24	13		13	11	45.8%
	Lamongan	Mantup	44,566	0.00	0	0		0	0	-
		Sambeng	54,727	0.00	0	0		0	0	-
	Gresik	Balongpanggang	59,480	2.51	29	16		16	13	44.8%
		Benjeng	67,821	7.00	26	26		26	0	0.0%
		Wringinanom	74,137	4.22	38	20		20	18	47.4%
		Kedamean	64,230	2.71	28	24		24	4	14.3%
	Sidoarjo	Tarik	68,074	4.40	38	23		23	15	39.5%
		Balong Bendo	76,970	15.11	40	38		38	2	5.0%
		Total	910,586	100.06	1614.3 ton-km			2147.5 ton-km	-533.2 ton-km	-33.0%
C-2 TPA in Dawar Blandong + WtE in Randegan	Kota Mojokerto	Kota All	143,377	57.58	3	3	20	5	-2.00	-66.7%
	Mojokerto	Mojoanyar	49,705	1.31	12	5	20	7	5.00	41.7%
		Sooko	73,101	2.74	20	10	20	12	8.00	40.0%
	Sidoarjo	Tarik	68,074	4.40	38	7	20	9	29.00	76.3%
		Balong Bendo	76,970	15.11	40	11	20	13	27.00	67.5%
		Krian	137,818	27.69	32	23	20	25	7.00	21.9%
		Wonoayu	79,125	15.16	24	22	20	24	0.00	0.0%
		Prambon	84,095	12.43	22	20	20	22	0.00	0.0%
	Mojokerto	Dawar Blandong	52,595	0.22	28	9		9	19	67.9%
		Jetis	85,482	2.85	28	9		9	19	67.9%
		Kemlagi	60,246	1.68	30	8		8	22	73.3%
		Gedek	58,881	1.80	24	13		13	11	45.8%
	Lamongan	Mantup	44,566	0.00	0	0		0	0	-
		Sambeng	54,727	0.00	0	0		0	0	-
	Gresik	Balongpanggang	59,480	2.51	29	16		16	13	44.8%
		Benjeng	67,821	7.00	26	26		26	0	0.0%
		Wringinanom	74,137	4.22	38	20		20	18	47.4%
		Kedamean	64,230	2.71	28	24		24	4	14.3%
		Total	1,334,430	159.40	3208.2 ton-km			2331.2 ton-km	876.9 ton-km	27.3%

表 2-17 中部システムのトン・キロベースの便益

(3) 南部システム

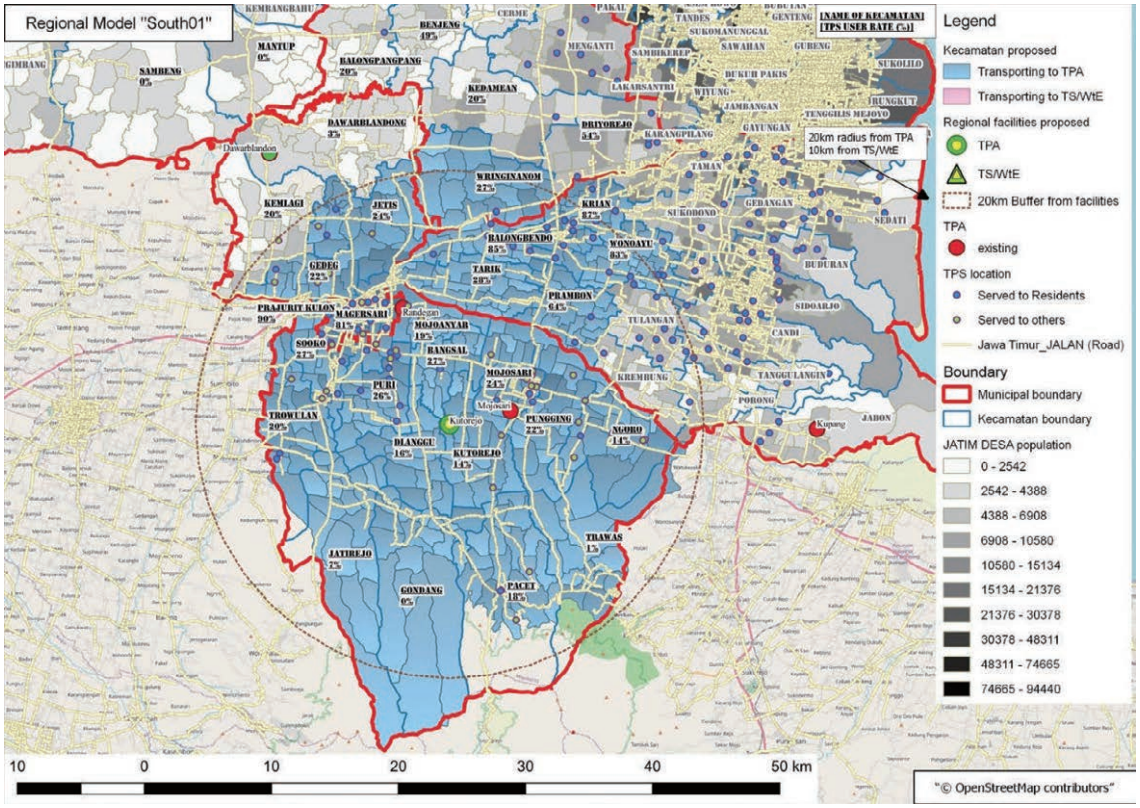


図 2-25 南部システム・オプション1の設定エリア (S-1)

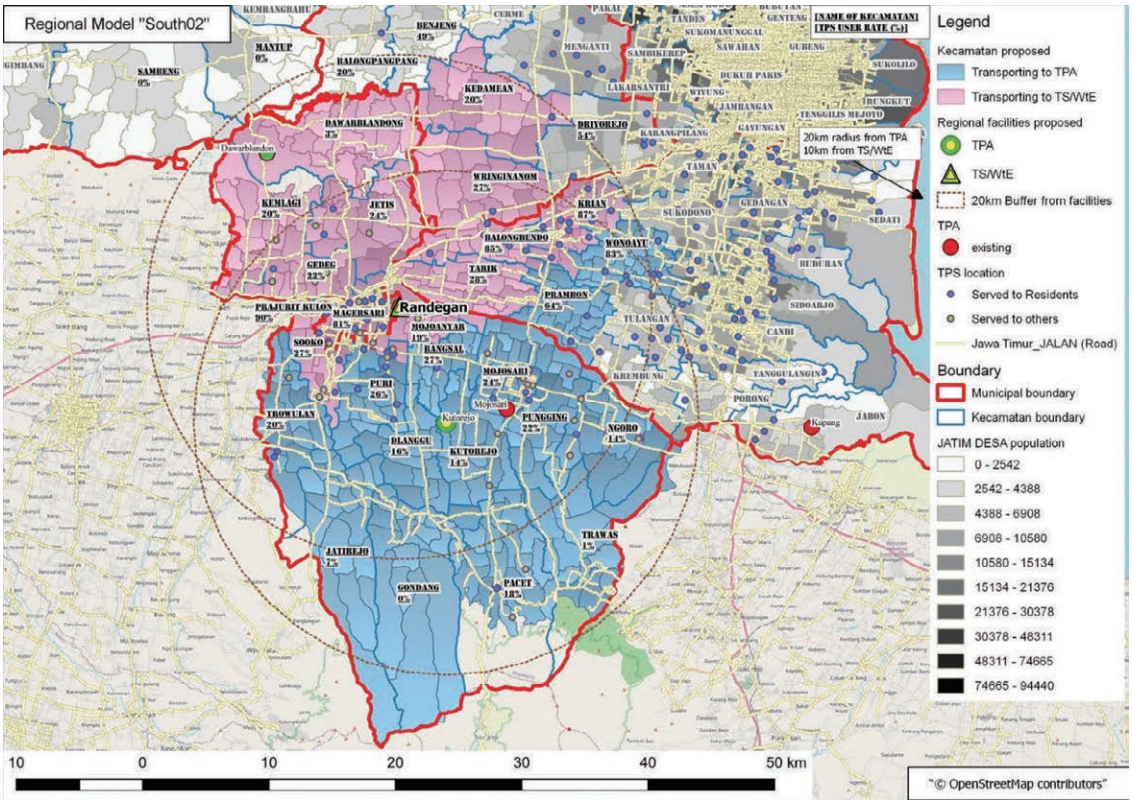


図 2-26 南部システム・オプション2の設定エリア (S-2)

Served Area/Kecamatan yang terlayani		Population/ Jumlah penduduk (2019)	Waste collection coverage/ Nilai Pelayanan Pengumpulan (%)	Waste disposal rate/Jumlah sampah yang dibuang per orang (g/day/person)	Waste disposal amount/ Jumlah sampah ke TPA (ton/day)
Kabupaten/Kota Regency/City	Kecamatan District				
Kota Mojokerto	Kota All	144,352	87	460	57.58
Mojokerto	All exc. Kemlagi & Dawarblandong	1,031,813	17	138	24.09
Gresik	Wringinanom	74,937	27	208	4.22
Sidoarjo	Tarik	69,100	28	227	4.40
	Balong Bendo	78,131	85	227	15.11
	Krian	139,896	87	227	27.69
	Wonoayu	80,318	83	227	15.16
	Prambon	85,363	64	227	12.43
	Total	1,703,910	38%		160.68
Kota Mojokerto	Kota All	144,352	87	460	57.58
Mojokerto	Dawar Blandong	53,026	3	138	0.22
	Jetis	86,183	24	138	2.85
	Kemlagi	60,740	20	138	1.68
	Gedek	59,364	22	138	1.80
	Mojoanyar	50,113	19	138	1.31
	Sooko	73,701	27	138	2.74
Gresik	Wringinanom	74,937	27	208	4.22
	Kedamean	64,923	20	208	2.71
Sidoarjo	Tarik	69,100	28	227	4.40
	Balong Bendo	78,131	85	227	15.11
	Krian	139,896	87	227	27.69
Mojokerto	Other Kecamatans	648,686	11	138	10.22
Sidoarjo	Wonoayu	80,318	83	227	15.16
	Prambon	85,363	64	227	12.43
	Total	1,768,833	36%		160.11

表 2-18 南部システムの廃棄物量

	Served Area/Kecamatan yang terlayani		Population/ Jumlah penduduk (2019)	Waste disposal amount/ Jumlah sampah ke TPA (ton/day)	A. Current transport distance/ Jarak ke TPA eksisting (km)	Transport distance in case of Regional System/ Jarak transportasi dalam hal Sistem Regional (km)			Transport savings/ penghematan biaya transport (km) A-D	Transport savings (%) A-D
	Kabupaten/ Kota	Kecamatan				B. Direct Transport to/ Transportasi Langsung ke TPA/TS/WtE	C. Transport from TS/WtE to TPA/ Dari TS/WtE ke TPA	D. Overall/ Jumlah (TS: B+C/3 WtE: B+C/10)		
South System										
S-1 TPA in Kutorejo	Kota Mojokerto	Kota All	143,377	57.58	3	15		15	-12	-400.0%
	Mojokerto	All exc. Kemlagi & Dawarblandong	1,031,813	24.09	14	11		11	3	21.4%
	Gresik	Wringinanom	74,137	4.22	38	28		28	10	26.3%
	Sidoarjo	Tarik	68,074	4.40	38	22		22	16	42.1%
		Balong Bendo	76,970	15.11	40	27		27	13	32.5%
		Krian	137,818	27.69	32	24		24	8	25.0%
		Wonoayu	79,125	15.16	24	24		24	0	0.0%
		Prambon	84,095	12.43	22	18		18	4	18.2%
		Total	1,695,409	160.68	2965.1 ton-km			3003.6 ton-km	-38.6 ton-km	-1.3%
S-2 TPA in Kutorejo + WtE in Randegan	Kota Mojokerto	Kota All	143,377	57.58	3	3	15	4.5	-1.5	-50.0%
	Mojokerto	Dawar Blandong	52,595	0.22	28	15	15	16.5	11.5	41.1%
		Jetis	85,482	2.85	28	14	15	15.5	12.5	44.6%
		Kemlagi	60,246	1.68	30	14	15	15.5	14.5	48.3%
		Gedek	58,881	1.80	24	14	15	15.5	8.5	35.4%
		Mojoanyar	49,705	1.31	12	5	15	6.5	5.5	45.8%
		Sooko	73,101	2.74	20	10	15	11.5	8.5	42.5%
	Gresik	Wringinanom	74,137	4.22	38	14	15	15.5	22.5	59.2%
		Kedamean	64,230	2.71	28	27	15	28.5	-0.5	-1.8%
	Sidoarjo	Tarik	68,074	4.40	38	7	15	8.5	29.5	77.6%
		Balong Bendo	76,970	15.11	40	11	15	12.5	27.5	68.8%
		Krian	137,818	27.69	32	23	15	24.5	7.5	23.4%
	Mojokerto	Other Kecamatans	651,803	10.22	14	11		11	3.0	21.4%
	Sidoarjo	Wonoayu	79,125	15.16	24	24		24	0.0	0.0%
		Prambon	84,095	12.43	22	18		18	4.0	18.2%
		Total	1,759,639	97.78	3096.6 ton-km			2147.9 ton-km	948.7 ton-km	30.6%

表 2-19 南部システムのトン・キロベースの便益

トンキロベースのコストの減少分は、表 2-20 のようにまとめることができる。この分析では、モジョケルト市のトンキロベースのコストは増加することを示しているが、これは、同市のごみの輸送距離が現在よりも広域処理をしたときに相当に長くなってしまうためである。従って、モジョケルト市にとっての広域処理システムは、経済的なメリットではなく最終処分地の持続的な確保という観点から捉えるべき事項であると言える。

なお、経済的メリットが見込めるその他の自治体でも、以下の点に留意する必要がある。

- このトンキロを用いた分析は廃棄物量と輸送距離のみを考慮したものである。トンキロという指標は、コストを表す形の 1 つに過ぎず、実際の輸送コストは車両の種類や台数、道路状況、人件費などの他の要因の影響を受ける。また、実際のプロジェクトでは、初期投資や施設運営などプロジェクトに含まれる様々なコンポーネントに要するコストを考慮する必要がある。これらの検討は、本プロジェクトの次フェーズで行われる。
- トンキロの算出は、現在の廃棄物管理状況に基づいており、広域システムの設定エリア内で現在収集され既存の最終処分場に運搬されている廃棄物が、広域システムの施設に搬入されることを想定している。一方で、設定エリア内はごみ収集率の低いエリアが多く、Jakstrada の目標である 70%の Handling を目指すには、収集サービスの拡大が求められるが、これに応じたコストの増加については、本調査では勘案されていない。この点も次フェーズにて更なる調査が必要となる。

表 2-20 トンキロベースのコスト減少分のまとめ

	現在のトンキロ	トンキロの減少分*	トンキロ減少率*	トンキロ減少率の内訳
TPA 中心の広域システム				
北部 N-1	386.4	14.8	3.8%	ラモンガン県での減少はゼロ。 グレシック県は 12.1%の減少
中部 C-1	1,614.3	-533.2	-33.0%	モジョケルト市は 500%の増加。 その他の自治体は 22.9%の減少。
南部 S-1	2,965.1	-38.6	-1.3%	モジョケルト市は 400%の増加。 その他の自治体は 23.4%の減少。
中継基地や廃棄物発電を活用したシステム				
北部 N-2	532.6	40.6	7.6%	ラモンガン県での減少はゼロ。 グレシック県は 15.1%の減少。
中部 C-2	3,177.9	846.6	26.6%	モジョケルト市は 66.7%の増加。 その他の自治体は 32.7%の減少。
南部 S-2	3,096.6	948.7	30.6%	モジョケルト市は 50%の増加。 その他の自治体は 35.4%の減少。

*プラスの数値はコストの減少、マイナスの数値はコストの増加を意味する。

B.8　優先自治体間の覚書締結に向けた自治体向け研修の検討と実施

B.2 節で述べた一連の現地調査、問題の分析、広域廃棄物管理システムの提案を含むすべての成果 1 のプロジェクト活動は、その活動プロセスを C/P が明確に理解できるよう、短期専門家チームと協議の機会を持ちながら、そして透明性を確保しながら実施されてきた。短期専門家チームがインドネシアで活動することができなくなった後は、成果 1 のために残った活動はすべて遠隔で行われなければならず、オンライン会議が唯一の相互の接点であった。東ジャワ州以外で広域

廃棄物管理の経験を持つ地域を選択して実施する予定だった研修プログラムも、オンラインでの実施となった。

そのため、2020 年 12 月に、東ジャワ州の C/P とプロジェクト地域の県・市を対象に、インターネットベースのセミナー（ウェビナー）を開催した。その目的は、以下の通りであった。

1. 東ジャワ州政府の関係者、プロジェクト対象地域の県・市および本プロジェクトに関連する他の機関の間で、広域廃棄物管理の一般的な概念を共有する。
2. 実際に実施された広域廃棄物管理の実践から得られた教訓を理解する。
3. 対象地域の県・市が、当プロジェクトの次フェーズ（フェーズ 2）への参加を検討することを促す。

PUPR、内務省、西ジャワ州、南カリマンタン州から発表者を招き、広域廃棄物管理システム開発の制度的および財政的側面と広域システムの実際の運営に関する知見が発表された。

ウェビナーの詳細は、添付資料３に示す。

B.9　B.7 で決めた優先自治体間と東ジャワ州との MOU 締結に向けた作業開始で決めた作業開始

東ジャワ州 C/P と短期専門家チームは、フェーズ 2 へ進むのに必要とされる MOU（覚書）がどうあるべきか、そしてその発行のためにどのような手順をとるべきかについて継続的に協議を続けてきた。そして双方とも、成果 1 の活動のみを行っている現段階のこのプロジェクトに続いて行われる、次のプロジェクト活動への自治体の意欲や参加意志を確認するための文書であり、広域事業の実施に必須の文書でありその実施へのコミットメントを示す KSB や PKS とは異なるという考えが一致した。この認識に立ち、文書は必ずしも関係するすべての自治体によって署名されるものではなく、各自治体が発行する個々の文書でもありうるとの考えに至った。

そのため、東ジャワ州官房局は 6 つの自治体に向けて、プロジェクトのフェーズ 2 に参加する意向を尋ねる書面を作成し、2020 年 12 月 10 日までにそれを発出した。並行して、州の C/P は自治体担当者と緊密に連絡を取り、フェーズ 2 に参加するかどうか、およびどの広域廃棄物管理システムに関心を持っているかに関する意思決定を促した。

東ジャワ州政府への回答で表明された自治体の意志は、現時点で次のとおりである。

表 2-21 フェーズ2に関する自治体の意思

自治体	意思表明手段	フェーズ2に関する意思
バンカラン県	口頭	3つの広域システムへの関心は示していないが、自区内処理の改善に関する支援を望んでいる。
シドアルジョ県	口頭	中部システムに関心がありプロジェクト活動に協力する意志がある。関心表明書は県知事の署名待ち。
モジョケルト県	関心表明書	中部システムに関心がありプロジェクト活動に協力する意志がある。
モジョケルト市	口頭	中部システムに関心がありプロジェクト活動に協力する意志がある。関心表明書は官房局長（municipal secretary）の署名待ち。
ラモンガン県	関心表明書	北部システムに関心がありプロジェクト活動に協力する意志がある。
グレシック県	関心表明書	北部システムと中部システムに関心がありプロジェクト活動に協力する意志がある。

第 3 章　プロジェクトの達成状況

3.1　プロジェクト目標

プロジェクト目標は「スラバヤ広域都市圏においてマスタープランに基づく廃棄物広域管理の取組みが試行される。」である。

現時点では、4 つの成果のうちの成果 1 の活動のみが実施された段階であり、プロジェクト目標の達成について論じるのは時期尚早である。成果１が、本プロジェクトの継続実施、ひいては成果２、成果３、成果４の達成を促進することが期待される。

3.2　成果

成果 1 は「スラバヤ広域都市圏の廃棄物管理の現状を把握・理解する。」である。この成果は、以下の理由から達成されたと考えられる。

- ごみ量とごみ質調査、タイムアンドモーション調査、リサイクル調査、住民意識調査などの調査を実施し、それらの結果を用いて現在および将来の廃棄物フロー図が作成された。
- 最終処分場を調査し、残余年数を推計した。
- 課題の特定対策の提案に基づき、3 つの広域廃棄物管理システムの地域設定が行われた。
- 北部と中部の広域廃棄物管理システムに関し、次期フェーズで活動をしていく意向を示した自治体が 5 つあった。
  北部システム…ラモンガン県とグレシック県が東ジャワ州宛てに関心表明書を送付。
  中部システム…モジョケルト県とグレシック県が東ジャワ州宛て関心表明書を送付。シドアルジョ県とモジョケルト市も口頭では関心のあることが確認済み。

3.3　今後の展望

本報告書執筆時点で、第 2 回 JCC の開催について PUPR と調整中であり、次の事項の合意を目指している。

- R/D が次期フェーズへの移行の条件としていた自治体間の MOU は、東ジャワ州政府宛ての関心表明書で置き換える、あるいは、次期フェーズの実施過程での MOU 署名を目指す。
- 次期フェーズは、次の広域廃棄物管理システムを対象とする。
  - 北部システム（ラモンガン県、グレシック県向け）
  - 中部システム（モジョケルト県、グレシック県、シドアルジョ県、モジョケルト市向け）
- シドアルジョ県、モジョケルト市は関心表明書を提出する必要がある。
- インドネシア側・日本側双方は、次期フェーズの円滑な開始に向け緊密に連携する。

添付資料 1

合同調整委員会議事録（案）

DRAFT

MINUTES OF MEETING
ON
WORK PLAN
OF
TECHNICAL COOPERATION FOR
DEVELOPMENT PLANNING PROJECT ON
REGIONAL SOLID WASTE MANAGEMENT
IN GERBANGKERTOSUSILA AREA

IN THE REPUBLIC OF INDONESIA

3 October 2019

First Joint Coordination Committee

9:00 – 12:00, 3 October 2019

Swiss Bellinn Juanda Hotel, Surabaya, East Java, Indonesia

1. The first Joint Coordination Committee was held on 3 October 2019 at Swiss Bellinn Juanda Hotel, Surabaya, Indonesia, with Mr. Dardjat W., Head of Regional Settlement Infrastructure Agency (hereafter referred to as "Balali"), as a chairperson.

2. The main agenda was the explanation of the work plan prepared by the short-term expert team dispatched by JICA. Its contents was discussed and clarification was made. Each city/regency was requested to accept the field surveys by the JICA's short-term experts, and to facilitate their survey, it was confirmed that Balai or Department of Public Housing; Residential Area and Human Settlements, East Java Province, would send a letter to each city/regency.

3. To further facilitate the project activities, a temporal contact person of each city/regency was nominated during the committee.

4. Details of the discussion is as attached in the appendix.

5. All agreed that once the letter was sent to each city/regency from Balai or Department of Public Housing; Residential Area and Human Settlements, East Java Province, the person nominated as the temporal contact person would be contacted to further determine the schedules of activities described in the work plan.

Appendix. Details of Discussion

Appendix. Details of Discussion

Minute of Meeting	Notulen Rapat
Time, Day and Date	**Waktu, Hari dan Tanggal**
09.00 am - 12.00 am, Thursday/Kamis, October 3rd , 2019	
Place	**Tempat**
Swiss bellinn Juanda Hotel, Surabaya, East Java, Indonesia	
Keynote speaker / Participants	**Narasumber / Peserta**
1. Bureau of Budget Planning and Overseas Cooperation, Ministry of Public Works and Housing (PUPR); 2. Representative Director of Settlement Infrastructure, Directorate General of Human Settlements (PUPR); 3. Representative Director of the Development of Environmental Sanitation (PLP), Directorate General of Human Settlements; 4. Mr. Han Chiba, Deputy Director Of Global Environment Department, JICA headquarters Tokyo; 5. Mr. Kaname Ishiguro, Project Coordinator, JICA Indonesia Office; 6. Ms. Noriko Otsuki, Leader of JICA Expert Team (Short term); 7. Ms. Monika Kristyana, Program Officer, JICA Indonesia Office; 8. Regional Settlement Infrastructure Agency, East Java Province; 9. Development Administration Bureau, Regional Secretary of East Java Province; 10. Development Planning Agency (Bappeda), East Java Province; 11. Department of Public Housing; Residential Area and Human Settlements; East Java Province; 12. Department of environment (DLH) of East Java Province; 13. Regional Secretary of Gresik Regency; 14. Government Section - Regional Secretariat of Mojokerto Regency; 15. Economic Section - Regional Secretariat of Mojokerto Regency; 16. Government Section - Regional Secretariat of Sidoarjo Regency; 17. Development Planning Agency of Gresik Regency; 18. Development Planning Agency of Bangkalan Regency; 19. Development Planning Agency of Mojokerto Regency; 20. Development Planning Agency of Sidoarjo Regency; 21. Department of Public Works and Spatial Planning of Gresik Regency; 22. Department of Public Works and Spatial Planning of Bangkalan Regency;	1. Biro Perencanaan Anggaran dan Kerjasama Luar Negeri, Kementerian Pekerjaan Umum dan Perumahan Rakyat (PUPR); 2. Perwakilan Direktur Keterpaduan Infrastruktur Permukiman, Ditjen Cipta Karya (PUPR); 3. Perwakilan Direktur Pengembangan Penyehatan Lingkungan Permukiman (PLP), Ditjen Cipta Karya (PUPR); 4. Bpk. Han Chiba, Wakil Direktur Departemen Lingkungan Global, Kantor Pusat JICA Tokyo; 5. Bpk. Kaname Ishiguro, Project Coordinator, kantor JICA Indonesia; 6. Ibu Noriko Otsuki, Ketua Tenaga Ahli JICA (Jangka pendek); 7. Ibu Monika Kristyana, Program Officer, kantor JICA Indonesia; 8. Balai Prasarana Permukiman Wilayah (PPW) Jawa Timur; 9. Biro Administrasi Pembangunan, Sekretaris Daerah Provinsi Jawa Timur 10. Badan Perencanaan Pembangunan (Bappeda) Provinsi Jawa Timur; 11. Dinas Perumahan Rakyat, Kawasan Permukiman dan Cipta Karya, Provinsi Jawa Timur; 12. Dinas Lingkungan Hidup (DLH) Provinsi Jawa Timur; 13. Sekretaris Daerah Kabupaten Gresik; 14. Bagian Pemerintahan - Sekretariat Daerah Kabupaten Mojokerto; 15. Bagian Perekonomian - Sekretariat Daerah Kabupaten Mojokerto; 16. Bagian Pemerintahan - Sekretariat Daerah Kabupaten Sidoarjo; 17. Baplitbangda Kabupaten Gresik; 18. Bappeda Kabupaten Bangkalan; 19. Bappeda Kota Mojokerto; 20. Bappeda Kabupaten Sidoarjo; 21. Dinas Pekerjaan Umum dan Tata Ruang Kabupaten Gresik; 22. Dinas Pekerjaan Umum dan Tata Ruang Kabupaten Bangkalan; 23. Dinas Pekerjaan Umum dan Penataan Ruang Kabupaten Mojokerto; 24. Dinas Pekerjaan Umum dan Penataan Ruang Kabupaten Sidoarjo;

23. Department of Public Works and Spatial Planning of Mojokerto Regency; 24. Department of Public Works and Spatial Planning of Sidoarjo Regency; 25. Department of Public Works and Human Settlements of Lamongan Regency; 26. Department of Environment, Gresik Regency; 27. Department of Environment, Bangkalan Regency; 28. Department of Environment, Mojokerto Regency; 29. Department of Sanitation and Green Open Space, Surabaya City; 30. Department of Environment, Lamongan Regency.	25. Dinas Pekerjaan Umum dan Cipta Karya Kabupaten Lamongan; 26. Dinas Lingkungan Hidup (DLH) Kabupaten Gresik; 27. Dinas Lingkungan Hidup Kabupaten Bangkalan; 28. Dinas Lingkungan Hidup Kabupaten Mojokerto; 29. Dinas Kebersihan dan Ruang Terbuka Hijau Kota Surabaya; 30. Dinas Lingkungan Hidup Kabupaten Lamongan.
Agenda	**Agenda**
Kick-Off Meeting of Technical Cooperation for Development Planning Project on Regional Waste Management in Gerbangkertosusila Area (the First Joint Coordination Committee)	*Kick-Off Meeting* Kegiatan Kerjasama Teknis Perencanaan Pengembangan Sistem Pengelolaan Sampah Regional di Wilayah Gerbangkertosusila (JJC 1)
Discussion	**Diskusi**
1. Opening **1.1 Mr. Chiba (JICA TOKYO)** - The purpose of this project is improving waste management system in Gerbangkertosusilo Area. The crucial issues of Asian countries today are rapid urbanization and economic development. At the same time, it has brought unprecedented waste issues to the society and community. - This project was proposed by Indonesian government to Japan government. The project duration is from 2019 to 2021. In the first half of the project period from October 2019 to the next year, the project team will conduct several basic surveys in each local governments. - The project output are some optimum options to Surabaya metropolitan area (Gerbangkertosusilo) in order to consider regional waste management system further. If some local government intend to cooperate with others for proceeding regional waste management system, the project can go to the second half of the project. In the second half of the project, the project team will formulate a Master plan for those local governments. - In this kick off meeting the participant would discuss about this project and promote mutual understanding among all the stakeholders.	**Pembukaan** **1.1 Bpk. Chiba (JICA TOKYO)** - Tujuan dari proyek ini adalah meningkatkan sistem pengelolaan sampah di Wilayah Gerbangkertosusilo. Hal krusial di negara-negara Asia saat ini, kita melihat peningkatan urbanisasi dan pengembangan perekonomian. Disaat yang bersamaan, membawa permasalahan terkait produksi sampah yang belum pernah terjadi sebelumnya kepada masyarakat dan komunitas. - Proyek ini diusulkan oleh pemerintah Indonesia kepada pemerintah Jepang. Durasi proyek ini adalah dari tahun 2019 hingga 2020. Pada awal periode proyek ini, tim proyek akan melakukan beberapa survei mendasar di setiap pemerintah kota/kab. - Hasil proyek adalah beberapa opsi optimal/terbaik untuk area metropolitan Surabaya (Gerbangkertosusilo) untuk mempertimbangkan sistem pengelolaan sampah regional lebih lanjut. Jika nantinya terdapat beberapa pemerintah daerah berniat untuk bekerja sama dengan yang lain, proyek dapat menuju ke bagian kedua dari proyek. Pada tahap kedua proyek, tim proyek akan merumuskan Rencana Induk untuk pemerintah daerah tersebut. - Dalam pertemuan awal ini, peserta akan berdiskusi terkait proyek ini dan menyamakan presepsi/pengertian di antara semua

2. Explanation about Project Implementation

2.1 Ms. Otsuki (Leader of JICA Expert Team - short term)

- Project Outline
- Expert Team Members
- Project Activities for Output 1
- Requests for C/P
- Plan for the Coming Weeks

Technical explanation regarding the implementation in the near future

- Regencies/Cities to Take Part in the Project
- Counterpart personel
- Location of Project Office
- Schedule of Meetings with Local Government and Time, Motion Trial
- Schedule of Expert team and Survey

3. Discussion Session

Preface from the moderator (Mr. Dardjat W., Head of Regional Settlement Infrastructure Agency/PPW)

1. It is expected that the relevant agencies in each city/regency can escort during the field visits, so that the experts can find out and learn about the overall waste management from the source to landfill in each city/regency;
2. It is expected to formed a team in all city/regency by specifically appointing the Person in Charge (PIC), therefore in the future they can work together with the experts;
3. The JICA Team will learn more about solid waste management in Gerbangkertosusilo area therefore, the cooperation from the local government in all city/regency is crucially expected.

3.1 Mr. Hariono (Regional Development Agency/BAPPEDA of Kab. Mojokerto)

1. States support for this project.
2. What is the new approach of solid waste management that mentioned at the beginning (opening statement by Mr. Chiba) related to this project?

pemangku kepentingan.

2. Penjabaran terkait Pelaksanaan Proyek

2.1 Ibu Otsuki (Ketua Tim Ahli JICA - Jangka pendek)

- Garis besar proyek
- Tim Tenaga Ahli
- Kegiatan Proyek untuk Output 1
- Partisipasi Mitra
- Agenda untuk minggu yang akan datang

Penjelasan teknis terkait pelaksanaan dalam waktu dekat

- Kota/Kabupaten yang ikut serta/menjadi bagian dalam proyek ini
- Tenaga pendamping/Dinas Pendamping
- Lokasi Kantor Tim Pelaksana Proyek
- Jadwal rapat bersama pemerintah kota/kabupaten dan percobaan survei lokasi, waktu & rute pengangkutan sampah
- Jadwal Tenaga Ahli dan Survei

3. Sesi Diskusi

Pengantar dari moderator (Bpk.Dardjat W, Kepala Balai PPW)

1. Diharapkan dinas terkait di tiap kota/kab dapat mengawal saat kunjungan ke lapangan, agar tenaga ahli mengetahui dan mempelajari dengan baik pengelolaan sampah secara keseluruhan dari sumber hingga ke TPA;
2. Diharapkan telah membentuk tim khususnya menunjuk penanggungjawab pada dinas terkait di seluruh kota/kab agar kedepannya dapat bekerjasama dengan tenaga ahli;
3. Tim JICA akan mempelajari/mengkaji bagaimana pengelolaan sampah di Gerbangkertosusilo sehingga diharapkan kerjasama dari dinas terkait di seluruh kota/kab.

3.1 Bpk. Hariono (BAPPEDA Kab. Mojokerto)

1. Menyatakan sangat mendukung proyek ini.
2. Pendekatan baru dalam pengelolaan sampah yang telah disebutkan diawal (pernyataan dalam kata pengantar oleh Mr. Chiba) penjabaran terkait proyek itu seperti apa?
3. Dalam hal ini kab. Mojokerto telah memiliki Master Plan dan dokumen lain terkait pengelolaan sampah, dirasa penelitian perlu sebagai bahan perbaikan;
4. Menyatakan bahwa penanggugjawab *(counterpart)* adalah Bpk.

3. In this case, kab. Mojokerto already has a Master Plan and other documents related to solid waste management, therefore this project might be as an improvement of those document;
4. Stating that the person in charge (counterpart) is Mr.Sumiono from DLH Kab. Mojokerto.

Response:

Mr. Chiba (JICA headquarters Tokyo)

- The new approach is not yet known, the experts will do the study and analysis first, that also will be adjusted to the character of each region.

3.2 Mrs. Sumiati (Department of Environment/DLH East Java Province)

1. There are 2 things that need to be added and considered in the survey, which are:
   solid waste transportation services have not been served 100%, there are some areas in city/regency in East Java that have not been accommodated/served due to the transportation constraints, garbage trucks cannot reach these areas;
2. We must consider the retriever (waste transporting/collecting employee);
3. The office for the expert team will be discussed further with superiors and will follow up immediately;
4. In East Java there are a number of private companies as waste transporting company. In this case, they are still needing a survey that related to financial analysis, related to tipping fees/retribution per month. The communities in general (who have not yet been served by waste transportation service) process their own waste by throwing it into the river or anywhere, bury that waste into their backyard, etc. They are may not have more money to pay the fees/retribution.

Response:

Ms. Otsuki - Leader of the expert team (short term)

- Related to those additional things, thank you for the information and the input, it will be adjusted later and if it necessary that will be added.
- This project (first half) does not focus on waste collection/transport officers. We rather focus on the macro things, not as detailed as that.

Sumiono dari DLH Kab. Mojokerto.

Tanggapan:

Bpk. Chiba (Kantor Pusat JICA Tokyo)

- Pendekatan baru tersebut belum dapat diketahui seperti apa, akan dilakukan studi terlebih dahulu dan disesuaikan dengan karakter masing-masing wilayah.

3.2 Ibu Sumiati (DLH Provinsi Jawa Timur)

1. Ada 2 hal yang perlu ditambahkan dan diperhatikan dalam survei yang akan dilakukan, yakni:
   Pelayanan pengangkutan persampahan belum 100% terlayani, masih terdapat wilayah pada kota/kab di Jawa Timur belum terakomodasi/terlayani pengangkutannya karena terkendala akses, truk pengangkut sampah tidak dapat menjangkau area tersebut;
2. Kita harus mempertimbangkan para pengumpul sampah;
3. Terkait kantor dari tim proyek kami akan dibicarakan lebih lanjut dengan atasan dan akan menindaklanjutinya dengan segera;
4. Di Jawa Timur terdapat beberapa perusahaan swasta (privat) yang melakukan pengangkutan sampah. Dalam hal ini mereka membutuhkan survei terkait analisis finansial/keuangan, hal ini terkait pembayaran retribusi/iuran perbulan. Masyarakat pada umumnya (yang belum terlayani pengangkutan) mengolah sampahnya sendiri dengan membuang ke sungai, ke sembarang tempat, mengubur sampah ke pekarangan belakang rumah, dll mereka mungkin tidak memiliki dana lebih untuk membayar retribusi.

Tanggapan:

Ibu Otsuki - Ketua tim tenaga ahli (jangka pendek)

- Terkait hal-hal tambahan tersebut, terimakasih atas masukannya dan informasinya, nantinya akan disesuaikan dan bila perlu akan ditambahkan.
- Tidak fokus ke para petugas pengumpul/pengangkut sampah. Kami hanya berfokus pada hal-hal makro (besar) tidak sedetail itu.

3.3 Mrs. Alin (Government Section of Sidoarjo Regency)

1. What kind of waste management system that mentioned at the beginning of the presentation?
2. Each region has a different character, therefore what kind of waste management system it is? For example, in Sidoarjo regency, the direction of processing in the plan is Waste to Energy, but after being analyzed it still cannot be applied;
3. What kind of waste management system will you recommend in Sidoarjo?

3.3 Mrs. Diah Palupi (Department of Environment/DLH, Gresik Regency)

1. Gresik already has 125 TPS (temporary waste shelter) in 18 districts, 120 waste banks, and has 1 landfill 9.5 ha.
2. What is the output of this project? Later it will be recommended regional scale of waste management or what kind of waste management system?
3. In the regions we discussed regional solid waste management but it has not been discussed again for a long time.
4. We already have Renstrada and Master Plan. Maybe this research can be used as an input and suggestions for improvement in the future.

3.4 Mrs. Terra Prima Sari (PPLP Directorate, PUPR)

1. This program since 2009, it is based on the necessity at that time, it were considered quite urgent in Surabaya and its surroundings. However, it was stopped, then there was a letter of interest from the Province of East Java therefore, the Ministry re-organized this activity through JICA;
2. The JICA project will greatly assist in each city/regency for future planning;
3. The existing conditions and the potential of each city/regency are very important to learn;
4. The output of this study will be used as recommendation for regional scale waste management system followed by an MoU. If the

3.3 Ibu Alin (Bagian pemerintahan Kab. Sidoarjo)

1. Pada pemaparan diawal belum terlihat jelas arah pengelolaan sampah akan seperti apa?
2. Tiap daerah memiliki karakter yang berbeda sehingga nantinya pengelolaan akan seperti apa? Contoh di kab.Sidoarjo arah pengolahannya pada perencanaannya yakni *Waste to Energy*, akan tetapi setelah dianalisis masih belum bisa diaplikasika;
3. Mohon rekomendasi di Sidoarjo arahnya akan seperti apa.

3.3 Ibu Diah Palupi (DLH, Kab. Gresik)

1. Di kab. Gresik telah memiliki 125 TPS di 18 Kecamatan, 120 Bank sampah, memiliki 1 TPA dengan luas 9,5 ha.
2. Apakah output dari kegiatan ini? Nantinya akan direkomendasikan pengelolaan skala regional atau seperti apa?
3. Di daerah kami sempat membahas pengelolaan secara regional tetapi telah lama tidak dibahas kembali.
4. Renstrada dan Master plan telah dimiliki mungkin penelitian ini dapat menjadi masukan dan saran untuk perbaikan kedepannya.

3.4 Ibu Terra Prima Sari (Direktorat PPLP, Kementerian PUPR)

1. Program ini telah ada sejak tahun 2009, hal ini berdasarkan kebutuhan yang pada saat itu dirasa cukup urgent di Surabaya dan sekitarnya. Namun, sempat terhenti, kemudian ada surat minat Provinsi Jawa Timur sehingga Kementerian menyelenggarakan kembali kegiatan ini melalui JICA;
2. Proyek JICA sangat akan membantu ditiap kab/kota untuk perencanaan kedepannya;
3. Kondisi eksisting dan potensi dari masing-masing kab/kota sangat penting diketahui seperti apa;
4. Pada output studi ini direkomendasikan bahwa pengelolaan sampah dengan skala regional akan ada MoU, bila kota/kab tidak ada yang menyetujui/bergabung maka pusat akan membatalkannya;

city/regency does not approve and decide not to join, the central government (Ministry) will cancel it; 5. There should be an official letter from the city/regency related to the person in charge (counterpart) from each city/regency.	5. Sebaiknya ada surat resmi dari kab/kota terkait penanggungjawab (counterpart) dari masing-masing kota/kab.
3.5 Mrs. Afifah Kemala (Directorate of Settlement Infrastructure Integrity, Directorate General of Human Settlements, PUPR) 1. Involving the person in charge (counterpart) is an instruction by the Ministry, therefore JICA can make coordination with the local government more easily; 2. JICA should make a report that given to the Ministry, specifically for this years activities (in Bahasa).	**3.5 Ibu Afifah Kemala (Dit KIP, DJCK)** 1. Keberadaan penanggungjawab (counterpart) merupakan bentuk arahan dari pusat agar pihak JICA dapat lebih mudah bekerja dan berkoordinasi dengan pemerintah daerah; 2. JICA dapat membuat laporan yang diberikan kepada pusat, khususnya kegiatan tahun ini (dalam bahasa Indonesia).
3.6 Bureau of Budget Planning and Overseas Cooperation, PUPR 1. Support this project, then waste management system in this area will be more effective; 2. The most important point for local government is the legality of this project, to avoid obstacles and mistakes in the process of recording asset.	**3.6 Biro perencanaan anggaran dan kerjasama luar negeri** 1. Mendukung penelitian ini agar tercapai pengelolaan yang efektif di wilayah ini; 2. Yang terpenting bagi pemerintah daerah adalah legalitas dari kegiatan ini, agar tidak ada kendala saat pencatatan di Aset.
3.7 Mrs. Sri (BAPPEDA of East Java Province) 1. This project arises because there is a requirement for regional waste management, that urgently needed; 2. Need an attention of the existing conditions, therefore it can obtain some plans that will be adjusted with the conditions; 3. The first output related with the MoU, therefore that the public relations bureau is expected to prepare the output of this first stage later.	**3.7 Ibu Sri (BAPPEDA Prov. Jawa Timur)** 1. Kegiatan ini muncul karena adanya kebutuhan untuk pengelolaan sampah secara regional dan sangat dibutuhkan; 2. Perlu memperhatikan kondisi eksisting yang sudah ada sehingga dapat memunculkan perencanaan yang disesuaikan dengan kondisi; 3. Output yang pertama ada kaitannya dengan MoU, sehingga biro humas diharapkan dapat mempersiapkan output tahap pertama ini nantinya.
3.8 Mrs. Shinta (DPRKPCK Provinsi Jawa Timur) 1. The office room has been prepared in PU of East Java Province; 2. Related to the person in charge (counterpart) will be discussed later; 3. It is necessary to pay attention the communication systems to make it easier in the process of coordination and the information about the progress of this project from each city/region and all the matters;	**3.8 Ibu Shinta (DPRKPCK Provinsi Jawa Timur)** 1. Ruangan telah disiapkan di PU Provinsi Jawa Timur; 2. Terkait penanggungjawab (counterpart) nantinya akan dibahas kembali; 3. Perlu diperhatikan sistem komunikasi agar lebih mudah dalam proses koordinasi dan informasi terkait perkembangan dari proyek ini dari tiap kota/kab dan hal-hal lainnya;

4. After the kick off meeting, each head of region (Walikota/Bupati) from each city/regency must get the information about this project, because there will be an MoU, thereafter this project can run smoothly in the future; 5. This project must be ensured of the legality, it has been officially (related to licensing, permit letter, etc.) **Moderator:** 1. In the near future JICA consultant will conduct a survey, a letter from the Balai/PU Province should be made, therefore when the survey team goes to the field they have a proof letter of legality, they are will conducting the survey officially; 2. When the survey is expected the responsible team from the city/regency has been formed therefore they can participate with JICA consultants; 3. The office that will be prepared in the Department of Public Housing and Settlements of East Java Province for the project team; 4. It is expected that there will be an implementation report to the Balai and the central government regarding the results of the field survey or activities that have been done; 5. Agreement on the schedule from the JICA Team to the local government that will be done in the near future, it still uses the same schedule as that prepared by JICA, just waiting for an official notification letter. **3.8 Mr. Iman (Department of Sanitation and green open space/DKRTH, Kota Surabaya)** It requires an official letter from the leadership regarding the visitation and field survey by the JICA team and must be scheduled. **Moderator:** 1. All the city/regency need an official letters related to the implementation of the visitation and field survey that will be carried by JICA;	4. Setelah kick off meeting tiap kepala daerah (Walikota/Bupati) dari tiap kota/kab harus mengetahui terkait kegiatan ini, karena akan ada MoU agar kegiatan ini kedepannya dapat berjalan dengan lancar; 5. Proyek ini harus dipastikan legalitasnya, telah resmi (terkait surat perizinan, dll) **Moderator:** 1. Dalam waktu dekat konsultan JICA akan melakukan survei, sebaiknya dibuatkan surat pengantar dari Balai/Provinsi sehingga saat tim survei turun ke lapangan memiliki bukti legalitas bahwa mereka melakukan survei secara resmi; 2. Saat survei diharapkan tim penanggungjawab (counterpart) dari kab/kota telah terbentuk dan dapat ikut serta dengan konsultan JICA; 3. Terkait kantor akan disiapkan kantor operasional untuk tim proyek di Dinas Perumahan Rakyat dan Permukiman Provinsi Jawa Timur; 4. Diharapkan ada laporan pelaksanaan ke Balai dan pusat terkait hasil pelaksanaan survei atau kegiatan yang telah dilakukan; 5. Kesepakatan jadwal kunjungan dari Tim JICA ke Instansi terkait yang akan dilakukan dalam waktu dekat masih menggunakan jadwal yang sama dengan yang telah disusun oleh JICA, tinggal menunggu surat pemberitahun resmi. **3.8 Bpk. Iman (Dinas Kebersihan dan Ruang Terbuka Hijau/DKRTH Kota Surabaya)** Butuh surat resmi pemberitahuan dari pimpinan terkait kunjungan dan survei yang akan dilakukan tim JICA dan harus terjadwal. **Moderator:** 1. Seluruh kab/kota butuh surat secara resmi terkait pelaksanaan kunjungan dan survei yang akan dilakukan JICA; 2. Berikut merupakan hasil sementara penentuan penanggungjawab dari tiap kab/kota:

2. The person in charge of each city/regency was temporarily determined and contact numbers were shared. **Moderator:** When the next meeting will be held? At the next meeting please provide an overview of the MoU/ example of the MoU. **Response:** Ms. Otsuki - Leader of the expert team (Short term) - Joint Coordination Committee 2 (JCC 2): **April 2020**	**Moderator:** Kapan pelaksanaan rapat selanjutnya akan dilaksanakan? Pada pertemuan selanjutnya mohon untuk memberikan gambaran terkait MoU/contoh MoU. **Tanggapan:** Ms. Otsuki - Ketua tim tenaga ahli (Jangka pendek) - Joint Coordination Committee 2 (JCC 2) : **April 2020**
Closing All the city/regency in Gerbangkertosusilo area need an official letters related to the implementation of the coordination and field survey plan by JICA expert team.	**Penutup** Seluruh kab/kota di wilayah Gerbangkertosusilo membutuhkan surat secara resmi terkait rencana pelaksanaan koordinasi dan survei lapangan yang akan dilakukan oleh tenaga ahli JICA.

DRAFT

MINUTES OF MEETING
OF
THE JOINT COORDINATING COMMITTEE
FOR
TECHNICAL COOPERATION FOR
DEVELOPMENT PLANNING PROJECT ON
REGIONAL SOLID WASTE MANAGEMENT
IN GERBANGKERTOSUSILA AREA

IN THE REPUBLIC OF INDONESIA

XX March 2021

Second Joint Coordinating Committee

X:XX – X:XX, XX March 2021

(Online Meeting)

1. The Second Joint Coordinating Committee was held online from x:xx to x:xx on XX February 2021 with Mr/Ms. XXXX as a chairperson. The attendees are listed in Appendix.

2. It was confirmed that referring to the Record of Discussion (R/D), the project consists of:

   Phase 1 (Output 1) Current situation survey on solid waste management,
   Phase 2 (Output 2) Development of regional solid waste management plan,
   Phase 3 (Output 3) Implementation of pre-feasibility study, and
   Phase 4 (Output 4) Capacity Development of provincial and local government officials.

   The current activities are for Phase 1 of the project. The R/D states that Phase 2 will start only after MOU is signed by the local governments. Instead of signing the MOU, individual Letters of Intention (LoI) addressed to East Jawa Province by the local governments in the project area are regarded as the means to express their intention to participate in the next phase of the project.

   It was agreed that the activities for Output 2, Output 3, and Output 4 will be implemented as for Phase 2.

3. The following was confirmed and agreed.

   a. Output 1 “Understanding Current SWM Situation” was achieved as the understanding of current SWM situation had led to the regional solid waste management (SWM) proposals.

   b. The SWM regional systems were proposed assuming that the regional TPA plan would be utilized by the local government outside Surabaya City. The systems proposed for further studies in the next phase are as below.

	North System	Central System	South System
Option 1: TPA-based Regional System	N-1 • TPA in Dadapan	C-1 • TPA in Dawarblandong	S-1 • TPA in Kutorejo
Option 2: Enhanced Regional System	N-2 • TS* • TPA in Dadapan	C-2 • WtE in Randegan • TPA in Dawarblandong	S-2 • WtE in Randegan • TPA in Kutorejo
Host local government	Lamongan Regency	Mojokerto Regency	Mojokerto Regency
Possible Users	Gresik Regency	Mojokerto City Gresik Regency Lamongan Regency Sidoarjo Regency	Mojokerto City Gresik Regency Lamongan Regency Sidoarjo Regency

TPA: Final disposal sites, TS: Transfer station, WtE: Waste to Energy
* The location of the TS for the north system is not determined yet.

c. Instead of signing the MOU mentioned in Paragraph 2, individual Letters of Intention (LoI) addressed to East Jawa Province by the local governments in the project area were regarded as the means to express their intention to participate in the next phase of the project.

d. The LoI were requested by the East Jawa provincial government to the local governments except for Surabaya City in December 2020. As of today, the province has received the LoI from XXX local governments.

e. Based on their intention expressed in the LoI, the next phase of the project will cover:
   - North system serving for Lamongan and Gresik Regencies, and
   - Central system serving for Mojokerto, Gresik and Sidoarjo Regencies.

   For the north system, the proposed land may need extension. This shall be further examined during the next phase. The both Indonesian side and Japanese side will examine optimum land use in Dawarblandong and Dadapan for the north system and central system during the next phase.

f. Sidoarjo Regency, Bangkalan Regency and Mojokerto City are requested to send its LoI by 5 March 2021.

g. The short-term expert team will submit a draft of the English final report to the Indonesian side by 23 February 2021. The comments on the report will be accepted by 5 March 2021.

h. The both Indonesian side and Japanese side shall closely collaborate for the smooth commencement of the next phase. In particular, the both sides shall agree the following issues, which are then to be confirmed in the revised R/D.

   - Project duration
   - Project design matrix

4. The committee was closed with a remark by XXX.

Appendices
- Attendees.
- LoI from Lamongan, Gresik and Mojokerto Regencies.

添付資料 2

本都市圏を対象とした

廃棄物管理に係る現況調査報告書

Table of Contents

Chapter 1 Waste Amount and Composition Survey

1.1 Outline

1.1.1 Objective

The objective of this survey was to calculate the generation rate and the physical composition of household waste in the Grebankertosusila region. The results are further used to investigate the household waste flow and current waste management practices by integrating other existing data that are available to the project team.

1.1.2 Target area and sample households

The survey was conducted in the six municipalities of the region: Mojokerto city, Mojokerto Regency, Gresik Regency, Lamongan Regency, Sidoarjo Regency, and Bangkalan Regency. The project team, in cooperation with the C/P, selected 40 households in each of the municipalities (20 in each of the rural and urban areas).

The table below presents the number of households selected in each of the municipalities.

Table 1-1. Number of households selected for the survey

Municipality	Area type	Kecamatan	Kelurahan	Sample HHs
Kab. Bangkalan	Rural	Burneh	Arok	10
			Tonjung	10
	Urban	Bangkalan	Demangan	20
	Subtotal			40
Kab. Gresik	Rural	Cerme	Semampir	20
	Urban	Kebomas	Kembangan	20
	Subtotal			40
Kab. Lamongan	Rural	Deket	Dlanggu	20
	Urban	Lamongan	Sukomulyo	20
	Subtotal			40
Kab. Mojokerto	Rural	Mojosari	Leminggir	20
	Urban	Mojosari	Kauman	9
			Mojosari	7
			Sarirejo	4
	Subtotal			40
Kab. Sidoarjo	Rural	Buduran	Banjarsari	20
	Urban	Sidoarjo	Magersari	20
	Subtotal			40
Kota Mojokerto	Urban	Magersari	Magersari	20
		Prajurit Kulon	Pulorejo	20
	Subtotal			40
Total				**240**

1.1.3 Survey period

The survey was conducted between 16 Nov and 22 Dec 2019. Actual sampling in a municipality was conducted for eight days during the survey period. The table below shows the implemented survey schedule.

Table 1-2. Survey schedule

No	Activities	November, 2019				December, 2019				
		4-10	11-17	18-24	4-10	25-1	2-8	9-15	16-22	23-29
1	Preparation for the survey									
2	Meeting with the C/P (DLHs of the municipalities)		Kota Mojokerto Kab.Mojokerto			Bangkalan Lamongan		Sidoarjo Gresik		
3	Selection of households									
4	Explanation to the households									
5	Implementation of questionnaire survey									
6	Distribution of sample bags									
7	Implementation of WAS		Kab. & Kota Mojokerto			Bangkalan & Lamongan			Sidoarjo & Gresik	
8	Implementation of WCS		Kab. & Kota Mojokerto			Bangkalan & Lamongan			Sidoarjo & Gresik	

1.2 Applied methodology

WACS consists of two parts: Waste Amount Survey (WAS) and Waste Composition Survey (WCS).

The implementation procedures of the surveys were the following.

1.2.1 The WAS procedures

(1) Sample preparation

Within this survey, household waste (HHW) was categorized as follows:

HHW 1. Material Recovered from HHW at Households: HHW with a market value, separated at households, and sold or given to recyclers (private companies, personnel, and waste pickers) or brought to waste banks.

HHW 2. HHW Recycled at Households: HHW that was reused or recycled at the household. The category included mostly composted organic waste, combustible waste used as a fuel, and food waste used for feeding domestic animals.

HHW 3. HHW Discharged for Collection: HHW that was collected by waste collection services provided by the municipalities and private collectors. The category included HHW discharged to TPS/TPS-3R and transported to TPA by the household themselves.

HHW 4. Unmanaged HHW: HHW that was not categorized into the above three categories. It included waste burned or buried by the households or dumped outside without any treatment.

The Survey Team provided the households with three types of plastic bags and requested them to put HHW 1 and 2 into the first and second bags separately while HHW 3 and 4 into the third bag.

(2) Weighing

HHW 1 and HHW 2 were measured at the premises of the households at the time of sample collection. When measuring these types of waste, the project staff sorted the sample into the waste types indicated in “1.2.2(3) Estimating physical composition”, weighed them by each waste type, and recorded the results in a data record sheet prepared for the survey.

The bags with HHW 3 and 4 were collected for further analysis. With bags coded to identify households, the collected samples of HHW 3 and 4 were weighed one by one, and the results were recorded on the data record sheet.

Combined with the number of family members of the households, the generation rates of the household waste in urban and rural areas were calculated for each target municipality.

1.2.2 WCS procedures

Waste composition analysis on the waste collected from urban and rural areas was conducted separately. The survey procedures are the following:

(1) Preparation of samples

Although the survey team was intending to reduce the amount of the sample waste collected for the survey before the WCS analysis, the team decided to include all the collected samples since the amounts of the samples were small.

Immediately after putting the waste out of its bags, the WCS analysis was conducted (see below).

(2) Calculation of specific gravity

The waste was put into a bucket with a capacity of approximately 60 liters and dropped three times from an elevation of 30 cm to make its volume proper. The volume and weight of the sample waste in the bucket were measured, and the apparent specific gravity was calculated.

(3) Estimating physical composition

After measuring its volume and weight, the sample waste was poured out and sorted manually into fourteen types: kitchen waste, wood/grass, paper-cardboard, paper-other paper, plastics-hard plastic, plastics-pet bottles, plastics-soft plastic, metal-aluminum can, metal-other metal, glass bottles, glass/ceramics/stones, textile, rubber/leather, and others. Each type of the sorted waste was weighed, and the physical composition was estimated based on the weights.

1.3 Results of the survey

1.3.1 Questionnaire survey

The project team, together with the C/P, visited the selected households and collected the necessary information about the households and household waste handling using a questionnaire.

According to the responses by the households, more than 65% of the households either segregate valuables (HHW1) or re-use/recycle waste. 37% of the households dispose of their waste by themselves.

Table 1-3. Household Waste handling

Municipalities		Responded HHs		HHs segregating valuables		HHs recycling waste		HHs disposing of waste by themselves (self-disposal)	
		Num	Share	Num	Share	Num	Share	Num	Share
Kab. Bangkalan	Rural	20	100.0%	11	55.0%	15	75.0%	19	95.0%
	Urban	20	100.0%	13	65.0%	15	75.0%	9	45.0%
	Subtotal	**40**	**100.0%**	**24**	**60.0%**	**30**	**75.0%**	**28**	**70.0%**
Kab. Gresik	Rural	20	100.0%	15	75.0%	13	65.0%	2	10.0%
	Urban	20	100.0%	9	45.0%	8	40.0%	10	50.0%
	Subtotal	**40**	**100.0%**	**24**	**60.0%**	**21**	**52.5%**	**12**	**30.0%**
Kab. Lamongan	Rural	20	100.0%	15	75.0%	16	80.0%	2	10.0%
	Urban	20	100.0%	16	80.0%	16	80.0%	1	5.0%
	Subtotal	**40**	**100.0%**	**31**	**77.5%**	**32**	**80.0%**	**3**	**7.5%**
Kab. Mojokerto	Rural	20	100.0%	18	90.0%	19	95.0%	20	100.0%
	Urban	20	100.0%	8	40.0%	13	65.0%	2	10.0%
	Subtotal	**40**	**100.0%**	**26**	**65.0%**	**32**	**80.0%**	**22**	**55.0%**
Kab. Sidoarjo	Rural	20	100.0%	16	80.0%	16	80.0%	18	90.0%
	Urban	20	100.0%	17	85.0%	12	60.0%	0	0.0%
	Subtotal	**40**	**100.0%**	**33**	**82.5%**	**28**	**70.0%**	**18**	**45.0%**
Kota Mojokerto	Urban	40	100.0%	23	57.5%	16	40.0%	7	17.5%
	Subtotal	**40**	**100.0%**	**23**	**57.5%**	**16**	**40.0%**	**7**	**17.5%**
Target area		**240**	**100.0%**	**161**	**67.1%**	**159**	**66.3%**	**90**	**37.5%**

(1) Segregation of valuables

Table 1-4 shows the number of households compiled by the types of valuables they segregated.

According to the table, cardboards, pet bottles, paper, and aluminum cans were the most common valuables in each municipality. The shares of the households segregating these valuables were 50% for cardboards, 65% for pet bottles, 21% for papers, and 26% for aluminum cans.

The shares of the households that segregate soft plastics, hard plastics, metal (other than aluminum cans), and glass bottles are small, varying from 2% to 13%.

Table 1-4. Humber of households by types of valuables

Data	Types of valuables	Kab. Bangkalan		Kab. Gresik		Kab. Lamongan		Kab. Mojokerto		Kab. Sidoarjo		Kota Mojokerto	Total
		Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Urban	
		20 HHs	20 HHs	20 HHs	20 HHs	20 HHs	20 HHs	20 HHs	20 HHs	20 HHs	20 HHs	40 HHs	240 HHs
Number of households segregating valuables	Cardboard	4	7	13	6	14	16	14	6	11	15	14	120
	Paper		2	7	3		8	5	3	5	12	6	51
	Pet bottles	11	13	15	8	14	15	18	8	16	16	23	157
	Soft plastic		1	3			1	9	2	1	2	12	31
	Hard plastic	2		1				3	1	1	6		14
	Aluminum can	5	9	4	1	8	8	8	4	9	4	4	64
	Other metals	2		1			2	5		1	7	1	19
	Glass bottles		1					1	1		2		5
Share of the households segregating valuables	Cardboard	20.0%	35.0%	65.0%	30.0%	70.0%	80.0%	70.0%	30.0%	55.0%	75.0%	35.0%	50.0%
	Paper		10.0%	35.0%	15.0%		40.0%	25.0%	15.0%	25.0%	60.0%	15.0%	21.3%
	Pet bottles	55.0%	65.0%	75.0%	40.0%	70.0%	75.0%	90.0%	40.0%	80.0%	80.0%	57.5%	65.4%
	Soft plastic		5.0%	15.0%			5.0%	45.0%	10.0%	5.0%	10.0%	30.0%	12.9%
	Hard plastic	10.0%		5.0%				15.0%	5.0%	5.0%	30.0%		5.8%
	Aluminum can	25.0%	45.0%	20.0%	5.0%	40.0%	40.0%	40.0%	20.0%	45.0%	20.0%	10.0%	26.7%
	Other metals	10.0%		5.0%			10.0%	25.0%		5.0%	35.0%	2.5%	7.9%
	Glass bottles		5.0%					5.0%	5.0%		10.0%		2.1%

The valuables segregated at the households are sold to waste recyclers mainly through traders, waste banks, local community.

The table below shows the types of buyers that collect valuables from the respondent households and sell to waste recyclers. According to the table, the main buyers are local traders and waste banks. “Other” stands for waste collection workers and poor people residing in the respondents’ areas whom the respondent households give their valuables for free of charge.

Table 1-5. Buyers by types of valuables

Municipality	Buyers	Number of responses							
		Cardboard	Paper	Pet bottles	Soft plastic	Hard plastic	Aluminum can	Other metals	Glass bottles
Kab. Bangkalan	Traders	90.9%	100.0%	87.5%	100.0%	50.0%	85.7%	50.0%	100.0%
	Other	9.1%	0.0%	12.5%	0.0%	50.0%	14.3%	50.0%	0.0%
	Subtotal	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Kab. Gresik	Traders	94.7%	90.0%	95.7%	100.0%	100.0%	100.0%	100.0%	
	Waste banks	5.3%	10.0%	4.3%	0.0%	0.0%	0.0%	0.0%	
	Subtotal	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	
Kab. Lamongan	Traders	46.7%	25.0%	44.8%	0.0%		50.0%	0.0%	
	Waste banks	43.3%	75.0%	41.4%	0.0%		37.5%	100.0%	
	Other	10.0%	0.0%	13.8%	100.0%		12.5%	0.0%	
	Subtotal	**100.0%**	**100.0%**	**100.0%**	**100.0%**		**100.0%**	**100.0%**	

Kab. Mojokerto	Local community	5.0%	0.0%	3.8%	0.0%	0.0%	8.3%	0.0%	50.0%
	Traders	82.5%	81.3%	78.8%	90.9%	75.0%	91.7%	100.0%	50.0%
	Other	12.5%	18.8%	17.3%	9.1%	25.0%	0.0%	0.0%	0.0%
	Subtotal	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Kab. Sidoarjo	Local community	3.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Traders	53.8%	41.2%	46.9%	66.7%	28.6%	84.6%	37.5%	0.0%
	Waste banks	42.3%	58.8%	40.6%	33.3%	71.4%	15.4%	62.5%	100.0%
	Other	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%
	Subtotal	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Kota Mojokerto	Traders	50.0%	58.3%	41.3%	25.0%		0.0%	0.0%	
	Waste banks	28.6%	25.0%	23.9%	41.7%		25.0%	100.0%	
	Other	21.4%	16.7%	34.8%	33.3%		75.0%	0.0%	
	Subtotal	**100.0%**	**100.0%**	**100.0%**	**100.0%**		**100.0%**	**100.0%**	

(2) Waste recycling at households

According to the responses, kitchen waste and green waste is recycled at households (Table 1-6). Although the table included "cardboards" and "other waste" (chicken dropping), the number of responses was one for each of the types; therefore, these types of waste can be ignored.

Table 1-6. Types of waste recycled at households (respondents)

Data	Waste type	Kab. Bangkalan		Kab. Gresik		Kab. Lamongan		Kab. Mojokerto		Kab. Sidoarjo		Kota Mojokerto	Total (240 HHs)
		Rural (20 HHs)	Urban (20 HHs)	Rural (20 HHs)	Urban (20 HHs)	Rural (20 HHs)	Urban (20 HHs)	Rural (20 HHs)	Urban (20 HHs)	Rural (20 HHs)	Urban (20 HHs)	Urban (40 HHs)	
Number of households that recycle waste	Kitchen waste	15.0	15.0	14.0	8.0	16.0	16.0	19.0	12.0	16.0	12.0	16.0	159.0
	Wood and grass		1.0				1.0	1.0	2.0	1.0	10.0		16
	Cardboard							1					1
	Other waste*								1				1
Share of households that recycle waste	Kitchen waste	75.0%	75.0%	70.0%	40.0%	80.0%	80.0%	95.0%	60.0%	80.0%	60.0%	40.0%	66.3%
	Wood and grass		5.0%				5.0%	5.0%	10.0%	5.0%	50.0%		6.7%
	Cardboard							5.0%					0.4%
	Other waste								5.0%				0.4%

Among the kitchen waste, rice and vegetable waste are commonly recycled at households, regardless of the municipalities. The rice is usually dried and used as a feed of chicken or sold to others, after drying, as a raw material of "Karak," a local snack. Like rice, vegetable waste is also used as a feed of domestic animals such as cattle and goats. A few households compost vegetable waste. Green waste, mainly leaves, and grass collected from gardens are usually composted (Table 1-7).

Table 1-7. Methods of household recycling

No	Types of waste recycled	240 HHs	Share
1	**Kitchen waste**	**159.0**	**66.3%**
	Make feed for domestic animals	73.0	30.4%
	Reuse for domestic purposes	32.5	13.5%
	Use for compost	16.5	6.9%
	Other (Dry and sell)	37.0	15.4%
2	**Wood and grass**	**20.0**	**8.3%**
	Reuse for domestic purposes	1.0	0.4%
	Use for compost	14.0	5.8%
	Use as fuel (burn instead of fuel)	1.0	0.4%
3	**Cardboard**	**1.0**	**0.4%**
	Reuse for domestic purposes	1.0	0.4%
4	**Other waste**	**1.0**	**0.4%**
	Use for compost	1.0	0.4%

(3) Self-disposal

As Table 1 shows, 37% of the respondent households dispose of waste by themselves. Most of the households dispose of waste due to the lack of collection service. Some households do not receive collection services even though they are residing in an area with collection services. The team assumed that many of these households were unwilling to pay for the services or located far from the TPSs in their *desa* or *kelurahan*.

Most households burn waste on their premises. Kitchen waste and green waste is put outside and burned after they are dry. Some incombustible waste is buried. Some households simply dump waste at dumpsites in their neighborhood (Table 1-8).

Table 1-8. Methods of self-disposal by types of waste

No	Waste type	Total (out of 240 HHs)		Responses by methods of self-disposal					
				Burn at own premises		Bury at own premises		Discharge in the neighborhood	
1	Kitchen waste	72.0	30.0%	66.0	27.5%			6.0	2.5%
2	Wood and grass	79.0	32.9%	75.0	31.3%	1.0	0.4%	3.0	1.3%
3	Cardboard	41.0	17.1%	37.0	15.4%			4.0	1.7%
4	Other paper	66.0	27.5%	61.0	25.4%			5.0	2.1%
5	Pet bottles	35.0	14.6%	31.0	12.9%			4.0	1.7%
6	Soft plastic	71.0	29.6%	67.0	27.9%			4.0	1.7%
7	Hard plastic	45.0	18.8%	43.0	17.9%			2.0	0.8%
8	Glass bottles	14.0	5.8%	13.0	5.4%			1.0	0.4%
9	Textiles	53.0	22.1%	49.0	20.4%			4.0	1.7%
10	Rubber and leather	37.0	15.4%	35.5	14.8%	0.5	0.2%	1.0	0.4%
11	Glass, ceramics and stones	27.0	11.3%	11.0	4.6%	15.0	6.3%	1.0	0.4%
12	Others	60.0	25.0%	54.5	22.7%	1.5	0.6%	4.0	1.7%

1.3.2 Waste amount and composition survey

(1) Waste generation rate

Waste generation rate was estimated for each of the four categories of household waste defined in "1.2.1(1) Sample preparation": Valuables segregated and sold out by households (HHW1), Waste recycled at households (HHW2), Waste discharged for collection (HHW3) and Waste disposed of by households themselves (HHW4).

The table below presents the generation rates for the waste categories in both urban and rural areas in the target municipalities.

Table 1-9. Waste generation rate in the target municipalities

Municipality	Area	HHW1 (g/psn/day)	HHW2 (g/psn/day)	HHW3 (g/psn/day)	HHW4 (g/psn/day)	Total (g/psn/day)
Kab. Mojokerto	Rural	0	45	0	280	325
	Urban	1	2	334	9	346
	Subtotal	**1**	**24**	**162**	**149**	**336**
Kota Mojokerto	Urban	3	7	321	24	355
	Subtotal	**3**	**7**	**321**	**24**	**355**
Kab. Bangkalan	Rural	13	9	19	216	257
	Urban	8	1	339	50	397
	Subtotal	**11**	**5**	**154**	**146**	**316**
Kab. Lamongan	Rural	26	57	241	29	354
	Urban	37	27	303	9	376
	Subtotal	**32**	**42**	**273**	**19**	**366**

Kab. Sidoarjo	Rural	3	5	29	220	257
	Urban	31	54	286	0	370
	Subtotal	**16**	**29**	**154**	**113**	**312**
Kab. Gresik	Rural	4	2	217	14	237
	Urban	3	0	242	102	347
	Subtotal	**3**	**1**	**229**	**55**	**288**

As Kota Mojokerto does not have rural areas, all *kelurahans* in the municipality are urban areas. According to the WACS results, waste generation rates estimated for the rural areas are usually smaller than those for the urban areas. There are no collection services (TPSs) in the rural areas selected in Kabupaten Mojokerto, Kabupaten Bangkalan, and Kabupaten Sidoarjo; HHW4 in the rural areas occupies more than 84% in the total generation rate of household waste. As for Gresik, HHW4 in the rural areas accounted for 6% of the generation rate of household waste since most of the selected rural households received collection services. In contrast, with the TPSs located far, many urban households did not receive collection service. Some of the urban households did not want to pay and rejected collection services (based on the interviews with the households). Therefore, HHW4, in the urban area, occupied a significant share in the generation rate of household waste (around 30%).

Table 1-10. Share of HHW1 to 4 in the generation rate of household waste

Municipality	Area	HHW1	HHW2	HHW3	HHW4	Total
Kab. Mojokerto	Rural	0.00%	13.85%	0.00%	86.15%	100.00%
	Urban	0.29%	0.58%	96.53%	2.60%	100.00%
	Subtotal	**0.30%**	**7.14%**	**48.21%**	**44.35%**	**100.00%**
Kota Mojokerto	Urban	0.85%	1.97%	90.42%	6.76%	100.00%
	Subtotal	**0.85%**	**1.97%**	**90.42%**	**6.76%**	**100.00%**
Kab. Bangkalan	Rural	5.06%	3.50%	7.39%	84.05%	100.00%
	Urban	2.02%	0.25%	85.39%	12.59%	100.00%
	Subtotal	**3.48%**	**1.58%**	**48.73%**	**46.20%**	**100.00%**
Kab. Lamongan	Rural	7.34%	16.10%	68.08%	8.19%	100.00%
	Urban	9.84%	7.18%	80.59%	2.39%	100.00%
	Subtotal	**8.74%**	**11.48%**	**74.59%**	**5.19%**	**100.00%**
Kab. Sidoarjo	Rural	1.17%	1.95%	11.28%	85.60%	100.00%
	Urban	8.38%	14.59%	77.30%	0.00%	100.00%
	Subtotal	**5.13%**	**9.29%**	**49.36%**	**36.22%**	**100.00%**
Kab. Gresik	Rural	1.69%	0.84%	91.56%	5.91%	100.00%
	Urban	0.86%	0.00%	69.74%	29.39%	100.00%
	Subtotal	**1.04%**	**0.35%**	**79.51%**	**19.10%**	**100.00%**

(2) Physical composition

Table 1-11 shows the estimated physical composition of household waste in the target municipalities.

Table 1-11. The physical composition of household waste

Waste types	Kab. Mojokerto			Kota Mojokerto			Kab. Bangkalan		
	Rural	Urban	**Total**	Rural	Urban	**Total**	Rural	Urban	**Total**
Glass bottles	0.00%	0.50%	**0.27%**		0.70%	**0.70%**	0.00%	1.73%	**0.90%**
Glass, ceramics and stones	1.04%	0.66%	**0.84%**		0.83%	**0.83%**	2.39%	1.70%	**2.03%**
Kitchen waste	63.33%	70.07%	**66.95%**		67.85%	**67.85%**	50.57%	53.94%	**52.32%**
Metal: Can	0.05%	0.63%	**0.36%**		0.68%	**0.68%**	0.21%	0.19%	**0.20%**
Metal: Other metal	0.18%	0.05%	**0.11%**		0.21%	**0.21%**	0.30%	0.54%	**0.43%**
Others	2.31%	3.29%	**2.83%**		2.45%	**2.45%**	3.23%	2.42%	**2.81%**
Paper: Cardboard	0.41%	0.58%	**0.50%**		0.52%	**0.52%**	0.42%	0.34%	**0.38%**
Paper: Other paper	6.85%	5.82%	**6.30%**		7.35%	**7.35%**	7.91%	10.66%	**9.34%**
Plastic: Hard plastic	1.20%	1.17%	**1.18%**		1.78%	**1.78%**	0.94%	2.04%	**1.51%**
Plastic: Pet bottles	2.92%	1.75%	**2.29%**		2.06%	**2.06%**	6.25%	2.97%	**4.54%**
Plastic: Soft plastic	8.00%	7.67%	**7.82%**		9.21%	**9.21%**	8.09%	9.69%	**8.92%**
Rubber and leather	0.69%	0.84%	**0.77%**		0.70%	**0.70%**	0.33%	0.24%	**0.29%**
Textile	1.71%	0.84%	**1.24%**		0.68%	**0.68%**	1.01%	1.03%	**1.02%**
Wood and grass	11.33%	6.14%	**8.54%**		4.98%	**4.98%**	18.35%	12.53%	**15.32%**
Subtotal	**100.00%**	**100.00%**	**100.00%**		**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Waste types	Kab. Lamongan			Kab. Sidoarjo			Kab. Gresik		
	Rural	Urban	**Total**	Rural	Urban	**Total**	Rural	Urban	**Total**
Glass bottles	0.06%	0.01%	**0.03%**	0.00%	0.39%	**0.23%**	0.00%	0.08%	**0.05%**
Glass, ceramics and stones	0.37%	0.58%	**0.48%**	0.20%	0.88%	**0.60%**	3.04%	1.09%	**1.79%**
Kitchen waste	61.82%	57.10%	**59.27%**	58.70%	54.25%	**56.10%**	61.33%	69.21%	**66.41%**
Metal: Can	0.09%	0.05%	**0.07%**	0.18%	0.07%	**0.12%**	0.20%	0.13%	**0.15%**
Metal: Other metal	1.11%	0.46%	**0.76%**	0.38%	0.75%	**0.59%**	0.10%	0.26%	**0.20%**
Others	9.87%	11.40%	**10.69%**	11.01%	5.89%	**8.03%**	10.09%	6.78%	**7.96%**
Paper: Cardboard	0.68%	2.57%	**1.70%**	0.26%	1.12%	**0.77%**	1.10%	0.49%	**0.71%**
Paper: Other paper	6.78%	8.88%	**7.92%**	9.27%	10.69%	**10.10%**	5.61%	6.20%	**5.99%**
Plastic: Hard plastic	2.58%	2.99%	**2.80%**	1.41%	4.80%	**3.39%**	1.59%	1.58%	**1.59%**
Plastic: Pet bottles	3.62%	3.62%	**3.62%**	3.20%	2.46%	**2.77%**	2.29%	1.68%	**1.90%**
Plastic: Soft plastic	8.31%	8.45%	**8.39%**	11.50%	8.92%	**9.99%**	11.20%	7.75%	**8.98%**
Rubber and leather	0.04%	0.40%	**0.24%**	0.26%	0.07%	**0.15%**	0.17%	0.52%	**0.39%**
Textile	1.67%	0.92%	**1.26%**	0.93%	1.99%	**1.55%**	0.83%	0.77%	**0.79%**
Wood and grass	3.01%	2.58%	**2.78%**	2.70%	7.74%	**5.64%**	2.47%	3.46%	**3.11%**
Subtotal	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

According to the table, kitchen waste occupies the biggest share (52% to 67%) in the household waste, regardless of municipalities. The second biggest share is occupied by wood & grass in Kab. Mojokerto (8.5%) and Kab. Bangkalan (15%), soft plastics in Kota Mojokerto (9.2%) and Kab. Gresik (9%), papers in Kab. Sidoarjo (10%), and other waste in Kab. Lamongan (10.7%). All the other types of waste account for less than 10% of the household waste.

In general, the physical composition of household waste in the target municipalities can be considered similar.

(3) Apparent specific gravity

Using the samples of WCS, the survey team estimated the apparent specific gravity of household waste for the rural and urban areas in each of the municipalities. The table below shows the calculated values.

Table 1-12. The apparent specific gravity of household waste

Municipality name	Area	Weight (kg)	Volume (liter)	Apparent Specific Gravity (g/liter)
Kab. Bangkalan	Rural	129.290	1,027.4	126
	Urban	173.630	1,388.9	125
	Subtotal	**302.920**	**2,416.3**	**125**
Kab. Mojokerto	Rural	153.330	1,334.6	115
	Urban	172.240	1,148.5	150
	Subtotal	**325.570**	**2,483.1**	**131**
Kota Mojokerto	Urban	326.381	1,706.2	191
	Subtotal	**326.381**	**1,706.2**	**191**
Kab. Lamongan	Rural	203.930	952.3	214
	Urban	240.280	1,117.2	215
	Subtotal	**444.210**	**2,069.5**	**215**
Kab. Sidoarjo	Rural	110.860	741.3	150
	Urban	128.300	817.6	157
	Subtotal	**239.160**	**1,558.9**	**153**
Kab. Gresik	Rural	137.890	918.2	150
	Urban	155.890	1,156.2	135
	Subtotal	**293.780**	**2,074.4**	**142**

1.4 Comparison of the results with the existing surveys

Five types of generation rates were estimated from the results of this survey: the generation rates for HHW1, HHW2, HHW3 and HHW4, and the overall rate of household waste ("Total" in "Table 1-9. Waste generation rate in the target municipalities", which is equal to the sum of HHW1 to 4). Since the sample was not sufficiently big (40 households/municipality), some of the rates estimated for HHW1 to 4 might be affected by the conditions of the selected areas and selected households.

The table below compares the overall generation rates of household waste with the figures being used by the municipalities.

The team was not able to collect the existing data of WACS from Kota Mojokerto and Kab. Lamongan. According to the DLH of Bangkalan, the municipality never conducted a WACS before. Therefore, the generation rates estimated for Kab. Sidoarjo, Kab. Mojokerto and Kab. Gresik were compared with the data of previous surveys conducted by these municipalities (Table 1-13).

Table 1-13. Comparison of results with the existing data

Municipality	Unit	The generation rates estimated under this survey	The generation rates of Municipality WACS*
Kab. Sidoarjo	g/person/day	312	540
Kab. Mojokerto	g/person/day	336	390
	liter/person/day	2.5 (336 g x 131 g/liter)[1]	2.5
Kab. Gresik	g/person/day	288	280
			340

Note: (1) **Kab. Sidoarjo:** "540 g/person/day" was taken from the presentation document "KAJIAN KEBIJAKAN HYBRID – Pembangkit Listrik Tenaga Sampah (PLTSa) & Sanitary Landfill" provided by the DLH of Sidoarjo; (2) **Kab. Mojokerto:** "390 g/person/day or 2.5 liters/person/day" was taken from the SWM Master Plan prepared by the municipality; (3) **Kab. Gresik:** Data were obtained through an interview with the DLH of Gresik. "280 g/person/day" is the result of the WACS conducted in 2016, while "340 g/person/day" is the result of WACS conducted in 2019.

The following are the major points identified through the comparison:

- According to the table, there has been a big difference between the generation rates estimated for Sidoarjo under this survey (312 g/person/day) and the rate being used by Kab. Sidoarjo (540 g/person/day). Since the generation rates being used in other municipalities are less than 400 g/person/day, it was assumed that the rate 540 g/person/day includes not only household waste but also household-like waste to be generated by sources other than households such as businesses, offices, and road-sweeping activity.
- The Kab. Mojokerto uses the generation rate of 390 g/person/day, which is 16% higher than the rate estimated under this survey (336 g/person/day). Despite the difference, the volume of waste to be generated a person per day (2.5 liters/person/day) is the same as the result of the WACS conducted by the project team (336 g/person/day ÷ 131 g/liter).
- The DLH of Kab. Gresik conducted WACS twice in 2016 and 2019. The generation rate was estimated to be 280 g/person/day in 2016 and 340 g/person/day in 2019. The 2016 survey covered the central part of the municipality while the other targeted households in the northern region. The waste generation rate estimated under this survey (288 g/person/day) is almost the same as the result of WACS conducted by the municipality in 2016.

Based on the above points, the generation rates of household waste estimated under this survey can be said to be similar to those of the WACS conducted by the municipalities; and therefore, the accuracy of the survey results can be considered sufficient enough.

1.5 Waste Amount and Composition of Surabaya City

Although neither waste amount survey nor waste composition survey was not carried out in this project, the

[1] "131 g/liter" is the apparent specific gravity estimated from the waste of Kab. Mojokerto under this survey ("Table 1-12. The apparent specific gravity of household waste").

short-term expert team collected relevant information of waste amount and composition of Surabaya City.

Waste generation in 2018 is reported as 2,206 ton/day by the Jakstrada Performance Report and household waste generation is calculated at 894.46 ton/day. Therefore, household like waste generation is 1,311.54 ton/day. This means household like waste is about 1.5 times more than household waste.

Waste generation rate is calculated to be at 716 g/person/day in terms of municipal waste (household + household like waste) using population data at 3,080,185 of 2018.

As for waste composition, a study done by Surabaya Institute of Technology gave the following results.

Table 1-14 Waste Composition of Surabaya City

	Rural	Urban
Kitchen waste	75%	74%
Plastic	11%	11%
Paper	7%	9%
Metal	1%	1%
Glass	1%	1%
Textile	1%	0%
Wood	1%	1%
Rubber	0%	0%
Diapers	1%	2%
Hazardous	0%	0%
Others	1%	1%

Source: Source: Jurnal Teknik ITS – Laju Timbulan dan Komposisi Sampah Rumah Tangga di Kecamatan Sukolilo Surabaya (HH Waste Generation rate and composition in Kecamatan Sukolilo Surabaya) by Devy Safitri Ayu Hapsari and Welly Herimurti, ITS 2017

Chapter 2 Waste Flow Analysis

2.1 Objectives

- To understand how the waste is managed as a holistic manner.
- To estimate the future waste flow, particularly future waste disposal amount, to understand the future issues.

2.2 Basics of Flow Analysis

2.2.1 Basic Waste Flow

Target waste of the study is divided into **HH Waste** and **HHL (Household Like) Waste**. A basic waste flow is designed as shown in Figure 2-1. Numerical information will be added to this flow.

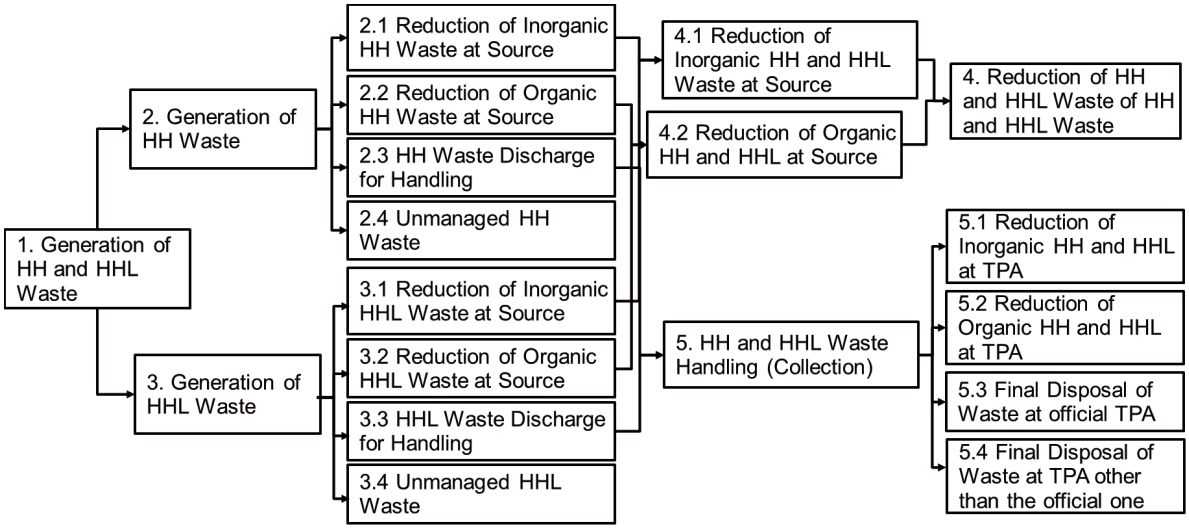


Figure 2-1. Basic Waste Flow Structure

2.2.2 Conditions for HH Waste Flow Development

As shown in Section 1.2.1, HH waste is categorized into 4 HHW i(1-4) and a HH waste flow is simply developed by the formula:

Generation Amount of HHW i = Generation Rate of HHW i x Population in 2019.

Where:

Generation Rate: 4 Rates of HHWi obtained by the WACS as shown in Table 1-9.

Population Data: Based on Badan Pusat Statistik (BPS) of each Kota & Regency, "KECAMATAN DALAM ANGKA-2019", 2019.

As for the classification of Urban and Rural, we referred to data from Statistics Office, "KLASIFIKASI PERKOTAAN DAN PERDESAAN DI INDONESIA", 2010.

For the limitation of time and budget, we limited the number of samples to only 40 for each municipality. To solve this point, WACS results of 6 municipalities (in total 240 samples) and 400 respondents of Public Opinion Survey for each municipality were referred.

2.2.3 Conditions for HHL Waste Flow Development

Same as HHW, HHL waste (HHLW) is categorized into HHLW i(1-4). In theory:

Generation Amount of HHLW i
= Generation Rate of HHLW i x Number of Generation Source of HHW i in 2019.

The application of theoretical calculation has such difficulties as

1. Contrary to HHW there are many kinds of waste generation sources of HHLW.
2. It needs a lot of time and efforts to know generation rate of each generation source
3. There may not be enough statistical data on the number of generation sources.

In this study, we decided to make the most of the data already in Jakstrada instead of applying the abovementioned calculation. Specifically:

- Use of Jakstrada Achievement Report 2018 as follows:

1. For development of "Flow 4. Reduction of HH and HHL Waste at Source", Flow 4.1 and Flow 4.2, "2018 WASTE REDUCTION PERFORMANCE REPORT" is used.
2. For Flow 5.1 and 5.2, "2018 WASTE HANDLING PERFORMANCE REPORT" is referred.
3. For Unmanaged Waste, "WASTE MANAGEMENT Balance 2018" is referred.

- Use of Available Data and Report: As for the "Flow 5.3 Final Disposal of Waste at Official TPA", use "Current Final Disposal Amount Data observed at the TPA".
- Then, Amount of HHLW i = Total Amount of Waste (HHW i + HHLW i) - Amount of HHW i.

There are some other specific issues in waste flow development for each municipality. They are explained in the following sections, together with the waste flow analysis results.

2.3 Gresik

2.3.1 Specific Conditions

Flow 1 & Flow 2

Flow 1. Generation of HH and HHL Waste = Flow 2 + Flow 3

Flow 2. Generation of HH Waste = Flow 2.1 + 2.2 + 2.3 + 2.4

Flow 2.1, 2.2, 2.3, 2.4 are calculated by multiplying the generation rate of each HHW of WACS with the population of 2019 as follows:

1. According to the BPS, the population and urban-rural population ratio of the Kab. in 2018: 1,335,698, Rural: 0.439 (586,571), Urban: 0.561 (749,127).
2. Population increase rate in 2019 is 0.01120 according to the "Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency".
3. Based on the increase rate the population of the Kab. in 2019: 1,350,658, Rural: 0.439 (592,939), Urban: 0.561 (757,719).

Flow 3

For "Flow 3 Generation of HHL Waste", the Waste Generation of 6,798 sources of A. Reduction of waste generation of "2018 Waste Reduction Performance Report" of Jakstrada was adopted. => 166.83 ton/day

Flow 3.1, 3.2, 3.3, 3.4 are calculated as follows:

1. 3.1 Reduction of Inorganic HHL Waste at Source:
   Flow 3.1 = Flow 4.1 - Flow 2.1
2. 3.2 Reduction of Inorganic HHL Waste at Source:
   Flow 3.2 = Flow 4.2 - Flow 2.2
3. 3.3 HHL Waste Discharge for Handling:
   Flow 3.3 = Flow 3 – (Flow 3.1 + 3.2 + 3.4)
4. 3.4 Unmanaged HHL Waste: Use "V. Unmanaged Waste Amount in "Waste Management Balance" of Jakstada" (142.38 ton/day) Flow 3.4 (56.79) = 142.38 – Flow 2.4 (85.59)

Flow 4

Flow 4.1 Reduction of Inorganic HH and HHL Waste at Source = Reduced Waste Amount of "A. Reduction of waste generation" and "B. Amount of waste utilized in the sources" mentioned in "2018 Waste Reduction Performance Report" in the JAKSTRADA.
=> 10.61 + 2.30 = 12.91 ton/day

Flow 4.2 Reduction of Organic HH and HHL Waste at Source = "Reduced Waste Amount of C. Amount of waste recycled in the sources in 2018 Waste Reduction Performance Report of JAKSTRADA + "Flow 2.2 Reduction of Organic HH Waste at Source".
=> 3.35 + 1.19 = 4.54 ton/day

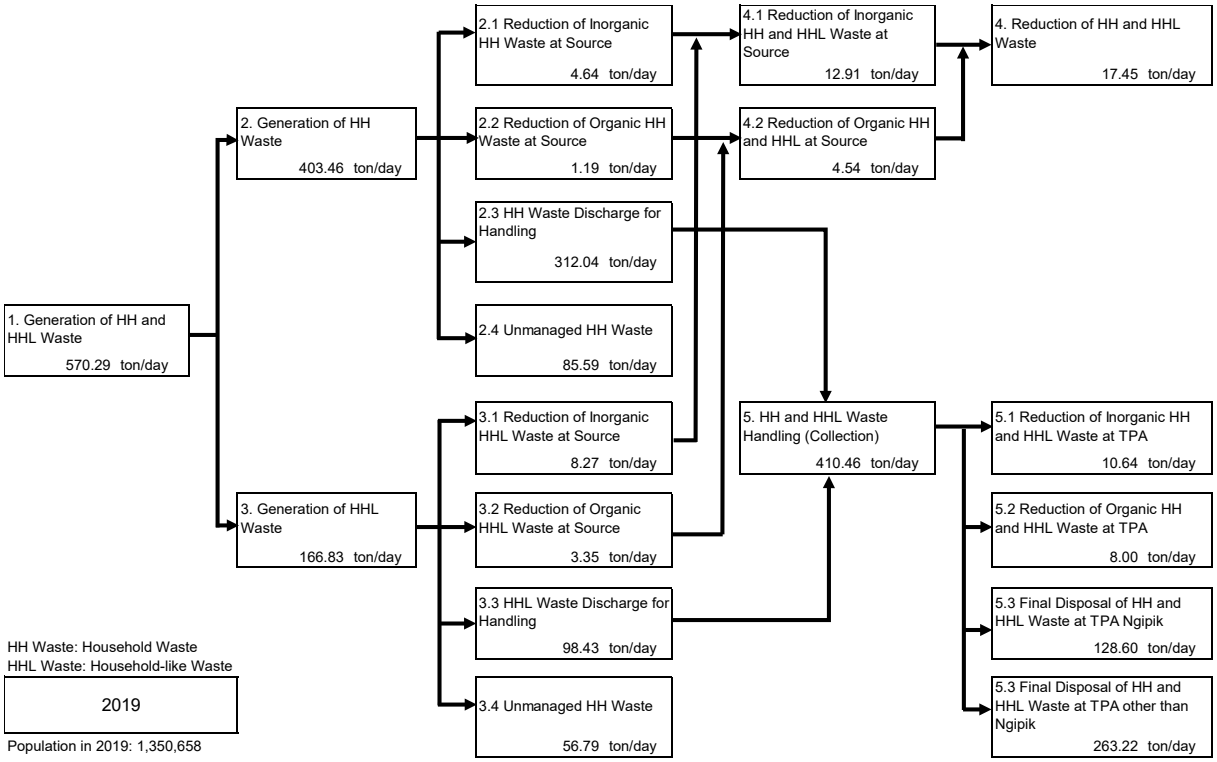
Flow 4 = Flow 4.1 + Flow 4.2

Flow 5
Flow 5. HH and HHL Waste Handling = Flow 2.3 + Flow 3.3
Flow 5.1, 5.2, 5.3, 5.4 are calculated as follows:

1. 5.1 Reduction of Inorganic HH and HHL Waste at TPA Ngipik: Reduced Waste Amount, 8.64 ton/day of "C.3 Plastic/paper recovery by waste collectors" + 2.00 ton/day of "C.5 Inorganic Waste Management by the government in TPA" shown in 2018 Waste Handling Performance Report. => 8.64 + 2.00 = 10.64
2. 5.2 Reduction of Organic HH and HHL Waste at TPA Ngipik: Reduced Waste Amount, 0.00 ton/day of "A. Waste processed into raw material (composting) + Reduced Waste Amount, 8.00 ton/day of "C. 4 Composting managed by the government in TPA" => 0.00 + 8.00 = 8.00
3. 5.3 Final Disposal of HH and HHL Waste at TPA Ngipik: Daily average disposal amount measured by the weighbridge of TPA Ngipik from Sep 9 to 30, 2019: 128.60 ton/day
4. 5.4 Final Disposal of HH and HHL Waste at other than TPA Ngipik:
   Flow 5.4 = Flow 5 – (Flow 5.1 + 5.2 + 5.3)

   Note: According to the results of POS and WACS, amount of collection (Handling) is larger than amount of waste reduced and disposed of at TPA Ngipik. In addition the administrative area of Kab. Gresik is very large. Large amount of the collected waste, therefore, are disposed of at TPA other than TPA Ngipik.

2.3.2 Current Waste Flow

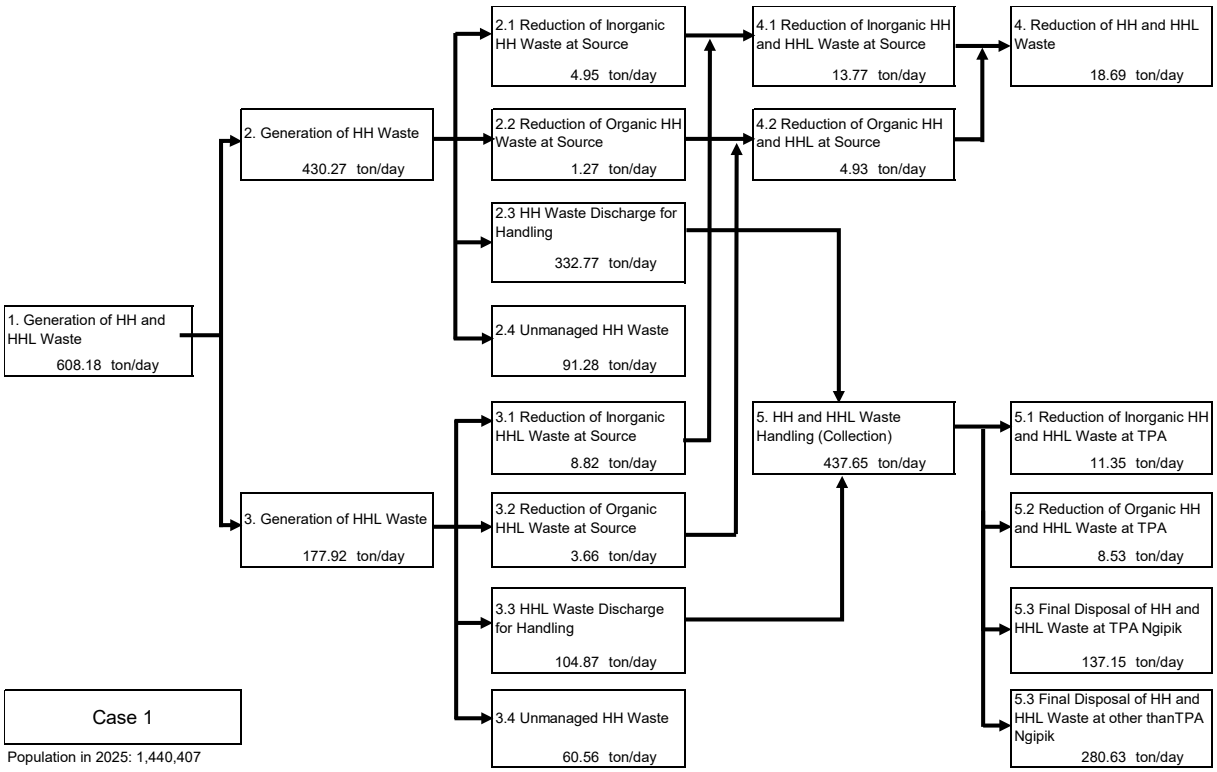


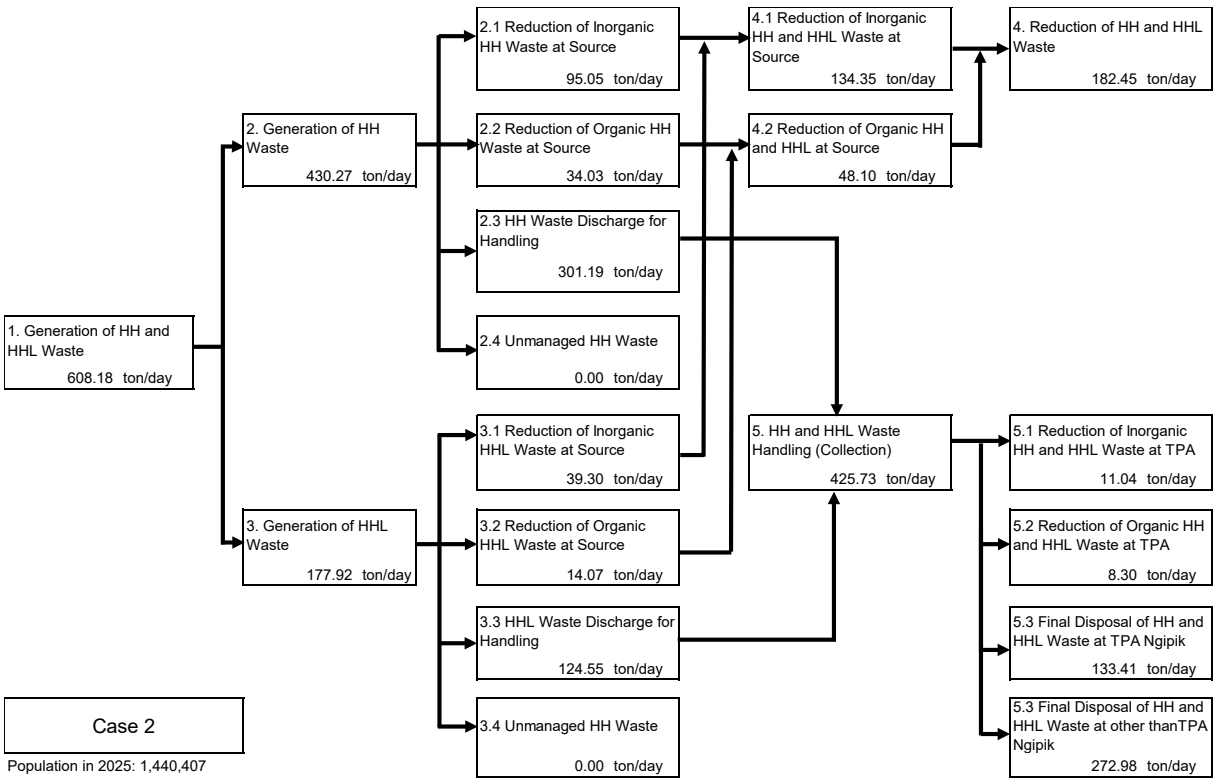
2.3.3 Future Waste Flow

Future Waste Flow is developed based on the following assumption:

1. **Same as JAKSTRADA, the <u>Target year is 2025</u>.**
2. According to "Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency" population increase rate up to 2025 is **<u>0.01078.</u>**
3. Based on the increase rate population in 2025 is **<u>1,440,407.</u>**
4. Waste generation rate (g/person/day) obtained by WACS is not changed until 2025.

5. Generation amount of HHW & HHLW increases in accordance with the population.
6. Future Waste Flow of the following two cases is developed:
   - Case 1: Rates of Reduction, Handling and Unmanaged wastes will not be changed.
   - Case 2: Rates of Reduction, Handling and Unmanaged wastes will be 30 %, 70 % and 0 % in 2025 according to the Target of Jakstrada.





2.4 Bangkalan

2.4.1 Sepcific Conditions

Flow 2. Generation of HH Waste = Flow 2.1 + 2.2 + 2.3 + 2.4

- Flow 2.1, 2.2, 2.3, 2.4 are calculated by multiplying the generation rate of each HHW of WACS, population and urban-rural population ratio in 2019 as follows:

1. According to the BPS, the population and urban-rural ratio of the regency in 2018: 1,071,199, Rural: 0.777 (831,861), Urban: 0.223 (239,338).
2. Population increase rate in 2019 is 0.00843 according to the "Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency".
3. Based on the increase rate the population and urban-rural ratio of the regency in 2019: 1,080,229, Rural: 0.777 (839,338), Urban: 0.223 (240,891).

Flow 3 Generation of HHL Waste: Flow 3 = Flow 1 – Flow 2

- Flow 3.1, 3.2, 3.3, 3.4 are calculated as follows:

1. 3.1 Reduction of Inorganic HHL Waste at Source: Flow 3.1 = Flow 4.1 - Flow 2.1
2. 3.2 Reduction of Inorganic HHL Waste at Source: Flow 3.2 = Flow 4.2 - Flow 2.2
3. 3.3 HHL Waste Discharge for Handling: Collection rate (67.5%) of POS is used. => Flow 3.3 = 0.675 x Flow 3
4. 3.4 Unmanaged HHL Waste: Flow 3.4 = Flow 3 – (Flow 3.1 + 3.2 + 3.3)

- To be noted that "V. Unmanaged Waste Percentage (75.66%)" shown in "Waste Management Balance" of Jakstada is not applied to, since if it is applied, Flow 3.3 becomes minus.

"Flow 4. Reduction of HH and HHL Waste at Source" is calculated as follows:

1. Flow 4.1 Reduction of Inorganic HH and HHL Waste at Source
   = Reduced Waste Amount of "A. Reduction of waste generation" and "B. Amount of waste utilized in the sources" mentioned in "2018 Waste Reduction Performance Report" in JAKSTRADA.
   => 11.17 + 10.85 = 22.02 ton/day
2. Flow 4.2 Reduction of Organic HH and HHL Waste at Source
   = "Reduced Waste Amount of C. Amount of waste recycled in the sources in 2018 Waste Reduction Performance Report of JAKSTRADA" + "Flow 2.2 Reduction of Organic HH Waste at Source".
   => 0.30 + 7.79 = 8.09 ton/day
3. Flow 4 = Flow 4.1 + Flow 4.2

Flow 5. HH and HHL Waste Handling = Flow 2.3 + Flow 3.3

- Flow 5.1, 5.2, 5.3, 5.4 are calculated as follows:

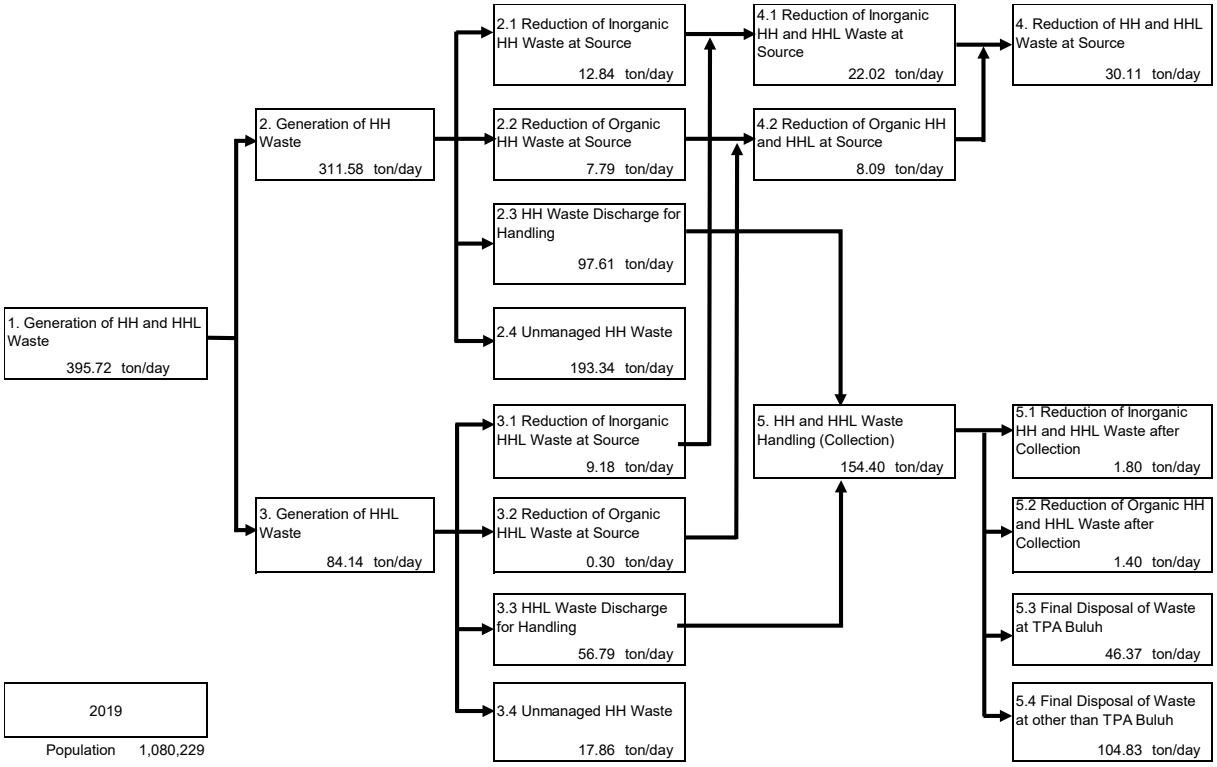
1. 5.1 Reduction of Inorganic HH and HHL Waste after Collection: Reduced Waste Amount, 1.80 ton/day of "C.3 Plastic/paper recovery by waste collectors" shown in 2018 Waste Handling Performance Report.
2. 5.2 Reduction of Organic HH and HHL Waste after Collection: Reduced Waste Amount, 0.90 ton/day of "A.3 Composting at TPST managed by the government" + Reduced Waste Amount, 0.50 ton/day of "C. 4 Composting managed by the government in TPA"
   => 0.90 + 0.50 = 1.40
3. 5.3 Final Disposal of HH and HHL Waste at TPA Buluh: Daily average disposal amount estimated by the record of Incoming Vehicle Data of TPA Buluh in Sep16-22, 2019:

Dump truck (6m3) 10 trips/day + Container truck (6m3) 12.43 trips/day
=> (6 x 10 x 0.4) + (6 x 12.43 x 0.3) = 46.37 ton/day

4. 5.4 Final Disposal of HH and HHL Waste at other than TPA Buluh:
Flow 5.4 = Flow 5 – (Flow 5.1 + 5.2 + 5.3)

- To be noted that according to the results of POS and WACS, amount of collection (Handling) is larger than amount of waste reduced and disposed of at TPA Buluh. In addition the administrative area of Bangkalan Regency is very large. Large amount of the collected waste, therefore, are considered to be disposed of at other than TPA Buluh.

2.4.2 Current Waste Flow

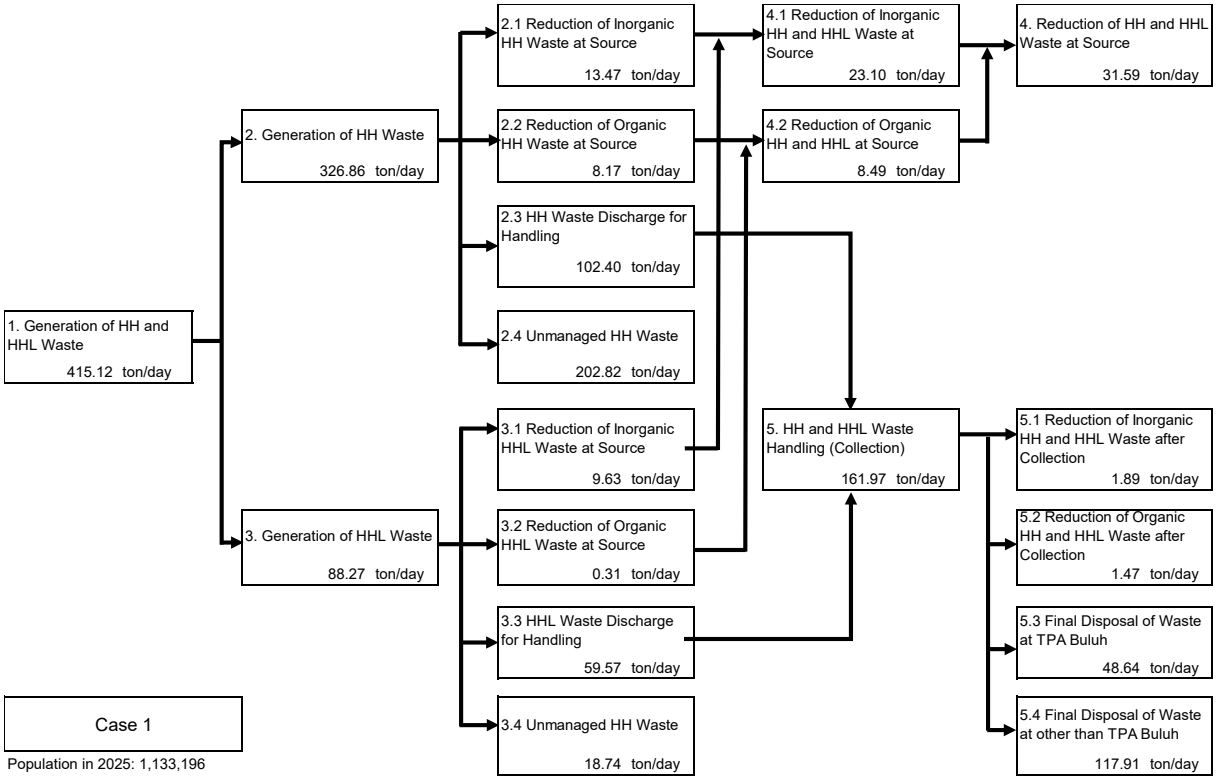


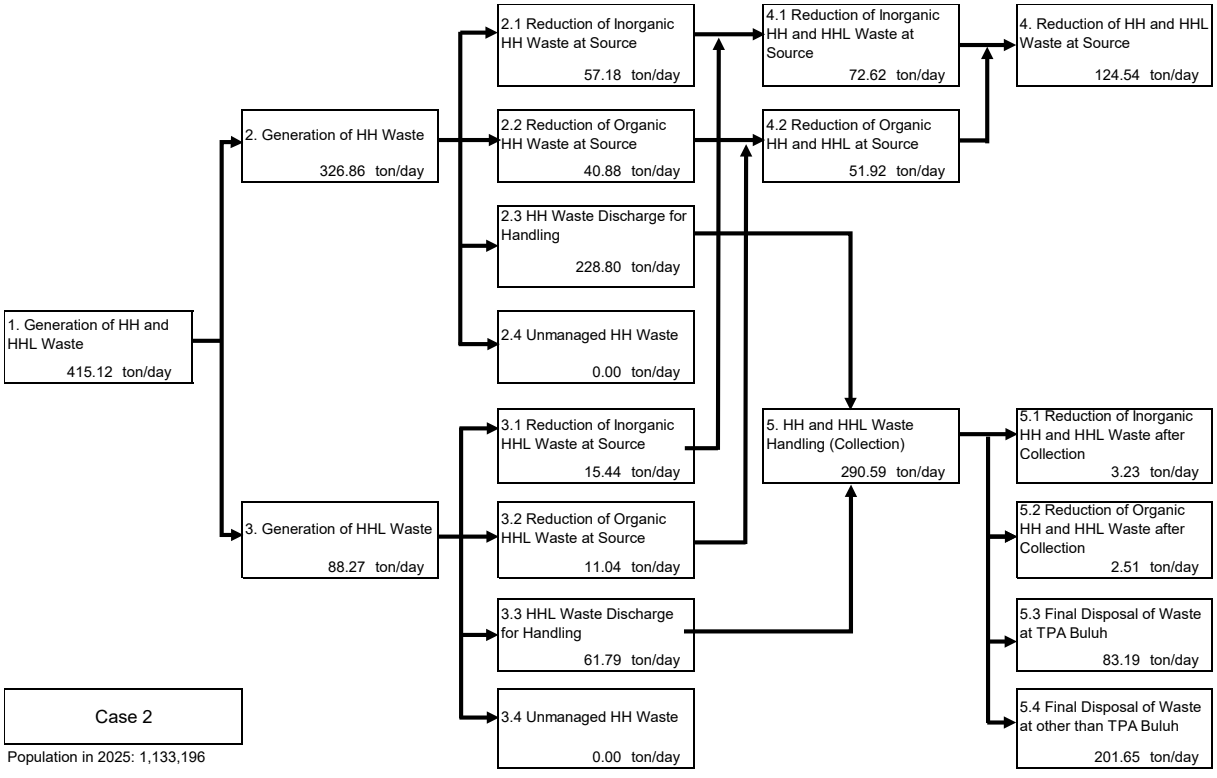
2.4.3 Future Waste Flow

Future Waste Flow is developed based on the following assumption:

1. **Same as JAKSTRADA, the <u>Target year is 2025</u>.**
2. According to "Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency" population increase rate up to 2025 is **<u>0.00801.</u>**
3. Based on the increase rate population in 2025 is **<u>1,133,196.</u>**
4. Waste generation rate (g/person/day) obtained by WACS is not changed until 2025.
5. Generation amount of HHW & HHLW increases in accordance with the population.
6. Future Waste Flow of the following two cases is developed:

    - Case 1: Rates of Reduction, Handling and Unmanaged wastes will not be changed.
    - Case 2: Rates of Reduction, Handling and Unmanaged wastes will be 30 %, 70 % and 0 % in 2025 according to the Target of Jakstrada.


1. Generation of HH and HHL Waste
415.12 ton/day
2. Generation of HH Waste
326.86 ton/day
3. Generation of HHL Waste
88.27 ton/day
2.1 Reduction of Inorganic HH Waste at Source
13.47 ton/day
2.2 Reduction of Organic HH Waste at Source
8.17 ton/day
2.3 HH Waste Discharge for Handling
102.40 ton/day
2.4 Unmanaged HH Waste
202.82 ton/day
3.1 Reduction of Inorganic HHL Waste at Source
9.63 ton/day
3.2 Reduction of Organic HHL Waste at Source
0.31 ton/day
3.3 HHL Waste Discharge for Handling
59.57 ton/day
3.4 Unmanaged HH Waste
18.74 ton/day
4.1 Reduction of Inorganic HH and HHL Waste at Source
23.10 ton/day
4.2 Reduction of Organic HH and HHL at Source
8.49 ton/day
4. Reduction of HH and HHL Waste at Source
31.59 ton/day
5. HH and HHL Waste Handling (Collection)
161.97 ton/day
5.1 Reduction of Inorganic HH and HHL Waste after Collection
1.89 ton/day
5.2 Reduction of Organic HH and HHL Waste after Collection
1.47 ton/day
5.3 Final Disposal of Waste at TPA Buluh
48.64 ton/day
5.4 Final Disposal of Waste at other than TPA Buluh
117.91 ton/day
Case 1
Population in 2025: 1,133,196


1. Generation of HH and HHL Waste
415.12 ton/day
2. Generation of HH Waste
326.86 ton/day
3. Generation of HHL Waste
88.27 ton/day
2.1 Reduction of Inorganic HH Waste at Source
57.18 ton/day
2.2 Reduction of Organic HH Waste at Source
40.88 ton/day
2.3 HH Waste Discharge for Handling
228.80 ton/day
2.4 Unmanaged HH Waste
0.00 ton/day
3.1 Reduction of Inorganic HHL Waste at Source
15.44 ton/day
3.2 Reduction of Organic HHL Waste at Source
11.04 ton/day
3.3 HHL Waste Discharge for Handling
61.79 ton/day
3.4 Unmanaged HH Waste
0.00 ton/day
4.1 Reduction of Inorganic HH and HHL Waste at Source
72.62 ton/day
4.2 Reduction of Organic HH and HHL at Source
51.92 ton/day
4. Reduction of HH and HHL Waste at Source
124.54 ton/day
5. HH and HHL Waste Handling (Collection)
290.59 ton/day
5.1 Reduction of Inorganic HH and HHL Waste after Collection
3.23 ton/day
5.2 Reduction of Organic HH and HHL Waste after Collection
2.51 ton/day
5.3 Final Disposal of Waste at TPA Buluh
83.19 ton/day
5.4 Final Disposal of Waste at other than TPA Buluh
201.65 ton/day
Case 2
Population in 2025: 1,133,196

2.5 Mojokerto City

2.5.1 Specific Condition

The specific condition for the development of Waste Flow for Kota Mojokerto is as follows:

- Flow 1. Generation of HH and HHL Waste = Flow 2 + Flow 3
- Flow 2. Generation of HH Waste = Flow 2.1 + 2.2 + 2.3 + 2.4
- Flow 2.1, 2.2, 2.3, 2.4 are calculated by multiplying the generation rate of each HHW of WACS with the population of 2019 as follows:

    1. According to the BPS, the population of the KOTA in 2018 is 143,377.
    2. Population increase rate in 2019 is 0.00721 according to the "Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency".
    3. Based on the increase rate the population of the KOTA in 2019 is 144,411.

- "Flow 3 Generation of HHL Waste "= Flow 3.1 + 3.2 + 3.3 + 3.4.

    1. "3.1 Reduction of Inorganic HHL Waste at Source " = Flow 4.1 - Flow 2.1.
    2. "3.2 Reduction of Inorganic HHL Waste at Source " = Flow 4.2 - Flow 2.2.
    3. "3.3 HHL Waste Discharge for Handling "= Flow 5. - Flow 2.3
    4. "3.4 Unmanaged HHL Waste" = "V. Unmanaged Waste Amount of Waste Management Balance of JAKSTRADA " - Flow2.4.

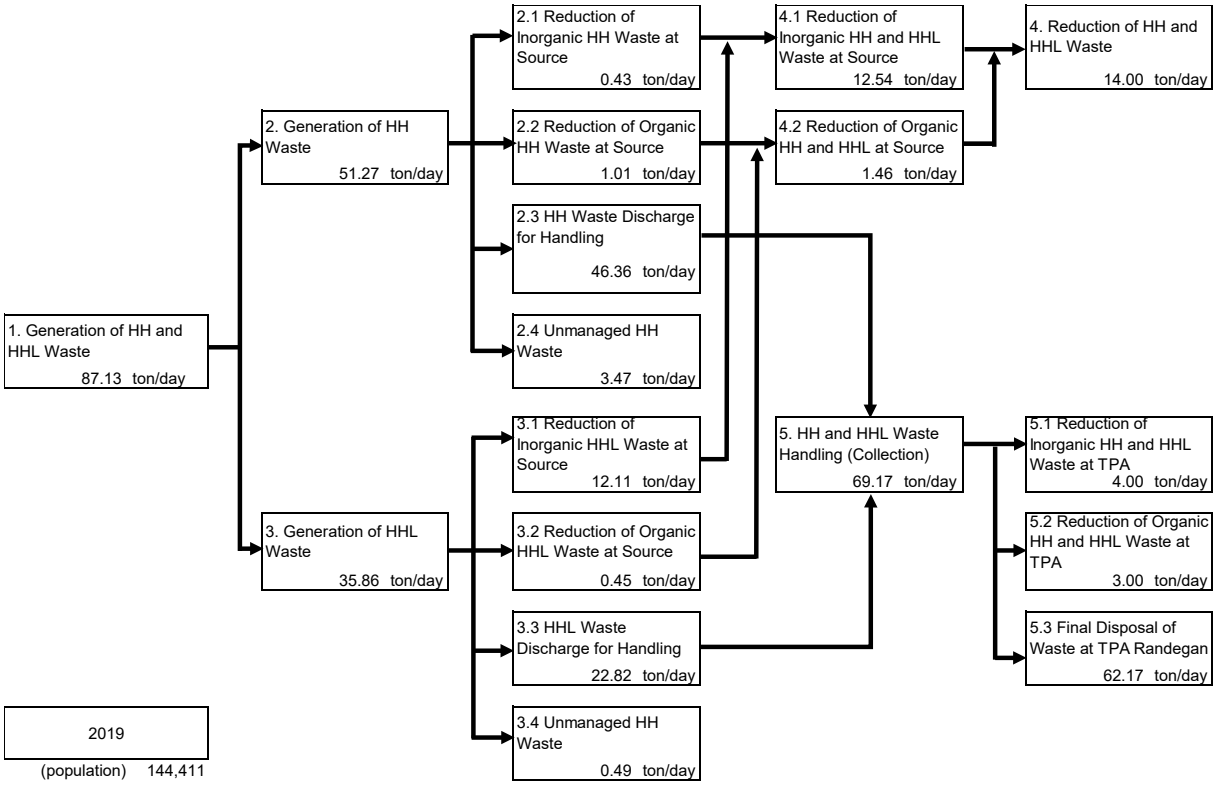
- Flow 4. Reduction of HH and HHL Waste at Source = Flow 4.1 + 4.2

    1. Flow 4.1 Reduction of Inorganic HH and HHL Waste at Source = Reduced Waste Amount of "A. Reduction of waste generation" and "B. Amount of waste utilized in the sources" mentioned in "2018 Waste Reduction Performance Report" in the JAKSTRADA.
       => 7.27 + 5.27 = 12.54 ton/day
    2. "Flow 4.2 Reduction of Organic HH and HHL Waste at Source" = "Reduced Waste Amount of C. Amount of waste recycled in the sources in 2018 Waste Reduction Performance Report of JAKSTRADA" + "Flow 2.2 Reduction of Organic HH Waste at Source".
       => 0.45 + 1.01 = 1.46 ton/day

- Flow 5 is "5. HH and HHL Waste Handling (Collection)" = Flow 5.1 + 5.2 + 5.3. Since composting is conducted only at TPA in September 2019, "A. Waste processed into raw material (composting)" of 2018 Waste Handling Performance Report" is not counted for Flow 5.2. Waste Generation of 96 ton/day of "A. Waste processed into raw material (composting)" is more than total waste generation of the Kota.

    1. "5.1 Reduction of Inorganic HH and HHL Waste at TPA" = Reduced Waste Amount, 4.00ton/day of "C.3 Plastic/paper recovery by waste collectors".
    2. "5.2 Reduction of Organic HH and HHL Waste at TPA" = Reduced Waste Amount, 3.00ton/day of "C. 4. Composting managed by the government in TPA"
    3. "5.3 Final Disposal of HH and HHL Waste": Daily average disposal amount measured by the Weighbridge from Sep.2 to Sep. 30, 2019.

2.5.2 Current Waste Flow

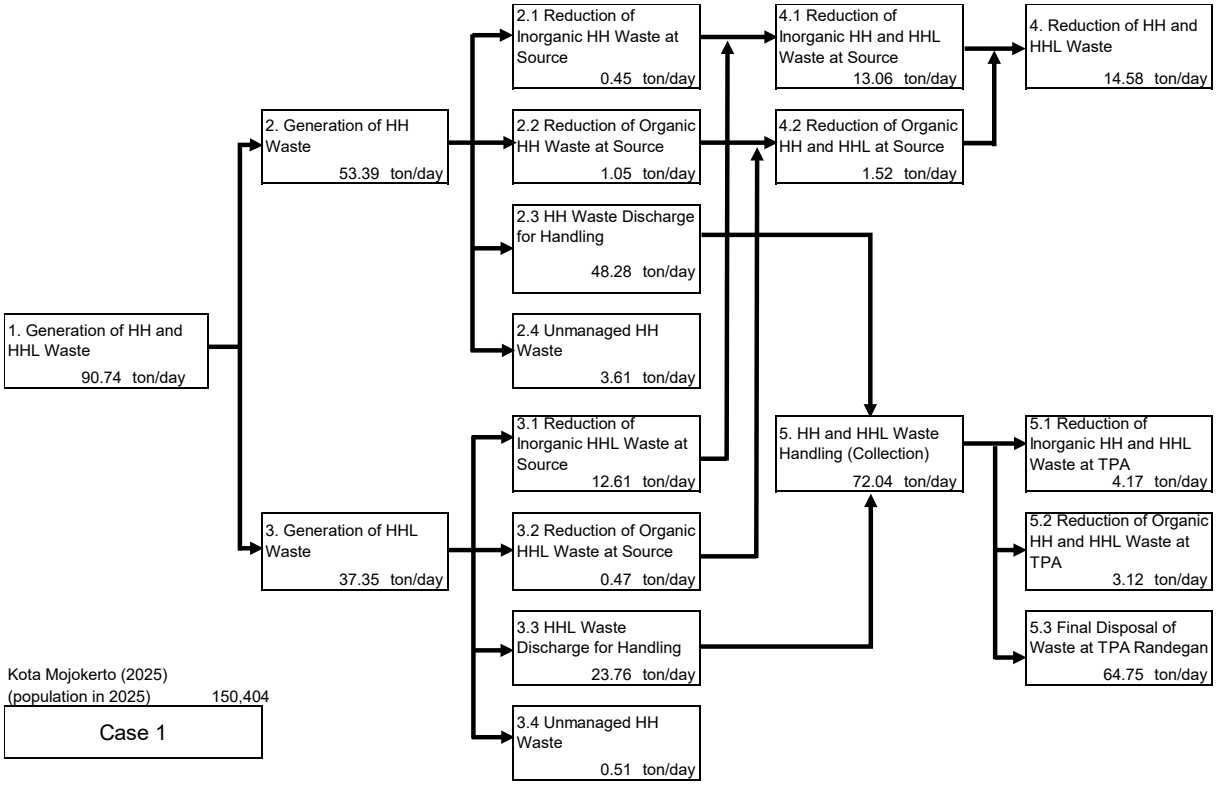


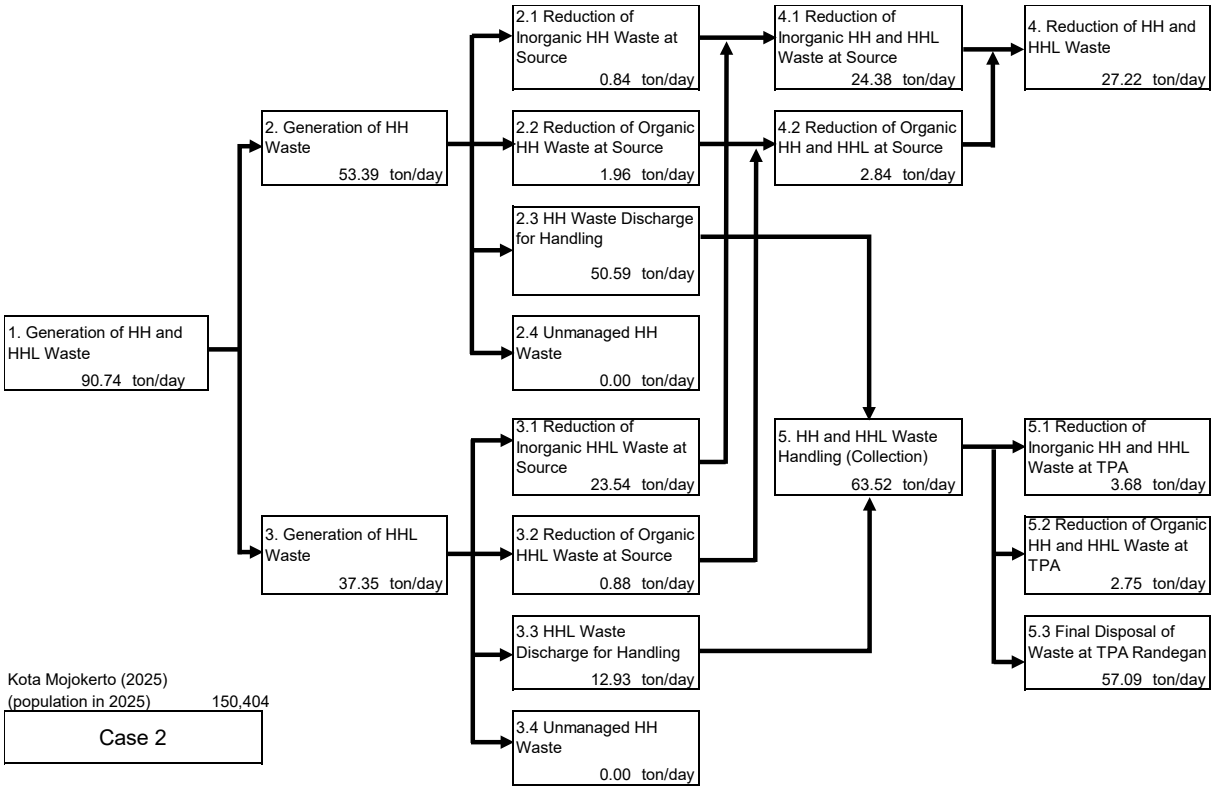
2.5.3 Future Waste Flow

Future Waste Flow is developed based on the following assumption:

1. **Same as JAKSTRADA, the <u>Target year is 2025</u>.**
2. According to 「Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency」 population increase rate up to 2025 is **<u>0.00680.</u>**
3. Based on the increase rate population in 2025 is **<u>150,404.</u>**
4. Waste generation rate (g/person/day) obtained by WACS is not changed until 2025.
5. Generation amount of HHW & HHLW increases in accordance with the population.
6. Future Waste Flow of the following two cases is developed:

    - Case 1: Rates of Reduction, Handling and Unmanaged wastes will not be changed.
    - Case 2: Rates of Reduction, Handling and Unmanaged wastes will be 30 %, 70 % and 0 % in 2025 according to the Target of Jakstrada.


1. Generation of HH and HHL Waste
90.74 ton/day
2. Generation of HH Waste
53.39 ton/day
3. Generation of HHL Waste
37.35 ton/day
2.1 Reduction of Inorganic HH Waste at Source
0.45 ton/day
2.2 Reduction of Organic HH Waste at Source
1.05 ton/day
2.3 HH Waste Discharge for Handling
48.28 ton/day
2.4 Unmanaged HH Waste
3.61 ton/day
3.1 Reduction of Inorganic HHL Waste at Source
12.61 ton/day
3.2 Reduction of Organic HHL Waste at Source
0.47 ton/day
3.3 HHL Waste Discharge for Handling
23.76 ton/day
3.4 Unmanaged HH Waste
0.51 ton/day
4.1 Reduction of Inorganic HH and HHL Waste at Source
13.06 ton/day
4.2 Reduction of Organic HH and HHL at Source
1.52 ton/day
4. Reduction of HH and HHL Waste
14.58 ton/day
5. HH and HHL Waste Handling (Collection)
72.04 ton/day
5.1 Reduction of Inorganic HH and HHL Waste at TPA
4.17 ton/day
5.2 Reduction of Organic HH and HHL Waste at TPA
3.12 ton/day
5.3 Final Disposal of Waste at TPA Randegan
64.75 ton/day
Kota Mojokerto (2025)
(population in 2025) 150,404
Case 1


1. Generation of HH and HHL Waste
90.74 ton/day
2. Generation of HH Waste
53.39 ton/day
3. Generation of HHL Waste
37.35 ton/day
2.1 Reduction of Inorganic HH Waste at Source
0.84 ton/day
2.2 Reduction of Organic HH Waste at Source
1.96 ton/day
2.3 HH Waste Discharge for Handling
50.59 ton/day
2.4 Unmanaged HH Waste
0.00 ton/day
3.1 Reduction of Inorganic HHL Waste at Source
23.54 ton/day
3.2 Reduction of Organic HHL Waste at Source
0.88 ton/day
3.3 HHL Waste Discharge for Handling
12.93 ton/day
3.4 Unmanaged HH Waste
0.00 ton/day
4.1 Reduction of Inorganic HH and HHL Waste at Source
24.38 ton/day
4.2 Reduction of Organic HH and HHL at Source
2.84 ton/day
4. Reduction of HH and HHL Waste
27.22 ton/day
5. HH and HHL Waste Handling (Collection)
63.52 ton/day
5.1 Reduction of Inorganic HH and HHL Waste at TPA
3.68 ton/day
5.2 Reduction of Organic HH and HHL Waste at TPA
2.75 ton/day
5.3 Final Disposal of Waste at TPA Randegan
57.09 ton/day
Kota Mojokerto (2025)
(population in 2025) 150,404
Case 2

2.6 Mojokerto Regency

2.6.1 Specific Conditions

Flow 1. Generation of HH and HHL Waste:

- The Generation Rate (GR) of Jakstada (0.701 kg/person/day) is very large compared to the GRs in other cities.

Items		Unit	Kota Mojokerto	Kab. Sidoarjyo	Kab. Mojokerto	Kab. Gresik	Kab. Lamongan	Kab. Bangkalan
Population in 2018		person	143,377	2,140,100	1,136,259	1,335,698	1,404,679	1,071,199
Population in 2019		person	144,411	2,173,272	1,146,054	1,350,658	1,408,064	1,080,229
Jakstrada 2018	**Waste Amount**	ton/day	59.35	1215.95	796.88	335.92	221.08	392
	Generation Rate (GR)	g/person/day	413.95	568.17	701.32	251.49	157.39	366
	Reduction	%	21.88	8.12	28.46	4.84	18.00	6
	Handling	%	71.44	54.16	4.23	52.77	73.05	19
	Unmanaged	%	6.67	37.72	67.30	42.38	8.95	76

- Therefore, the amount of waste (HHW + HHLW) is calculated using the intermediate value of 0.5 kg/person/day of the big cities's GR (0.4-0.6 kg/person/day) shown in "SNI 04-1993-03" as the GR of waste (HHW + HHLW) of Mojokerto Regency.

Flow 2. Generation of HH Waste = Flow 2.1 + 2.2 + 2.3 + 2.4

- Flow 2.1, 2.2, 2.3, 2.4 are calculated by multiplying the generation rate of each HHW of WACS with the population of 2019 as follows:
- From the WACS results, we considered as below.
  Generation rate result in rural area = Generation rate in area without waste collection service.
  Generation rate result in urban area = Generation rate in area with waste collection service (= Kec. Mojosari)

Municipality	Area	HHW1 (g/psn/day)	HHW2 (g/psn/day)	HHW3 (g/psn/day)	HHW4 (g/psn/day)	Total (g/psn/day)	
Kab. Mojokerto	Rural	0	45	0	280	325	=area w/o collection
	Urban	1	2	334	9	346	=area w/ collection
	Subtotal	**1**	**24**	**162**	**149**	**336**	

- Population increase rate in 2019 is 0.00862 according to the "Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency". Based on the increase rate the population of the Kab. in 2019 is 1,146,054., including
  1,065,830 in area without waste collection service
  80,224 in area with waste collection service (Mojosari)
- By multiplying population with waste generation rate in the table above, the amount of HHW1-4 can be calculated.

Flow 3 Generation of HHL Waste: Flow 3 = Flow 1 – Flow 2. Flow 3.1, 3.2, 3.3, 3.4 are calculated as follows:

1. 3.1 Reduction of Inorganic HHL Waste at Source: Flow 3.1 = Flow 4.1 - Flow 2.1
2. 3.2 Reduction of Inorganic HHL Waste at Source: Flow 3.2 = Flow 4.2 - Flow 2.2
3. 3.3 HHL Waste Discharge for Handling: Flow 3.3 = Flow 5 – Flow 2.3
4. 3.4 Unmanaged HHL Waste: Flow 3.4 = Flow 3 – Flow (3.1 + 3.2 + 3.3)

"Flow 4. Reduction of HH and HHL Waste at Source" is calculated as follows:

1. Flow 4.1 Reduction of Inorganic HH and HHL Waste at Source: "A. Reduction of waste generation" (0.19 ton/day) + "B. Amount of waste utilized in the sources"(225.79 ton/day) mentioned in "2018 Waste Reduction Performance Report" in the JAKSTRADA is too large (c.f. Recyclable inorganic waste is, in general, mostly card board and PET bottles, which

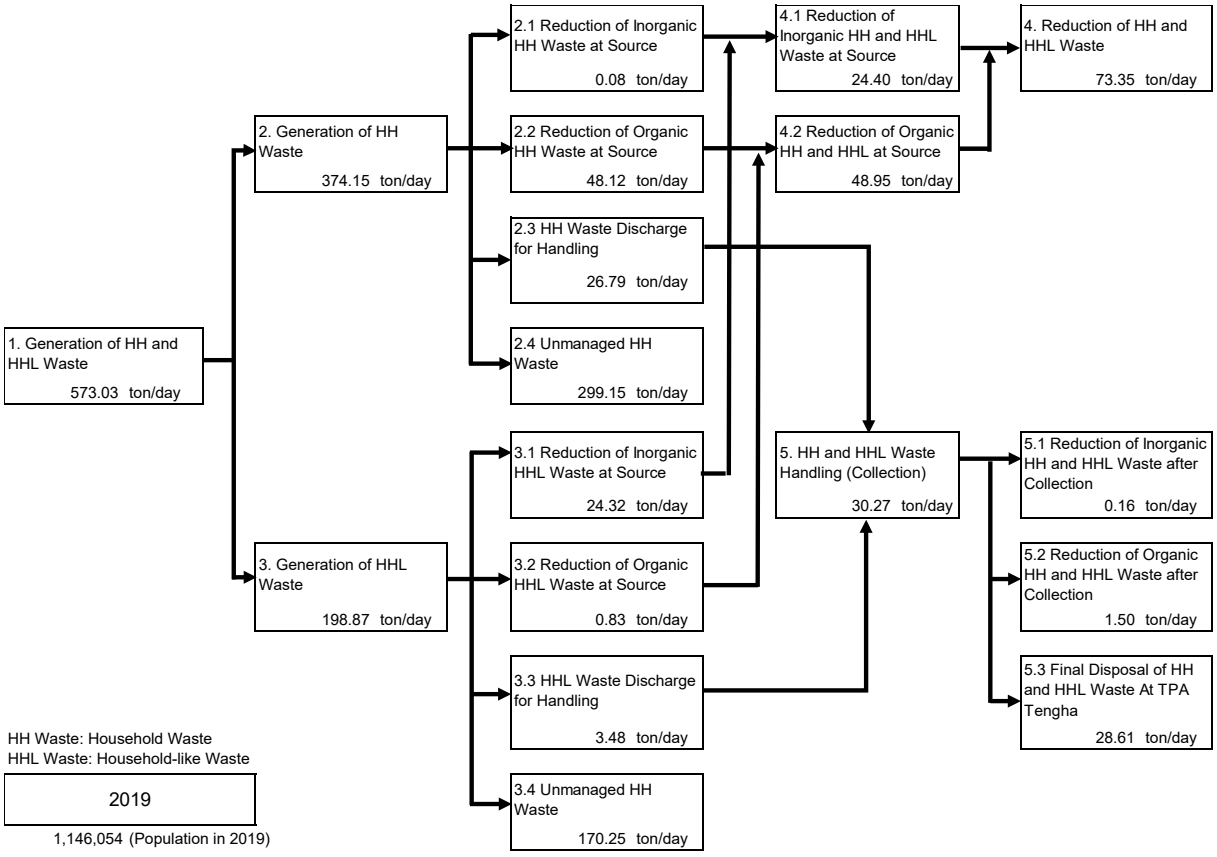
account for only 2.8% (=22.3 ton/day out of total waste 797 ton/day (Jakstrada)). Instead of using Jakstrada data, we applied recycling survey results, **24.4 ton/day**.

2. Flow 4.2 Reduction of Organic HH and HHL Waste at Source = "Reduced Waste Amount of C. Amount of waste recycled in the sources in 2018 Waste Reduction Performance Report of JAKSTRADA」 + "Flow 2.2 Reduction of Organic HH Waste at Source".
   => 0.83 + 48.12 = **48.95 ton/day**
3. Flow 4 = Flow 4.1 + Flow 4.2

Flow 5. HH and HHL Waste Handling (Collection) = Flow 5.1 + 5.2 + 5.3. Flow 5.1, 5.2, 5.3 are calculated as follows:

1. Flow 5.1 Recovered Inorganic HH and HHL Waste after collection: Reduced Waste Amount, **0.16 ton/day** of "C.3 Plastic/paper recovery by waste collectors" shown in 2018 Waste Handling Performance Report. .
2. Flow 5.2 Recovered Organic HH and HHL Waste after collection = Reduced Waste Amount of "A.3 TPST managed by government" + it of "C. 4. Composting managed by the government in TPA" => **1.00 + 0.50 = 1.50 ton/day**
3. "5.3 Final Disposal of HH and HHL Waste": Daily average disposal amount measured by the Weighbridge from Sep.1 to Sep. 30, 2019. => **28.61 ton/day**

2.6.2 Current Waste Flow

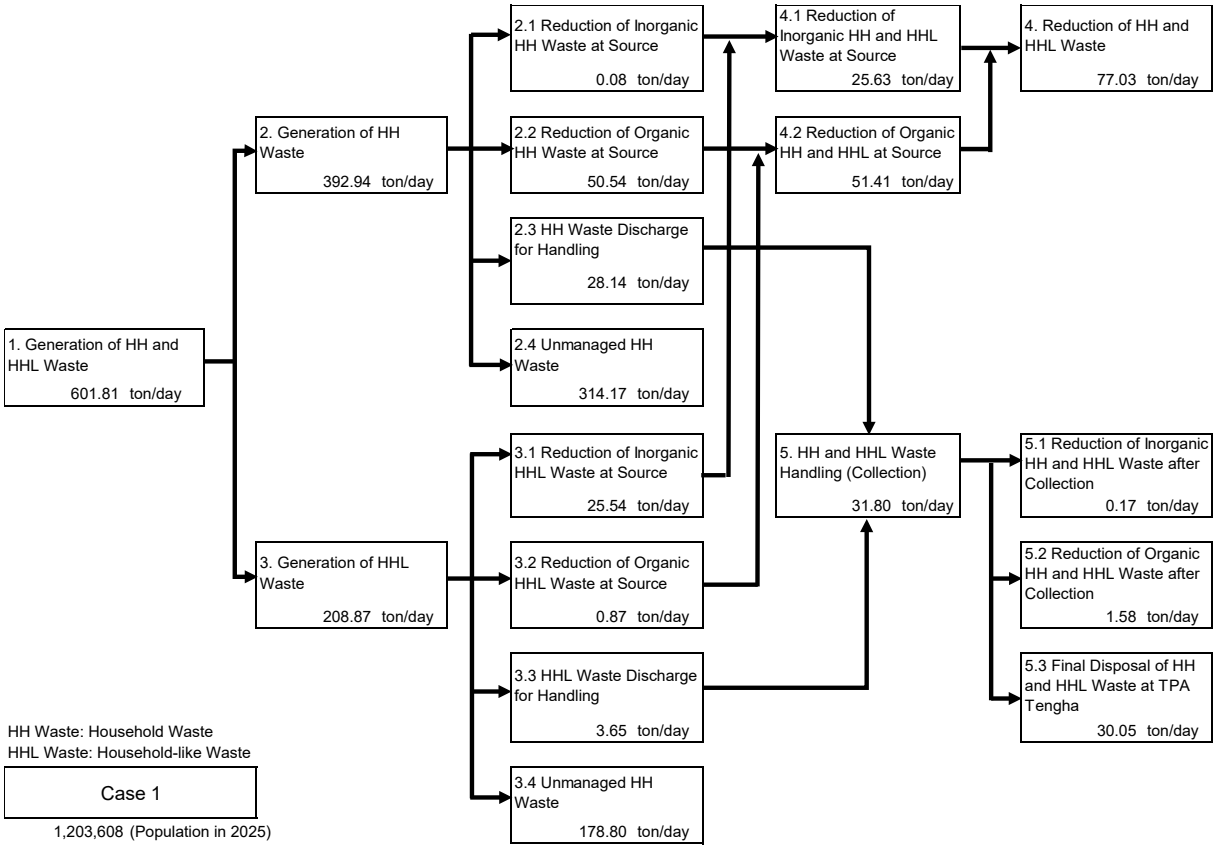


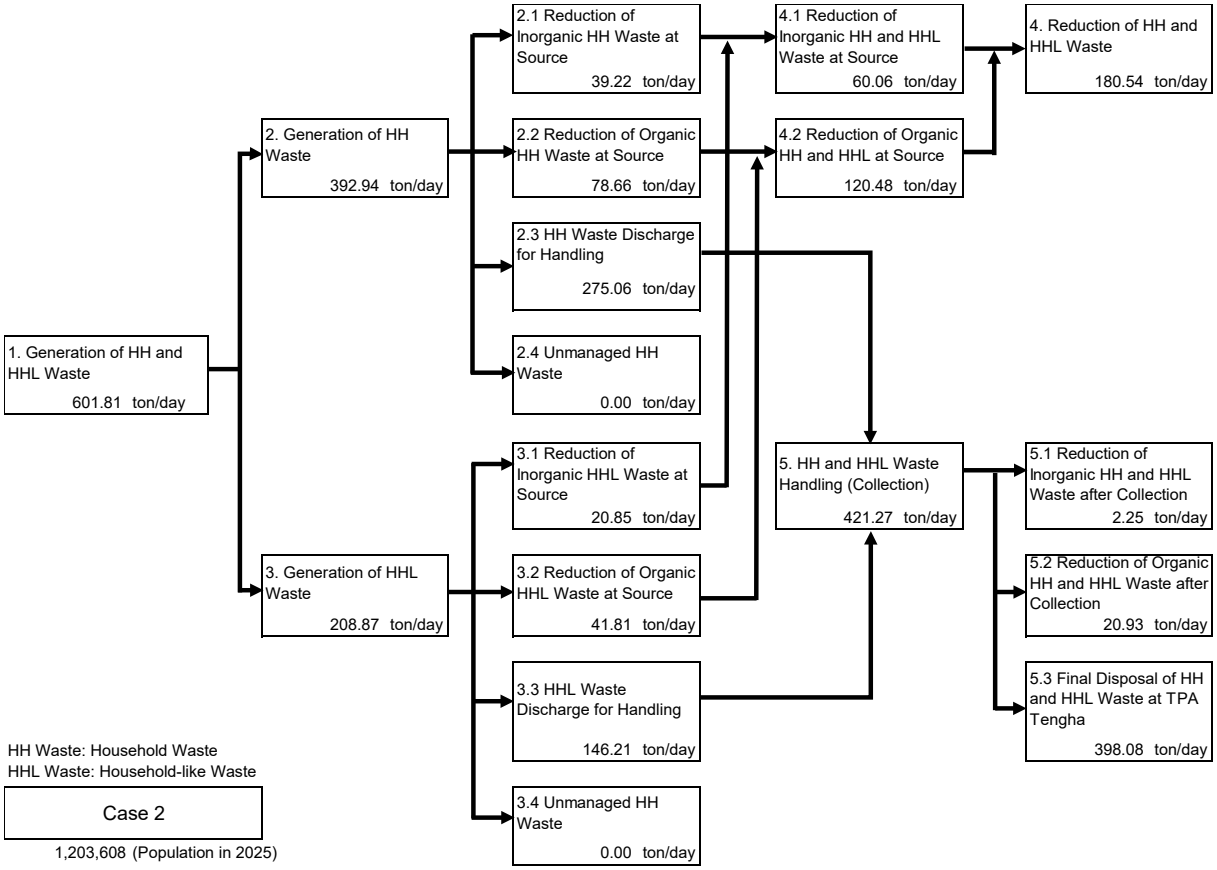
2.6.3 Future Waste Flow

Future Waste Flow is developed based on the following assumption:

1. **Same as JAKSTRADA, the Target year is 2025.**
2. According to 「Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency」 population increase rate up to 2025 is **0.00820.**
3. Based on the increase rate population in 2025 is **1,203,608.**

4. Waste generation rate (g/person/day) obtained by WACS is not changed until 2025.
5. Generation amount of HHW & HHLW increases in accordance with the population.
6. Future Waste Flow of the following two cases is developed:
   - Case 1: Rates of Reduction, Handling and Unmanaged wastes will not be changed.
   - Case 2: Rates of Reduction, Handling and Unmanaged wastes will be 30 %, 70 % and 0 % in 2025 according to the Target of Jakstrada.





2.7 Sidoarjo

2.7.1 Specific Conditions

Flow 1. Generation of HH and HHL Waste:

- The Generation Rate (GR) of Jakstada (0.568 kg/person/day in 2019) is applied to calculate the amount of waste (HHW + HHLW).
- Because the GR is within the range of the Big City Generation Rate (0.4-0.6kg/Person/Day) shown in "SNI 04-1993-03" and is a reasonable number.

Flow 2. Generation of HH Waste = Flow 2.1 + 2.2 + 2.3 + 2.4

- Flow 2.1, 2.2, 2.3, 2.4 are calculated by multiplying the generation rate of each HHW from WACS with the population of 2019 as follows:

1. The generation rage of each HHW from WACS (Slide 7) shows a big difference between urban and rural. On the other hand, Public Opinion Survey, which interviewed as many as 300 households, did not show such difference.
2. Therefore, we did not use the urban/rural waste generation, but rather we used the subtotal (overall) generation rate calculated from the results of 40-household sampling (both in rural and urban).
3. According to the BPS, the population of the Kab. in 2018: 2,140,100. Note: Population in 2018 of Jakstrada is 2,251,752.
4. Population increase rate in 2019 is 0.01550 according to the “Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency”.
5. Using this increase rate the population of the Kab. in 2019: 2,173,272.
6. By multiplying population with waste generation rate in the table above, the amount of HHW1-4 can be calculated.

Flow 3 Generation of HHL Waste: Flow 3 = Flow 1 – Flow 2

- Flow 3.1, 3.2, 3.3, 3.4 are calculated as follows:

1. 3.1 Reduction of Inorganic HHL Waste at Source: Flow 3.1 = Flow 4.1 - Flow 2.1
2. 3.2 Reduction of Inorganic HHL Waste at Source: Flow 3.2 = Flow 4.2 - Flow 2.2
3. 3.3 HHL Waste Discharge for Handling: Flow 3.3 = Flow 3 – Flow (3.1 + 3.2 + 3.4)
4. 3.4 Unmanaged HHL Waste:
   Flow 3.4 = "Unmanaged Waste Amount of Jakstrada" (458.64 t/d) – Flow 2.4 (245.58 t/d)

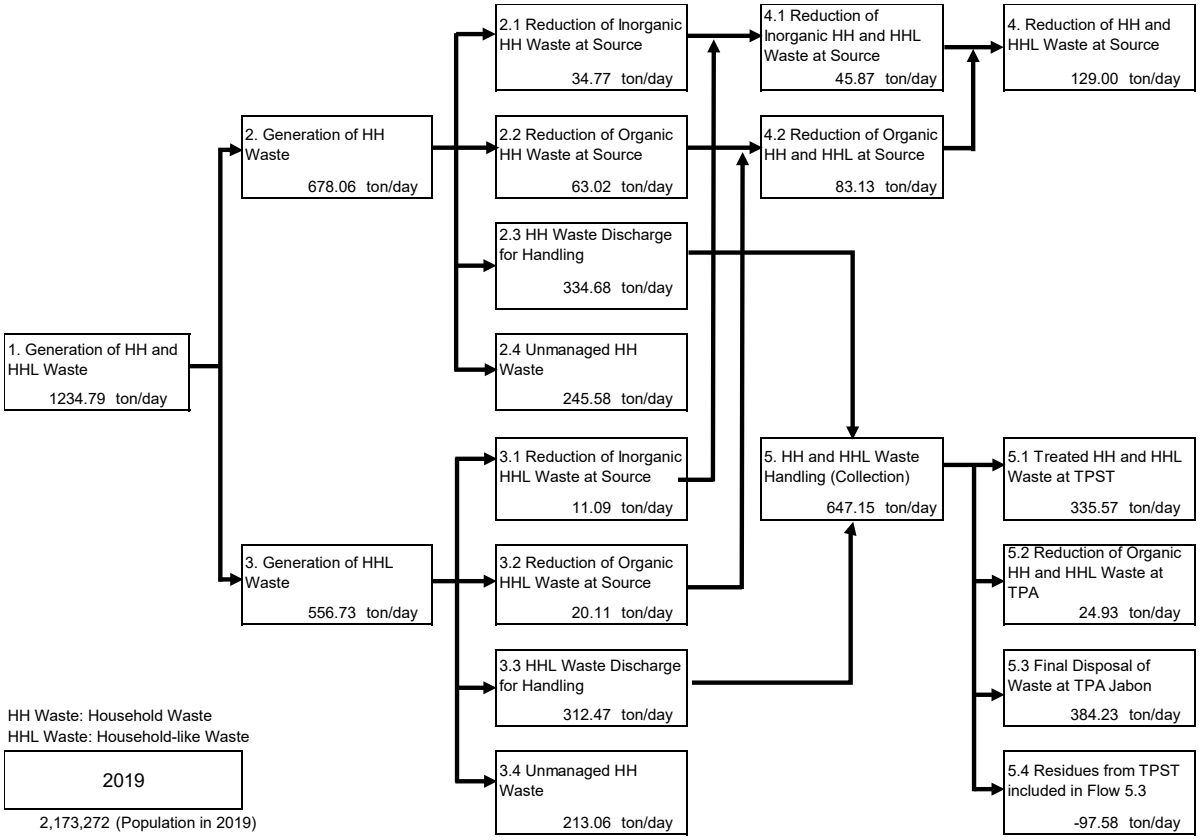
Flow 4. Reduction of HH and HHL Waste at Source

- Flow 4. Reduction of HH and HHL Waste at Source = 425 - 296 = 129 ton/day
  These figures came from the slide provided by the Regency, which was "Emission Reduction Program" in Sidoarjo in Semi Annual Workshop SWM Kemen PUPR in Oct. 25, 2019.
- Flow 4.1 Reduction of Inorganic HH and HHL Waste at Source:
  Flow 4.1 = Flow 4 x (Flow 2.1/(Flow 2.1 + Flow 2.2)
  => 45.87 = 129.00 x 34.77/(34.77 + 63.02)
- Flow 4.2 Reduction of Organic HH and HHL Waste at Source:
  Flow 4.2 = Flow 4 x (Flow 2.2/(Flow 2.1 + Flow 2.2)
  => 83.13 = 129.00 x 63.02/(34.77 + 63.02)
- To be noted that total of "A. Reduction of waste generation" (0.07 ton/day) + "B. Amount of waste utilized in the sources" (32.64 ton/day) + "C. Amount of waste recycled in the sources" (66.13 ton/day) mentioned in "2018 Waste Reduction Performance Report" in the JAKSTRADA is **98.84 ton/day**. => Flow 2.1 + 2.2 = **97.79 ton/day.**

Flow 5. HH and HHL Waste Handling (Collection) = Flow 2.3 + 3.3 => 647.15 ton/day

- **Flow 5.1, 5.2, 5.3 and 5.4 are calculated as follows:**
  1. Flow 5.1 Recovered Inorganic HH and HHL Waste at TPA: Waste Received of "A.3 TPST managed by government" shown in 2018 Waste Handling Performance Report. => **335.57 ton/day**
  2. Flow 5.2 Reduction of Organic HH and HHL Waste at TPA: Reduced Waste Amount of "C. 4. Composting managed by the government in TPA" => **24.93 ton/day**
  3. Flow 5.3 Final Disposal of HH and HHL Waste: Daily average disposal amount measured by the Weighbridge from March to June 2019. => **384.23 ton/day**
  4. Flow 5.4 Residues from TPST = Flow 5 - Flow (5.1 + 5.2 + 5.3) = **- 97.58 ton/day** => Actually the amount of waste for Flow 5.4 is included in Flow 5.3.

2.7.2 Current Waste Flow

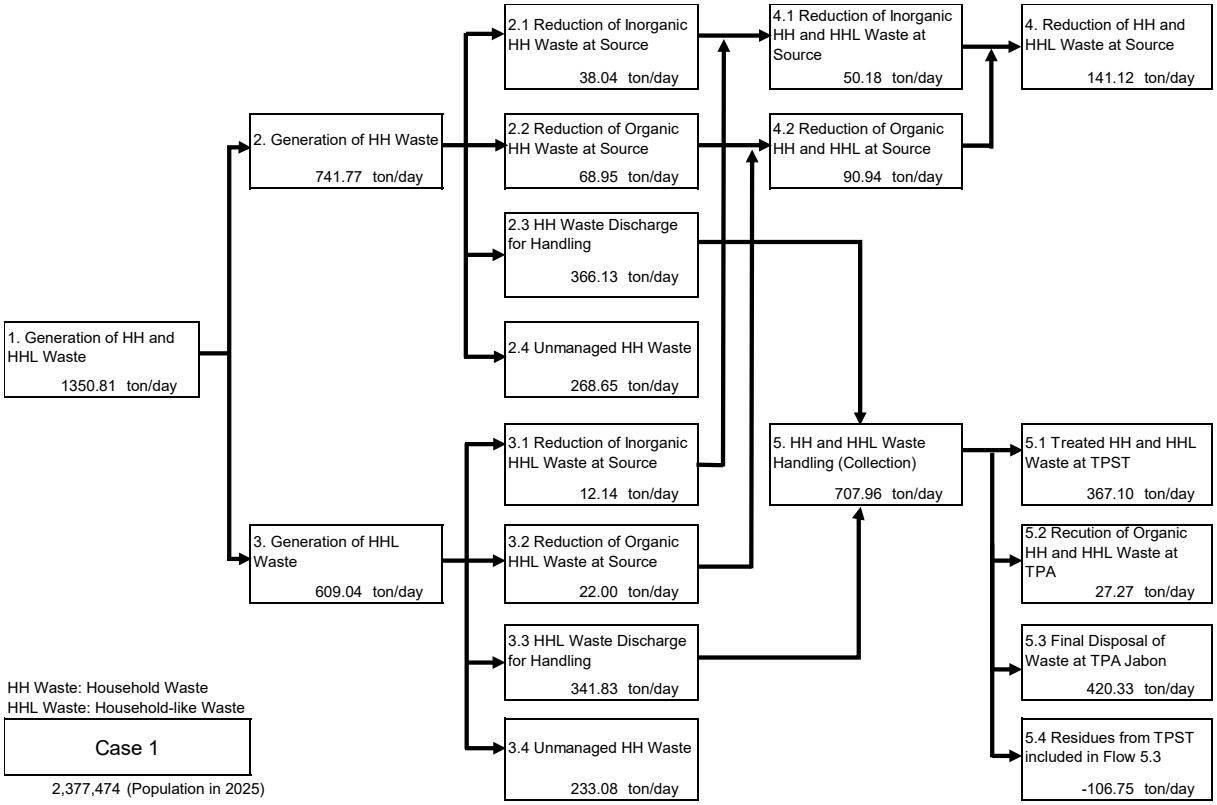


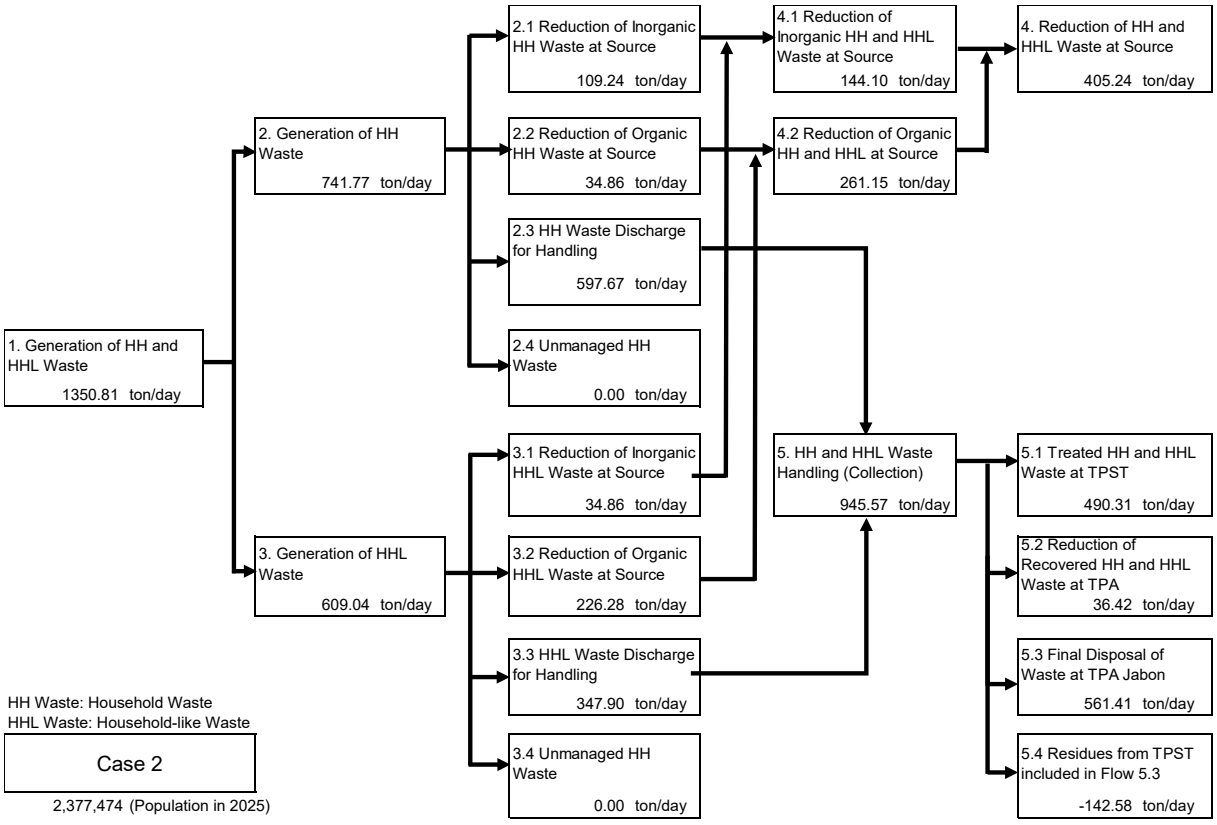
2.7.3 Future Waste Flow

Future Waste Flow is developed based on the following assumption:

1. **Same as JAKSTRADA, the <u>Target year is 2025</u>.**
2. According to 「Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency」 population increase rate up to 2025 is **<u>0.01508.</u>**
3. Based on the increase rate population in 2025 is **<u>2,377,474.</u>**
4. Waste generation rate (g/person/day) obtained by WACS is not changed until 2025.
5. Generation amount of HHW & HHLW increases in accordance with the population.
6. Future Waste Flow of the following two cases is developed:

    - Case 1: Rates of Reduction, Handling and Unmanaged wastes will not be changed.
    - Case 2: Rates of Reduction, Handling and Unmanaged wastes will be 30 %, 70 % and 0 % in 2025 according to the Target of Jakstrada.


1. Generation of HH and HHL Waste
1350.81 ton/day
2. Generation of HH Waste
741.77 ton/day
3. Generation of HHL Waste
609.04 ton/day
2.1 Reduction of Inorganic HH Waste at Source
38.04 ton/day
2.2 Reduction of Organic HH Waste at Source
68.95 ton/day
2.3 HH Waste Discharge for Handling
366.13 ton/day
2.4 Unmanaged HH Waste
268.65 ton/day
3.1 Reduction of Inorganic HHL Waste at Source
12.14 ton/day
3.2 Reduction of Organic HHL Waste at Source
22.00 ton/day
3.3 HHL Waste Discharge for Handling
341.83 ton/day
3.4 Unmanaged HH Waste
233.08 ton/day
4.1 Reduction of Inorganic HH and HHL Waste at Source
50.18 ton/day
4.2 Reduction of Organic HH and HHL at Source
90.94 ton/day
4. Reduction of HH and HHL Waste at Source
141.12 ton/day
5. HH and HHL Waste Handling (Collection)
707.96 ton/day
5.1 Treated HH and HHL Waste at TPST
367.10 ton/day
5.2 Recution of Organic HH and HHL Waste at TPA
27.27 ton/day
5.3 Final Disposal of Waste at TPA Jabon
420.33 ton/day
5.4 Residues from TPST included in Flow 5.3
-106.75 ton/day
HH Waste: Household Waste
HHL Waste: Household-like Waste
Case 1
2,377,474 (Population in 2025)


1. Generation of HH and HHL Waste
1350.81 ton/day
2. Generation of HH Waste
741.77 ton/day
3. Generation of HHL Waste
609.04 ton/day
2.1 Reduction of Inorganic HH Waste at Source
109.24 ton/day
2.2 Reduction of Organic HH Waste at Source
34.86 ton/day
2.3 HH Waste Discharge for Handling
597.67 ton/day
2.4 Unmanaged HH Waste
0.00 ton/day
3.1 Reduction of Inorganic HHL Waste at Source
34.86 ton/day
3.2 Reduction of Organic HHL Waste at Source
226.28 ton/day
3.3 HHL Waste Discharge for Handling
347.90 ton/day
3.4 Unmanaged HH Waste
0.00 ton/day
4.1 Reduction of Inorganic HH and HHL Waste at Source
144.10 ton/day
4.2 Reduction of Organic HH and HHL at Source
261.15 ton/day
4. Reduction of HH and HHL Waste at Source
405.24 ton/day
5. HH and HHL Waste Handling (Collection)
945.57 ton/day
5.1 Treated HH and HHL Waste at TPST
490.31 ton/day
5.2 Reduction of Recovered HH and HHL Waste at TPA
36.42 ton/day
5.3 Final Disposal of Waste at TPA Jabon
561.41 ton/day
5.4 Residues from TPST included in Flow 5.3
-142.58 ton/day
HH Waste: Household Waste
HHL Waste: Household-like Waste
Case 2
2,377,474 (Population in 2025)

2.8 Lamongan Regency

2.8.1 Specific Conditions

Flow 1. Generation of HH and HHL Waste:

- The Generation Rate (GR) of Jakstada (0.157 kg/person/day) is very small compared to the GRs in other cities.

Items		Unit	Kota Mojokerto	Kab. Sidoarjyo	Kab. Mojokerto	Kab. Gresik	Kab. Lamongan	Kab. Bangkalan
Population in 2018		person	143,377	2,140,100	1,136,259	1,335,698	1,404,679	1,071,199
Population in 2019		person	144,411	2,173,272	1,146,054	1,350,658	1,408,064	1,080,229
Jakstrada 2018	**Waste Amount**	ton/day	59.35	1215.95	796.88	335.92	221.08	392
	Generation Rate (GR)	g/person/day	413.95	568.17	701.32	251.49	157.39	366
	Reduction	%	21.88	8.12	28.46	4.84	18.00	6
	Handling	%	71.44	54.16	4.23	52.77	73.05	19
	Unmanaged	%	6.67	37.72	67.30	42.38	8.95	76

- Therefore, the amount of waste (HHW + HHLW) is calculated using the intermediate value of 0.5 kg/person/day of the Big City Generation Rate (0.4-0.6 kg/person/day) shown in "SNI 04-1993-03" as the GR of waste (HHW + HHLW).

Flow 2. Generation of HH Waste = Flow 2.1 + 2.2 + 2.3 + 2.4

- Flow 2.1, 2.2, 2.3, 2.4 are calculated by multiplying the generation rate of each HHW of WACS with the population of 2019 as follows:

1. According to the BPS, the population and urban-rural ratio the Kab. in 2018: 1,404,679, Rural: 0.805 (1,131,050), Urban: 0.195 (273,629).
2. Population increase rate in 2019 is 0.00241 according to the "Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency".
3. Based on the increase rate the population of the Kab. in 2019: 1,408,064, Rural: 0.805 (1,133,492), Urban: 0.195 (274,572).

Flow 3 Generation of HHL Waste: Flow 3 = Flow 1 – Flow 2

- Flow 3.1, 3.2, 3.3, 3.4 are calculated as follows:

1. 3.1 Reduction of Inorganic HHL Waste at Source: Flow 3.1 = Flow 4.1 - Flow 2.1
2. 3.2 Reduction of Inorganic HHL Waste at Source: Flow 3.2 = Flow 4.2 - Flow 2.2
3. 3.3 HHL Waste Discharge for Handling: Flow 3.3 = Flow 3 – (Flow 3.1 + 3.2 + 3.4)
4. 3.4 Unmanaged HHL Waste:
   Use the amount (19.78 ton/day) of "V. Unmanaged Waste Amount and Generation Rate (0.1574 kg/p/d) in "Waste Management Balance" of Jakstada" and Applied GR (0.500 kg/p/d)
   Flow 3.4 (27.50) = (0.5/0.1574) x 19.78 – Flow 2.4 (35.34)

"Flow 4. Reduction of HH and HHL Waste at Source" is calculated as follows:

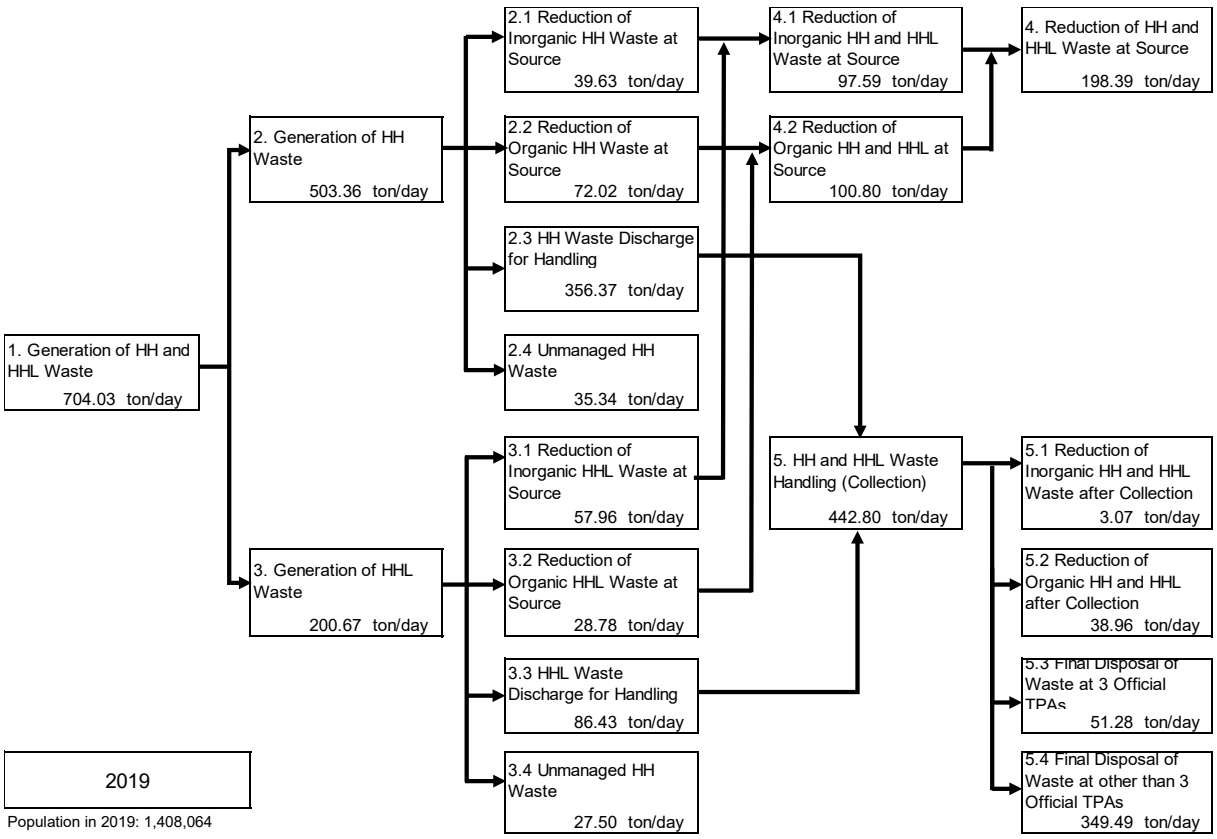
1. Flow 4.1 Reduction of Inorganic HH and HHL Waste at Source = Rate of Applied GR and Jakstrada GR (0.5/0.1574) x Reduced Waste Amount of "A. Reduction of waste generation" and "B. Amount of waste utilized in the sources" mentioned in "2018 Waste Reduction Performance Report" in the JAKSTRADA.
   => (0.5/0.1574) x (9.45 + 21.27) = 97.59 ton/day
2. Flow 4.2 Reduction of Organic HH and HHL Waste at Source = Rate of Applied GR and Jakstrada GR (0.5/0.1574) x Reduced Waste Amount of "C. Amount of waste recycled in the sources" in 2018 Waste Reduction Performance Report of JAKSTRADA" + "Flow 2.2 Reduction of Organic HH Waste at Source".
   => (0.5/0.1574) x 9.06 + 72.02 = 100.80 ton/day
3. Flow 4 = Flow 4.1 + Flow 4.2

Flow 5. HH and HHL Waste Handling = Flow 2.3 + Flow 3.3

- Flow 5.1, 5.2, 5.3, 5.4 are calculated as follows:

1. 5.1 Reduction of Inorganic HH and HHL Waste after Collection: Reduced Waste Amount, 1.77 ton/day of "A.1 Central waste bank managed by government" + 1.30 ton/day of "C.3 Plastic/paper recovery by waste collectors" shown in 2018 Waste Handling Performance Report.
   => 1.77 + 1.30 = 3.07
2. 5.2 Reduction of Organic HH and HHL after Collection: Reduced Waste Amount, 2.28 ton/day of "A.2 Composting at Recycling Center (PDU) + 2.85 ton/day of "A.5 Composting from TPS" + 3.04 ton/day of "B.1 Biodigester" + 0.48 ton/day of "C.4 Composting in TPA" + 30.30 ton/day of "C.5 Methane gas capturing and utilizing as electrical energy source"
   => 2.28 + 2.85 + 3.04 + 0.48 + 30.30 = 38.95
3. 5.3 Final Disposal of HH and HHL Waste at 3 Official TPAs: Daily average disposal amount measured by the weighbridge of TPA Tambakrigadung in Sep1-30, 2019 (39.58 ton/day) + "Reduced Waste Amount, 11.70 ton/day of C.2 Waste in the control landfill" shown in 2018 Waste Handling Performance Report for other two TPAs.
   => 39.58 + 11.70 = 51.28 ton/day
4. 5.4 Final Disposal of HH and HHL Waste at other than 3 Official TPAs:
   Flow 5.4 = Flow 5 – Flow (5.1 + 5.2 + 5.3)
   Reasons of final disposal at sites other than 3 official TPAs:
   - According to the public opinion survey, the rates of households and business establishments which discharge waste correctly to the waste collection service are relatively high (Household Average 58 %, Business Average: 79 %)
   - However total disposal amount in 3 official TPA is small.

2.8.2 Current Waste Flow

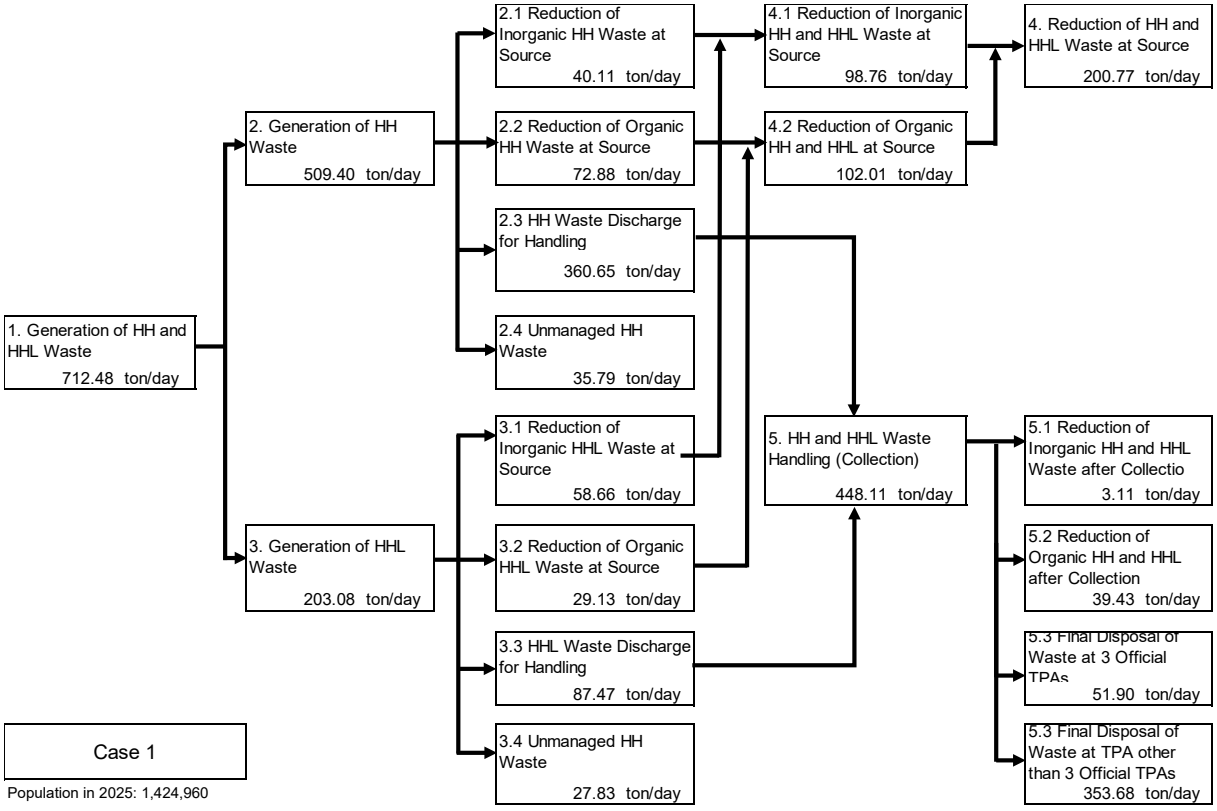


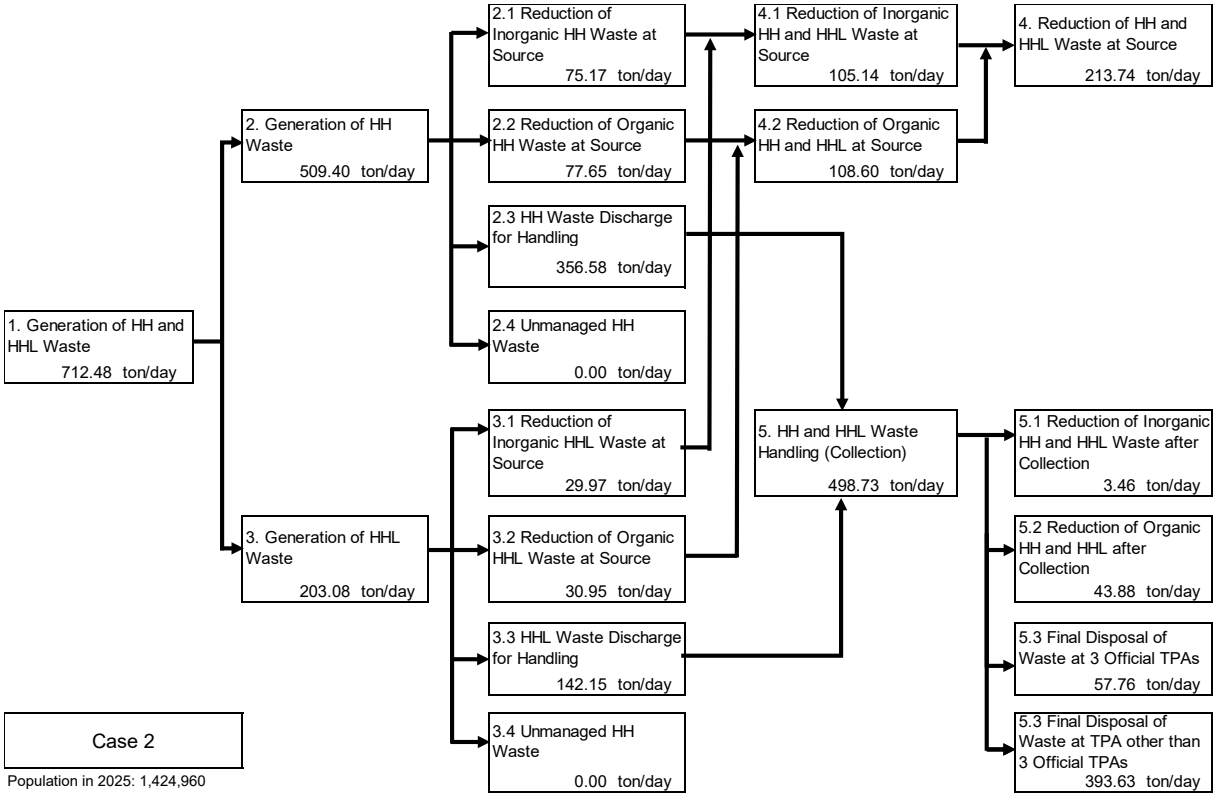
2.8.3 Future Waste Flow

Future Waste Flow is developed based on the following assumption:

1. **Same as JAKSTRADA, the Target year is 2025.**
2. According to 「Population Projection of City/Regency in East Java Province (2015-2025), East Java Provincial Statistics Agency」 population increase rate up to 2025 is **0.00199.**
3. Based on the increase rate population in 2025 is **1,424,960.**
4. Waste generation rate (g/person/day) obtained by WACS is not changed until 2025.
5. Generation amount of HHW & HHLW increases in accordance with the population.
6. Future Waste Flow of the following two cases is developed:

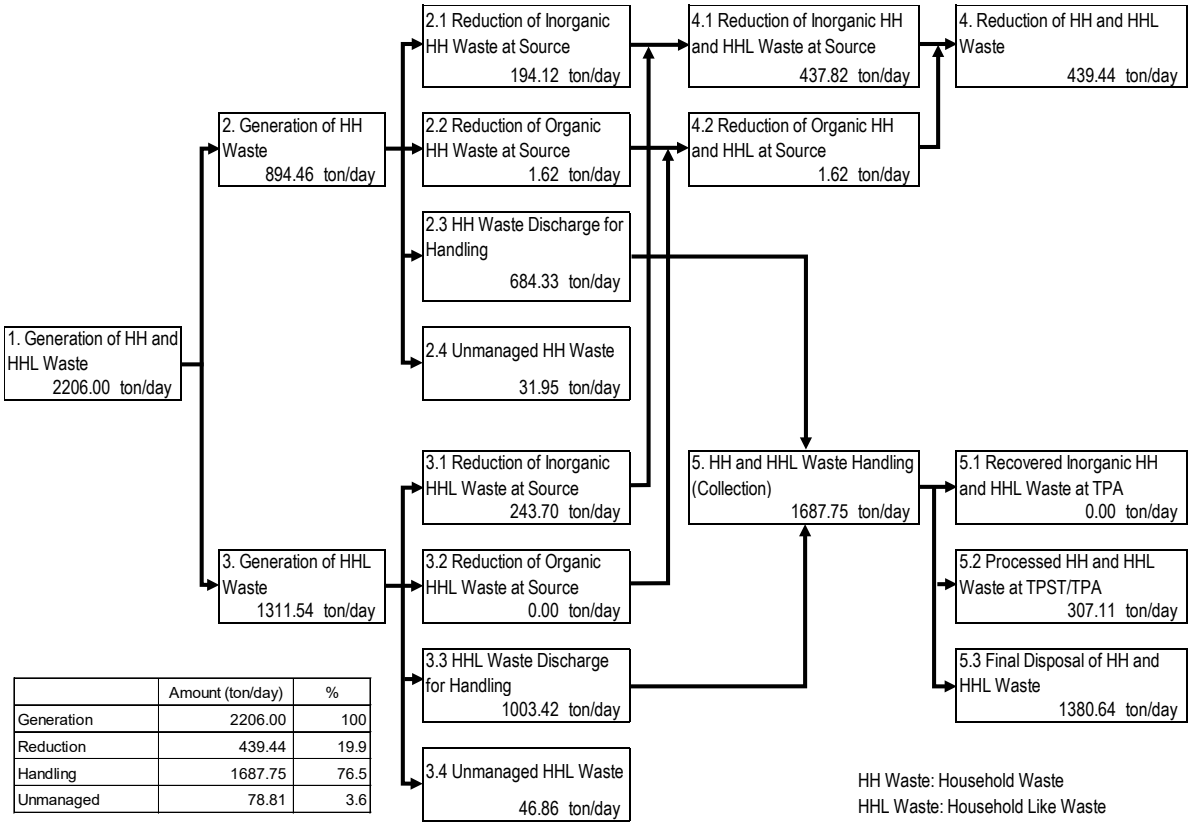
- Case 1: Rates of Reduction, Handling and Unmanaged wastes will not be changed.
- Case 2: Rates of Reduction, Handling and Unmanaged wastes will be 30 %, 70 % and 0 % in 2025 according to the Target of Jakstrada.





2.9 Surabaya City

Although the waste amount survey or other related surveys were not carried out in Surabaya City, unlike the other six regencies/cities, the waste flow of Surabaya City was studied and presented below.



	Amount (ton/day)	%
Generation	2206.00	100
Reduction	439.44	19.9
Handling	1687.75	76.5
Unmanaged	78.81	3.6

Figure 2-2. Waste Flow of Surabaya City (2018)

The main data that were used to formulate this waste flow are as follows.

- Population data and population growth rate:
  Total population of the city in 2018: 3,080,185 (from "KECAMATAN DALAM ANGKA-2019" by BPS (Central Statistics Agency))
  Population growth rate: 0.721% (from "Population Projection of City/Regency in East Java Province (2015-2025)" by East Java Provincial Statistics Agency)
- Household waste generation were calculated using the population and household waste generation rate which appeared in the academic papers as below.

Kecamatan	Waste generation rate (kg/person/day)	Reported in	Kecamatan population (2018)
Sukolilo	0.38	ITS Technical Journal[2]	114,309
Genteng	0.35	Sited in the above[3]	31,451
Tambaksari	0.27	Sited in the above[4]	234,473
Rungkut,	0.31	Sited in the above[5]	117,591

  From these figures, weighed average of waste generation rate was 0.290 kg/person/day. By multiplying this with the population, total household waste generation amount of 2018 was calculated at 894.46 ton/day.

- Most other figures were taken from "Jakstrada Performance Report 2018" of the city.
- Values for 2.3 and 3.3 were set by assuming that the ratio of those are the same with that of values for 2 and 3. Same applied to values for 2.4 and 3.4

[2] Devy Safitri Ayu Hapsari and Welly Herumurti, "Laju Timbulan dan Komposisi Sampah Rumah Tangga di Kecamatan Sukolilo Surabaya" JURNAL TEKNIK ITS Vol. 6, No. 2 (2017), 2337-3520

[3] N. Setiadewi, "Pengaruh SPA Terhadap Pengelolaan Sampah Permukiman Kecamatan Tambaksari," Institut Teknologi Sepuluh Nopember, 2014.

[4] N. Setiadewi, "Pengaruh SPA Terhadap Pengelolaan Sampah Permukiman Kecamatan Tambaksari," Institut Teknologi Sepuluh Nopember, 2014.

[5] Y. P. Ratih, "Perencanaan Fasilitas Pengolahan Sampah Rumah Tangga di Kecamatan Rungkut Surabaya," Institut Teknologi Sepuluh Nopember, 2013.

Chapter 3 Time and Motion Survey

3.1 Outlines

The time and motion survey is to clarify the routes of waste collection trucks and time consumption, which gives a picture of actual waste collection operation.

The survey is generally done by one or more people who follow a waste collection truck and they will keep record when the truck starts its pool, which road it goes, where and how long it stops, what time it arrives at waste collection points, what time it disposes of waste at the TPA and what time it finishes the work of the day.

In order to make the survey more convenient and efficient, we used GPS loggers. Placed on top of the collection trucks. The logger can record the locational data and the temporal data of truck movement.

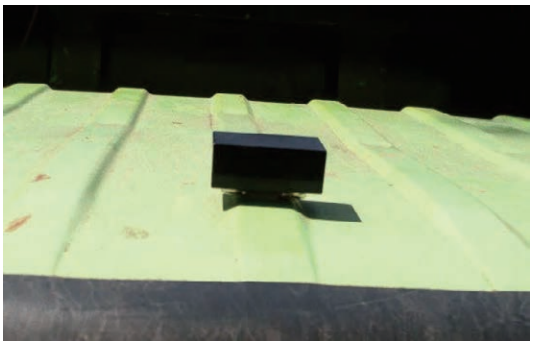


Figure 3-1 GPS Logger on the Truck

3.2 Implementation

Under the supervision of the short-term experts, a survey assistant carried out the survey by placing the GPS loggers on the trucks, collect them after recording and drawing data into the PC.

As five GPS loggers were available, five trucks at most were chosen for each municipality and their morning shifts were surveyed. In nature, the time and motion survey is effectively done to assess the movement of dump trucks which stops a number of waste collection locations along one route. Therefore, we placed priority to the dump trucks when appropriate. Also, we placed priority to the trucks which go longer routes. In Lamongan, as we had information that the trucks which go to TPA Tambakrigadung were all arm rolls, we surveyed trucks that go to TPA Dadapan.

Due to the outbreak of the pandemic and the precautionary measures of Mojokerto Regency, there was no chance to do this survey in Mojokerto Regency.

3.3 Survey Results

The following tables are the results recorded by the loggers.

Table 3-1. Time and Motion Survey Result in Gresik

	Trucks	Container Capacity	Survey Date	Day	Distance (km)	From	To	Duration	Move	Stop	No. of TPS	Trips	Load (TPS)	Unload (TPA)	Waste Volume (kg)
1	Arm Roll	6 m^3	2019/10/24	Thu	76.9	07:36:26	12:33:09	4:56:43	3:21:18	1:35:25	5	1	0:11:47	0:06:14	1,280
												2	0:03:40	0:07:20	870
												3	0:03:51	0:05:19	1,090
												4	0:07:56	0:05:19	20
												5	0:38:41	0:09:34	NO DATA
2	Arm Roll	6 m^3	2019/10/24	Thu	139	07:18:22	13:16:38	5:58:16	4:43:56	1:14:20	4	1	0:05:30	0:08:04	1,460
												2	0:03:07	0:05:30	870
												3	0:05:30	0:09:21	1,390
												4	0:04:24	0:08:50	1,120
3	Arm Roll	6 m^3	2019/10/24	Thu	96.1	07:48:27	11:40:52	3:52:25	3:18:14	0:34:11	3	1	0:15:09	0:14:29	NO DATA
												2	0:04:02	0:06:25	
	Additional collection to replace another broken arm roll				62.7	15:09:37	17:38:44	2:29:07	1:55:12	0:33:55		1	0:06:44	0:07:01	NO DATA
4	Dump Truck	8 m^3	2019/10/24	Thu	57.2	07:37:10	11:29:00	3:31:50	2:15:23	1:16:27	NO DATA				
5	Dump Truck	8 m^3	2019/10/24	Thu	NO DATA										

Table 3-2. Time and Motion Survey Result in Bangkalan

No.	Trucks	Container Capacity	Survey Date	Day	Distance (km)	From	To	Duration	Move	Stop	No. of TPS	Trips	Load (TPS)	Unload (TPA)	Waste Volume (kg)
1	Dump Truck	6 m^3	2020/6/9	Tue (second half for the day)	60.6	12:22:51	17:41:31	5:18:40	2:56:14	2:22:26	14	1	2:08:08	0:06:10	2,400
			2020/6/10	Wed (first half for the day)	60.8	05:37:15	11:57:12	6:19:57	3:07:26	3:12:31		1	2:07:42	0:05:38	2,400
2	Dump Truck	6 m^3	2020/6/9	Tue (second half for the day)	57.8	12:43:02	17:57:59	5:14:57	3:36:29	1:38:28	7	1	1:29:20	0:11:17	2,400
			2020/6/10	Wed (first half for the day)	70.5	05:55:04	11:58:33	6:03:29	4:08:45	1:54:44		1	1:39:03	0:10:42	2,400
3	Dump Truck	6 m^3	2020/6/10	Wed	124	05:03:16	11:34:57	6:31:41	4:44:29	1:47:12	6	1	0:32:15	0:04:11	2,400
												2	0:22:18	0:10:27	2,400
4	Dump Truck	6 m^3	2020/6/10	Wed	126	05:06:35	11:52:00	6:45:25	5:16:43	1:28:42	12	1	1:38:25	0:03:58	2,400
												2	1:12:03	0:04:48	2,400
5	Dump Truck	6 m^3	2020/6/10	Wed	111	6:04:05	14:43:06	8:39:01	5:50:42	2:48:19	7	1	1:11:13	0:10:47	2,400
												2	0:22:11	0:10:23	2,400

Waste volume per truck was calculated by multiplying the container volume (6m3) and unit weight at 0.4.

Table 3-3. Time and Motion Survey Result in Mojokerto City

No.	Trucks	Container Capacity	Survey Date	Day	Distance (km)	From	To	Duration	Move	Stop	No. of TPS	Trips	Load (TPS)	Unload (TPA)	Waste Volume (kg)
1	Arm Roll	6 m^3	2020/3/10	Tue	95.9	07:43:08	13:59:47	6:16:39	5:45:32	0:31:07	4	1	0:06:32	0:10:25	4,060
												2	0:05:48	0:06:33	4,105
												3	0:09:45	0:04:56	3,140
												4	0:04:15	0:06:24	NO DATA
2	Arm Roll	6 m^3	2020/3/10	Tue	51.3	07:38:14	13:55:48	6:17:34	4:18:15	1:59:19	4	1	0:15:29	0:13:15	1,690
												2	0:18:53	0:09:10	2,580
												3	0:06:08	0:05:46	3,605
												4	0:22:11	0:12:43	3,245
3	Arm Roll	6 m^3	2020/3/10	Tue	36.7	11:58:13	14:42:21	2:44:08	2:24:00	0:20:08	3	1	0:03:56	0:03:58	3,895
												2	0:07:27	0:04:59	3,980
												3	0:02:46	0:07:48	NO DATA
4	Dump Truck	8 m^3	2020/3/10	Tue	39.1	09:09:17	16:33:31	7:14:24	3:31:20	3:43:04	3	1	1:54:31	0:16:11	4,180
												2	1:15:07	0:10:41	NO DATA
												3	0:26:38	0:12:33	NO DATA
5	Dump Truck	8 m^3	2020/3/10	Tue	35.4	7:49:42	11:54:42	4:05:00	2:43:19	1:21:14	3	1	0:52:32	0:03:33	NO DATA
												2	0:11:00	0:03:42	
												3	0:12:29	0:03:07	

Table 3-4. Time and Motion Survey Result in Sidoarjo

No.	Trucks	Container Capacity	Survey Date	Day	Distance (km)	From	To	Duration	Duration - 2hours	Move	Stop	Stop - 2hours	No. TPS	Trips	Load (TPS)	Unload (TPA)	Waste Volume (kg)
1	Arm Roll	6 m^3	2020/3/6	Fri	175	03:54:51	14:34:27	10:35:56	8:35:56	7:11:28	3:28:28	1:28:28	2	1	0:23:50	0:13:55	3,790
														2	0:12:37	0:15:24	4,550
2	Arm Roll	6 m^3	2020/3/6	Fri	134	04:17:23	15:33:38	11:16:15	9:16:15	5:54:16	5:21:59	3:21:59	2	1	0:21:56	0:43:00	2,000
														2	1:33:17	0:44:30	2,020
3	Dump Truck	8 m^3	2020/3/6	Fri	167	06:21:03	17:26:38	11:05:35	9:05:35	7:05:05	4:00:30	2:00:30	2	1	0:24:56	0:16:54	4,010
														2	3:04:40	0:34:27	4,150
4	Dump Truck	8 m^3	2020/3/6	Fri	99.3	05:44:57	14:57:37	9:12:40	7:12:40	5:43:54	3:28:46	1:28:46	1	1	1:59:49	0:22:32	2,360
5	Dump Truck	8 m^3	2020/3/6	Fri	163	3:45:31	14:48:49	11:03:18	9:03:18	5:53:19	5:09:59	3:09:59	2	1	1:56:42	0:46:49	NO DATA
														2	0:49:05	0:46:46	

There are so many "Stop Time" in this table, because the day was Friday. We subtracted 2 hours from the stop-time and total duration time.

Table 3-5. Time and Motion Survey Result in Lamongan

No.	Trucks	Container Capacity	Survey Date	Day	Distance (km)	From	To	Duration	Move	Stop	No. of TPS	Trips	Load (TPS)	Unload (TPA)	Waste Volume (kg)
1	Arm Roll	6 m^3	2020/3/3	Tue	25.8	06:10:15	09:11:50	3:01:35	1:47:20	1:14:15	2	1	0:06:44	0:12:54	1,800
												2	0:04:49	0:02:53	1,800
2	Arm Roll	6 m^3	2020/3/3	Tue	23.2	12:34:34	14:29:20	1:54:56	0:53:10	1:01:36	2	1	0:03:41	0:02:21	1,800
												2	1:06:49	0:03:07	1,800
3	Dump Truck	6 m^3	2020/3/3	Tue	28.7	06:10:12	09:15:28	3:05:16	1:32:31	1:32:45	2	1	0:18:34	0:05:26	2,400

3.4 Analysis Results

The survey data were analyzed and interpreted as below.

Table 3-6. Time and Motion Survey Result (Arm Roll Trucks)

	Arm Roll (6 m^3)			
	Gresik	Lamongan	Sidoarjo	Mojokerto City
Time duration per trip	01:26:23	01:14:08	04:28:03	01:23:29
Loading time per trip	00:09:12	00:20:31	00:37:55	00:09:23
Max Loading Time per trip	00:38:41	01:06:49	01:33:17	00:22:11
Min Loading Time per trip	00:03:07	00:03:41	00:21:56	00:02:46
Waste Amount per trip	1,012.5	*1,800.0*	3,090.0	3,366.7
Coefficient of Deviation	0.42	-	0.36	0.23
Travel distance per trip	31.2	12.3	77.3	16.7
Average Velocity (km/hour)	28.1	18.3	23.6	14.8

Table 3-7. Time and Motion Survey Result (Dump Trucks)

	Dump Truck (8 m^3(except for Lamongan, whose volume is 6 m^3))			
	Lamongan	Sidoarjo	Mojokerto City	Bangkalan
Time duration per trip	01:32:38	05:04:19	01:53:14	00:58:33
Loading time per trip	00:09:17	00:49:31	00:48:43	00:16:35
Waste Amount per trip	*2,400.0*	2,360.0	4,180.0	*2,400.0*
Coefficient of Deviation	-	0.23	-	-
Travel distance per trip	14.4	85.9	12.4	61.1
Waste loaded (kg/minute)	*129.3*	19.7	36.5	*31.5*
Average Velocity (km/hour)	18.6	23.0	11.9	20.6
Number of TPS per trip	2	1	1	4.6

The italic figures needs care as waste volume was not obtained by truck scales but by calculation assuming full loading.

1. Time duration per trip: The overall average for dump trucks and arm rolls was about 2.25 hours. If data of Sidoarjo was excluded, it becomes 1.5 hours.
2. In case of arm roll trucks, the loading time at a TPS may be one of the indicators to consider work efficiency. In fact, the loading time of arm roll trucks must be usually and simply determined by the mechanics of the vehicle and should be stable. Average loading time of four municipalities, however, varies. Actually, the data vary even in an individual municipality as the large disparity between the maximum and minimum figures show.

   For a scheduled operation, it is advised to make the loading time stable. The reason for the prolonged loading time needs to be reported and the countermeasures should be taken.

3. As for the dump trucks, the waste amount loaded per unit time is important. In this light, Bangkalan has

outrageous figure. However, the figure should be taken with care as Bangkalan's TPA has no truckscale and the waste amount loaded on the truck may be overestimated.

How much the waste amount loaded per unit time should be depends on individual conditions and no standard figures can be presented. It is recommended to regularly collect data in the similar way so that the standard figures are understood. This helps the monitoring of collection works.

4. The waste amount per trip varies, although their container sizes are the same. Basically it can be said that the more waste, the more efficiency. Two municipalities recorded the waste amount by the arm rolls over 3,000 kg and one municipality that by the dump truck over 4,000 kg, which are equivalent to as much as 500 kg/m3.

   Such exceptional waste data needs to be detected in a daily operation. The cause may include human or mechanical errors, but if there is no error, such overloading should be avoided as it will damage the vehicles.

5. The waste amount loaded onto the trucks varies. We calculated “coefficient of variation”, which indicate to what extent data vary. Those of Gresik and Sidoarjo are high, which means there are some trucks which carry small volume of waste compared to their full capacity. The location of TPS and other waste collection points should be planned so that each trip can effectively and fully utilize the truck capacity. The high coefficient of variation may be suggesting the necessity of relocation of TPS or other waste collection points.

Chapter 4 Recycling Survey

4.1 Objectives

The aim of this study is to estimate the amount of recyclable waste collected and its flow through interviews with major recyclers, and to contribute to the creation of waste flows.

4.2 Survey method

A recycling survey was conducted by a short-term expert and a local assistant according to the following procedure.

Step 1: Request the target municipalities to introduce recycling companies.

Step 2: Visit the introduced recyclers and conduct an interview survey to understand the source and amount of recyclable waste.
Step 3: Obtain information on the recyclable waste collector (Intermediary / Buyer) through an interview survey.
Step 4: Carry out interviews with recyclers to grasp the source and destination of recyclable waste and its volume.
Step 5: Following the above steps, aggregate the amount of recyclable waste collected from the target municipalities by type.

Community-based 3R activities at Waste Bank and TPS-3R or TPST were understood from the Jakstrada Achievement Report prepared by each municipality annually. The actual situation was confirmed by visiting Central Waste Bank in Kota Mojokerto and interviewing the community leader of the bank about the type and amount of recyclable waste they handle. For TPSTs, we visited a TPST in Sidoarjo Regency to check the actual situation. The results of these surveys were used as a reference because the recyclable waste collected through community and municipality-based 3R activities is included in the volume handled by Intermediaries/Buyers and Recyclers.

4.3 Implementation of Recycling Survey

4.3.1 Survey period

The survey was carried out between 7 November and 13 December 2019.

4.3.2 Recycling companies targeted for the interview survey

A total of 21 recyclers, middlemen and collectors were visited during this survey, the breakdown of which is shown in the table below.

Table 4-1. List of Recycling Companies visited

Company name		Classification	Location	Product	Materials
1	PT Handoko Jaya	Recycler	Kab. Bangkalan	Plastic flake Briquet	Plastic, Coconut shell, etc.
2	UD Anugrah	Recycler	Kab. Gresik	Plastic pellets	LDPE plastics
3	PT Surabaya Mekabox	Recycler	Kab. Gresik	Corrugate Carton box	Paper/Cardboard
4	PT WJS	Recycler	Kab. Mojokerto	Plastic pellet	Plastic
5	PT Kemasan Ciptatama Sempurna	Recycler	Kab. Mojokerto	Styrofoam box	Plastic
6	UD Samudra Jaya	Recycler	Kab. Sidoarjo	Plastic hanger	Plastic
7	UD B-Plast	Recycler	Kab. Sidoarjo	Plastic goods	Plastic
8	PT Mtra Utama Plastik	Recycler/ Buyer	Kab. Bangkalan	Plastic basket	Paper

9	UD Wira Jaya	Recycler/ Buyer	Kab. Bangkalan	Plastic flake	Plastic, Metal, Papre/Cardnoard, E-waste
10	CV Sinar Mulia Rejeki	Intermediary	Kab. Lamongan		PET, HDPE, Metal, Alminum, Paper/ Cardboard, E-waste, Glass
11	CV Utama	Intermediary	Kab. Sidoarjo		PE Plastics
12	UD Hamid	Intermediary	Kab. Sidoarjo		Metal
13	CV Omben Putra	Intermediary	Kab. Sidoarjo		Metal
14	PT Langgeng Jaya Plastik	Buyer	Kab. Gresik		Plastic (PET)
15	CV Pelita Mas Anugrah	Buyer	Kab. Gresik		LDPE plastics
16	UD Samber Rejeki	Buyer	Kab. Lamongan		Plastic, Metal, Paper, Cardboard, Glass bottle
17	Mr. Adi	Buyer	Kab. Lamongan		PET, HDPE, Metal, Alminum, Paper/ Cardboard, E-waste, Glass
18	PT Inocycle Tbk	Buyer	Kab. Mojokerto		Plastic (PET)
19	PT Inocycle Tbk	Buyer	Kab. Mojokerto		Plastic
20	PT Asia Bottle Cycling	Buyer	Kab. Sidoarjo		Plastic (PET)
21	UD Berkah Lokal	Buyer	Kota Mojokerto		Plastic, Metal, Papre/Cardnoard, Glass

4.4 Review of Jakstrada Report

A summary of the following seven items from the Jakstrada Report prepared in 2019 by the six target municipalities was reviewed. .

(1) Waste Management Balance
(2) Details for waste reduction 2017
(3) Details for managed waste 2017
(4) Details for managed waste 2018
(5) 2018 Implementation Report
(6) Details for waste reduction 2018
(7) 2018 Achievement Report Summary

Jakstrada's Achievement Report shows the amount of waste generated, the amount of waste reduced and the amount of waste managed. In addition, the amount of waste reduction includes the following items, which contain valuable information on recycling, so we confirmed this in this survey.

a. waste reduction through multiple programmes in multiple facilities (e.g. schools, public buildings)
b. Use of waste (material recovery) in multiple facilities (e.g. TPS, waste banks) run by local communities.
c. Recycled waste (composting) in some community-managed facilities (e.g. TPS, waste banks).
d. Waste processed into raw materials (composting) in some facilities managed by the government.
e. Waste treated with energy at multiple government-controlled facilities
f. Waste at landfill site.

4.5 Findings of Recycling survey

The volume of recyclable waste handled by the companies listed above was aggregated by type and collection area (target municipality). If the companies could not specify the amount by collection area,

we estimated the amount by allocating it to the population. The results are shown in the table below. The companies visited were located in six municipalities in the project area. It is assumed that there are a number of large recyclers in Surabaya as it is a metropolitan city where 3Rs are outstandingly active, but interview with them was not possible in this survey.

The amount of recyclable waste obtained from the interviews with recyclers was 304.1 tons per day, with the largest amount of waste paper and cardboard (62%), followed by plastics (31%) and scrap metal (6%). By region, Kab. Sidoarjo has the largest share (29%), followed by Kota Surabaya (22%), Kab. Lamongan (17%) and Kab. Gresik (13%).

Table 4-2. Summary of Recyclable Wastes

Origin of Material	Plastic	Paper/ Cardboard	Metal	Glass	Total	Number of Surveyed companies
	ton/day	ton/day	ton/day	ton/day	ton/day	
Gresik Regency	12.4	26.0	0.2	0.0	38.6	4
Bangkalan Regency	9.4	20.1	0.3	0.0	29.8	3
Mojokerto Regency	12.6	11.6	0.2	0.0	24.4	4
Mojokerto City	3.0	1.6	0.1	0.0	4.8	1
Surabaya City	27.7	38.2	0.8	0.0	66.7	0
Sidoarjo Regency	17.9	60.2	10.8	0.0	88.8	6
Lamongan Regency	12.3	31.8	6.7	0.1	51.0	3
Total	95.2	189.6	19.1	0.2	304.1	21
	31%	62%	6%	0%	100%	

The table below shows how much recyclables are going out from which municipality and how much recyclables are coming in to them. For Bangkalan, Sidoarjo and Lamongan, they are the major source of recyclables for themselves. For Gresik, Sidoarjo is the top supplier and Surabaya is the second. For Mojokerto city, Mojokerto Regency is the main origin.

Table 4-3. Origin and Destination of Recyclable Wastes (ton/day)

		Waste Destination							
		Gresik	Bangkalan	Mojokerto Regency	Mojokerto City	Surabaya	Sidoarjo	Lamongan	Total
Waste Origin	Gresik	34.5	0.0	1.2	2.1	0.0	0.1	0.8	38.6
	Bangkalan	10.1	18.1	1.0	1.0	0.0	0.0	0.0	30.1
	Mojokerto R.	12.0	0.0	0.0	9.6	0.0	2.5	0.3	24.4
	Mojokerto C.	1.4	0.0	0.0	3.3	0.0	0.1	0.0	4.8
	Surabaya	42.4	10.2	3.3	3.3	0.0	7.0	0.4	66.7
	Sidoarjo	60.2	0.0	3.3	4.9	0.0	20.4	0.0	88.8
	Lamongan	17.7	0.0	0.2	0.3	0.0	0.1	32.7	51.0
	Total	178.4	28.3	9.0	24.5	0.0	30.2	34.1	304.4

In the table below, the first line shows the amount of waste separated by community. Most of such information was found in Jakstrada and used to draw current waste flow charts in Chapter 2. The recyclable items are those which are sold at the waste banks or to the waste collectors. The second line shows waste amount which go out of the municipalities, as found in this recycling survey. The third line shows waste amount processed in the municipalities.

The forth (bottom) line is the waste amount which is supposed to come into the municipalities (=amount treated + amount separated by community – amount of out-going). Gresik has a very large number and it is likely that a large amount of waste enters Gresik although the recycling survey could not identify

where such waste is processed. Such waste may come from Surabaya, which was not surveyed. It also can be said that recyclers of Gresik have larger capacity of processing than what can be collected in the regency. Waste separation at source will need to be more encouraged.

On the other hand, Lamongan has a large amount of waste separated by community in the municipality but local recyclable processing is only one sixth. There are two possibilities: the recycling survey could not cover many recycling companies, or the data of waste separated by community is overstated and needs revised.

Table 4-4. Recyclables in and out of the Municipalities (ton/day)

	Gresik	Bangkalan	Mojokerto Regency	Mojokerto City	Surabaya	Sidoarjo	Lamongan
Separated by Community	17.5	30.1	73.4	14.0	439.44	129.0	198.4
Out-going	38.6	29.8	24.4	4.8	66.7	88.8	51.0
Processed	178.4	28.3	9.0	24.5	--	30.2	34.1
Supposed to come into	199.5	27.9	-39.9	15.3	--	-10.0	-113.3

Chapter 5 Public Opinion Survey

5.1 Objectives

A Public Opinion Survey (POS) was conducted in order to grasp the habit of waste handling and opinions of the local governments of the residents about the SWM operations and business entities.

5.2 Survey method

5.2.1 Survey process

Implementation Arrangement: Survey assistants carried out the interview under the supervision of the short-term experts.

Number of Samples: 300 residents and 100 business entities of each regency/city.

Step 1. To select target households and business entities in cooperation with the C/P.

Step 2. To prepare the questionnaires for households and business entities which cover questions about their waste handling habits (waste separation and discharge manner, usage of waste banks, etc.) and opinions about the SWM operations.

Step 3. To explain the survey assistants about interview procedure, contents of the questionnaire and specific points to be noted.

Step 4. The survey assistants visit the residents and business entities and interview them using the questionnaires.

Step 5. The survey assistants fill out the answer format, and submit it to the short-term expert.

5.2.2 Sampling

The number of samples of Households and Business entities was set by the following procedure.

Number of Households samples

Step 1: Kecamatan is classified based on high, medium, and low population density, and Kecamatan to be sampled is determined in consultation with short-term experts and local government C/P.

Step 2: Clarify population and the number of TPS of Desa/Kelurahan (Village / Sub-district) in the selected Kecamatan. Then select Desa/Kelurahan considering the number of TPS installed and the size of population.

Step 3: The sample size of each Desa / Kelurahan is determined according to the size of population.

Through consultation between the short-term expert and the C/P of the target municipality, the number of Kecamatan selected in step 1 was 6 for Mojokerto Regency and 5 for Sidoarjo Regency and Lamongan Regency, respectively.

Number of Business entities samples

The number of samples of business entities was set according to the procedure with the advice of C/P who is familiar with the distribution of business establishments in the region.

Step 1: Allocate 100 samples to the Kecamatan selected in Households Step 1 in consultation with the C/P.

Step 2: Furthermore, it will be distributed to Desa / Kelurahan in Kecamatan selected in Step 2 of Households.

The number of samples of each Kabupaten/Kota (Regency/City) selected by the above procedure was set as shown in the table below.

Table 5-1. Distribution of the number of samples by Kecamatan for each municipality

Kabpaten (Regency) / Kota (City)	Kecamatan	Households		Business Entities	
		Rate	HHs	Rate	BEs
1. KAB. GRESIK	GRESIK	33%	99	50%	50
	KEBOMAS	45%	134	40%	40
	CERME	22%	67	10%	10
	Total number of samples	100%	300	100%	100
2. KAB. BANGKALAN	BANGKALAN	39%	116	70%	70
	BURNEH	29%	86	20%	20
	TANAH MERAH	33%	98	10%	10
	Total number of samples	100%	300	100%	100
3. KOTA MOJOKERTO	KRANGGAN	28%	83	32%	32
	MAGERSARI	43%	128	46%	46
	PRAJURIT KULON	30%	89	22%	22
	Total number of samples	100%	300	1	100
4. KAB. MOJOKERTO	BANGSAL	12%	37	17%	17
	MOJOSARI	19%	57	10%	10
	PURI	17%	52	25%	25
	DAWAR BLANDONG	12%	37	16%	16
	JETIS	20%	61	12%	12
	GEDEG	19%	56	20%	20
	Total number of samples	100%	300	100%	100
5. KAB. SIDOARJO	SIDOARJO	27%	81	20%	20
	BUDURAN	13%	40	18%	18
	SUKODONO	17%	51	18%	18
	TAMAN	27%	80	25%	25
	GEDANGAN	16%	48	19%	19
	Total number of samples	100%	300	100%	100
6. KAB. LAMONGAN	LAMONGAN	20%	60	40%	40
	DEKET	14%	41	10%	10
	TIKUNG	14%	41	10%	10
	PACIRAN	30%	90	30%	30
	BRONDONG	23%	68	10%	10
	Total number of samples	100%	300	100%	100

Table 5-2. Number of samples by business sector

Kinds of business / Local Gov.	Shops	Restaur-ants	Super-markets	Hotels	Public/Private Offices	Schools	Markets	Others	Total
Kab. Bangkalan	30	30	10	4	20	5	1	0	100
Kab. Gresik	33	28	12	4	17	4	2	0	100
Kab. Lamongan	30	29	11	5	20	3	2	0	100
Kab Mojokerto	31	26	16	2	18	5	1	1	100
Kab. Sidoarjo	31	29	11	4	19	3	3	0	100
Kota Mojo	31	30	10	5	19	3	2	0	100

5.2.3 Sample locations

The coordinates of all samples were recorded to get distance from them to the nearest TPS.

5.2.4 Preparation

Two types of questionnaires were prepared, one for households and one for business entities.

A group of 5 survey assistants were formed with one leader for the survey. They were trained to get familiar to the questionnaires, survey procedure and communication tools among the team.

5.3 Implementation of POS

The interview survey using the questionnaire was conducted in each Kabupaten / Kota by the teams for two weeks in November 2020 (see table below). In addition to collecting the questionnaires, survey assistant A confirmed the location of TPS near from the samples.

Table 5-3. Implementation period of POS for each municipality

	Dates of Interview with Households	Dates of Interview with Business/ Institutional Entities
Kab. Bangkalan	15-26 Nov.	18-25 Nov.
Kab. Gresik	14-26 Nov.	16-26 Nov.
Kab. Lamongan	15-26 Nov.	15-26 Nov.
Kab. Mojokerto	14-27 Nov.	24-26 Nov.
Kab. Sidoarjo	15-28 Nov.	17-26 Nov.
Kota Mojo	12-25 Nov.	18-25 Nov.

5.4 Results of POS

In this chapter, the results of the surveys for households and business entities are presented in an inter-municipal manner.

The aggregation results of the survey for households and business entities are shown in Chapters 4 and 5, respectively, for each municipality.

5.4.1 Household

(1) Material recycling or compost

1) Overviews

Q1 Do you recycle or compost your waste? (MA: multiple answers)
1. Yes, I usually separate recyclable waste and sell it to Waste Bank.
2. Yes, I usually separate recyclable waste and sell it to Recyclables Buyers.
3. I usually compost food waste.
4. I usually compost green waste.
5. I hardly recycle or compost my waste.
6. Others

More than half of the respondents from almost all local governments answered that they did not recycle. Kab. Bangkalan, Kab. Gresik, and Kab. Sidoarjo had a high percentage of respondents who responded not recycle, at around 70%-83%, while Lamongan, Mojokerto, and Kota Mojokerto had 48%-57%.

In Material recycle, 20-60% of respondents said that valuable materials were sorted and sold to a recycling company or Waste Bank. Kab. Gresik, Kota Mojokerito, and Kab. Lamongan have relatively high rates of using Waste Bank at 31%, 26%, and 21%, respectively. The ratio in other municipalities is less than 10%, and it is hardly used in Bangkalan.

Kab. Gresik, Kab. Lamongan, and Kab. Sidoarjo have 13% to 18% of the respondents who say they are composting organic waste, but it seems compost is not as prevalent in other municipalities as these three Kabpatens.

Table 5-4. Summary of Question 1 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Waste Bank user	0.3%	31.0%	21.0%	4.7%	8.0%	26.3%
2. Sell recyclable to Buyers.	19.3%	14.7%	39.3%	23.0%	30.7%	17.7%
3. Compost food waste.	0.0%	10.3%	8.3%	1.7%	0.0%	1.0%
4. Compost green waste.	0.3%	3.0%	9.3%	13.0%	2.7%	1.0%
5. No recycling	83.0%	66.7%	47.7%	73.0%	56.7%	51.0%
6. Others	3.3%	4.0%	2.0%	0.7%	2.3%	6.3%

2) About Waste Bank

Q2 (For those who do not use Waste Bank) What is the major reason that you don't use Waste Bank?
1. Because the Waste Bank is far
2. Because the price is cheap
3. Because it is annoying
4. Others (Please specify:)

The reason for not using the Waste Bank is that it is distant or the purchase price is cheap, but the majority of the reasons are "There is no Waste Bank in the neighborhood or it is closed" and "I don't know Waste Bank".

Table 5-5. Summary of Question 2 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Waste Bank is far	9.0%	4.8%	12.2%	28.3%	10.5%	24.0%
2. Price is cheap	0.0%	6.8%	6.3%	26.2%	11.2%	0.0%
3. It is annoying	1.0%	1.0%	0.0%	4.2%	5.8%	0.4%
4. Others	90.0%	81.2%	67.2%	40.9%	72.1%	72.9%

(2) Handling of waste that has not been recycled or composted

1) Overviews (Q3)

Q3 How do you handle the waste that is not recycled or composted? (MA)
1. I bring it to TPS or TPA by myself
2. It is collected by collector hired by the community I belong to.
3. It is collected by management office of housing complex or apartment
4. It is collected by municipality
5. I burn it.
6. I bury it.
7. I throw it into a road or open land or waterway.
8. Others

About the handling of non-recycled waste, respondents could make multiple answers to the eight prepared answers. The breakdown of the 8 answers is that 1 to 4 are so-called appropriate handlings that are eventually accumulated in the TPA using the existing collection system, and 5 to 8 are so-called inappropriate handlings that are burning or throwing the waste in an open land or waterways.

The table below shows the number of respondents with 1 to 4 (appropriate handling) including multiple responses, the number of respondents responding to both 1 to 4 & 5 to 8 (appropriate and inappropriate handling), and 5 to 8 (inappropriate handling).

At Kab. Gresik, Kab. Sidoarjo, and Kota Mojokerto, more than 80% of respondents said that they are handling them appropriately. On the other hand, Kab. Bangkalan and Kab. Mojokerto respectively 79% and 72% of respondents answered that they are handling inappropriately. In Kab. Lamongan, 58% of respondents answered that they handled it appropriately, and 31% said that they handled it inappropriately. Kab. Lamongan had the highest proportion among the 6 municipalities, with 12% responding that they were handling both.

Table 5-6. Number of Respondents of Question 3

	Kab. Bangkalan		Kab. Gresik		Kab. Lamongan		Kab. Sidoarjo		Kab. Mojokerto		Kota Mojokerto	
1 ~ 4	53	18%	254	85%	173	58%	248	83%	79	26%	276	92%
1~4 & 5~8	9	3%	24	8%	35	12%	6	2%	4	1%	20	7%
5 ~ 8	238	79%	22	7%	92	31%	46	15%	217	72%	3	1%
Total	300	100%	300	100%	300	100%	300	100%	300	100%	299*	100%

*: One respondent did not answer this question.

Looking at the breakdown of multiple answers handling appropriately, the majority of respondents used the collection service by the community except Kab. Bangkalan, and Kota Mojokerto had a response rate of 86%. Kab. Gresik had the highest percentage of respondents who directly brought it to TPS at 23%. Respondents who answered that collection/transportation of Municipality are generally small at 1.3% to 18.3%.

The most common type of inappropriate handling was burning, with 80% of Kab. Bangkalan respondents. In addition, the so-called illegal dumping of waste thrown into open lands and waterways was 22% and 14% in Kab. Bangkalan and Kab. Lamongan, respectively.

Table 5-7. Summary of Question 3 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Bring to TPS or TPS	7.0%	22.7%	14.0%	4.3%	3.0%	3.7%
2. Collected by community	2.3%	54.3%	51.3%	43.7%	22.0%	86.3%
3. Collected by housing complex or apartment	5.0%	5.3%	6.0%	19.3%	1.7%	3.3%
4. Collected by municipality	7.0%	14.7%	2.0%	18.3%	1.3%	6.7%
5. Burning	80.3%	8.3%	28.0%	15.3%	70.0%	7.3%
6. Burying	15.7%	1.0%	2.3%	1.7%	2.0%	1.0%
7. Throwing to open land or waterway	21.7%	2.0%	13.7%	0.0%	4.3%	0.0%
8. Others	0.0%	6.0%	5.7%	0.7%	2.0%	0.3%

2) Why behave inappropriately (question to respondents in 5-8 above) (Q4)

Q4 (to those who chose the answers 5-8 above) Why do you handle your waste in that manner?

1. Because I couldn't find public collection service.
2. Because I don't want to pay for collection service
3. Because TPS is far from my house
4. Others (Please specify:_____)

Many of the respondents who responded that they were inappropriately handling answered, "There is no public collection service."

Table 5-8. Summary of Question 4 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. No public collection service.	66.7%	13.0%	67.7%	46.2%	67.4%	4.5%
2. Don't want to pay for collection service	3.7%	2.2%	0.0%	11.5%	5.4%	4.5%
3. TPS is far from my house	5.0%	15.2%	8.7%	3.8%	15.8%	4.5%
4. Others	5.3%	19.6%	15.7%	36.5%	11.3%	77.3%
(Blank)	1.3%	50.0%	7.9%	1.9%	-	9.1%

(3) Payment for waste collection service

1) Payment to Community

Q5.1 How much do you currently pay for waste collection service per month? (to Community)

The proportion of respondents paying to the community varies according to their municipality, with 90% for Kota Mojokerto, 61%-79% for Gresik, Lamongan and Sidoarjo, and 8.7% for Bangkalan, the lowest.

This reflects the result of "Q4: Handling of waste that has not been recycled or composted", and the respondents who pay the collection service cost generally discharge appropriately.

Table 5-9. Summary of Question 5.1 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
Pay	8.7%	61.0%	61.3%	79.0%	27.3%	90.3%
(Blank) = not pay	91.3%	39.0%	38.7%	21.0%	72.7%	9.7%
Average (among those who pay)	28,154	14,260	15,310	15,895	14,500	12,819
Overall average	2,440	8,698	9,390	12,557	3,963	11,580

2) Payment to Municipal Government

Q5.2 How much do you currently pay for waste collection service per month? (to Municipal Government)

Lamongan has no regulation to collect Retribution, but other municipalities have a small number of respondents paying to the Municipal Government compared to the Community, even though there is a regulation. Therefore, it can be said that the collection of waste fees from citizens is extremely limited in the six municipalities surveyed.

Table 5-10. Summary of Question 5.2 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
Pay	3.7%	16.3%	0.0%	3.0%	6.3%	6.3%
(Blank) = not pay	96.3%	83.7%	100.0%	97.0%	93.7%	93.7%
Average (among those who pay)	26,591	15,041	0	21,000	29,158	11736.84
Overall average	975	2,457	0	630	1,8477	743.33

(4) Waste discharge frequency

1) Overviews

Q6 How frequently do you discharge your waste? (Times per week)

Regarding the frequency of discharge, most of the respondents of all municipalities answered that they discharge it every day, and Kab. Mojokerto answered that it discharges 10 to 20 times a week (does not store garbage in the house). The next highest number is twice or three times a week.

Table 5-11. Summary of Question 6 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1	2.0%	4.7%	0.3%	1.3%	0.3%	0.3%
2	3.0%	13.3%	1.3%	13.7%	32.3%	6.7%
3	5.3%	20.0%	25.3%	23.7%	10.7%	34.3%
4	5.3%	2.7%	18.3%	6.7%	7.7%	3.3%
5	5.3%	1.0%	0.7%	1.3%	1.7%	4.0%
6	11.7%	1.7%	1.3%	1.0%	2.3%	6.7%
7	63.3%	54.3%	52.7%	50.0%	23.0%	43.3%
10					0.3%	
12					0.3%	
14					16.7%	
15					3.7%	
16					0.7%	
20					0.3%	

(5) Awareness of TPA

Q7 Do you know at which TPA your waste is disposed of?
1. Yes _____
2. Yes, but I do not know the name.
3. No I do not know.

Between 60% and 96% of Kab. Bangkalan, Kab. Lamongan, Kab. Sidoarjo, and Kab. Mojokeruto respondents do not know the TPA at which their waste is disposed of. It can be said that public awareness of Solid Waste Management (SWM) conducted by Municipality is low. On the other hand, in Kab. Gresik and Kota Mojokerto, 66% and 52% of respondents recognize TPA respectively. It was found that there are differences in public awareness regarding SWM among the 6 municipalities.

Table 5-12. Summary of Question 7 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Yes, I know the name of TPA	2.3%	38.0%	25.7%	12.0%	3.7%	31.0%
2. Yes, but not know the name of TPA	13.7%	28.0%	3.0%	28.0%	0.7%	20.7%
3. No I do not know.	84.0%	33.0%	71.3%	60.0%	95.7%	48.3%
(Blank)		1.0%				
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

(6) Satisfaction with Municipal waste management

1) Overviews

Q8 Are you satisfied with the municipal waste management you live in?
1. Yes, I am satisfied.
2. No, I am not satisfied
3. I do not know.

Regarding the current residents' satisfaction with waste management, the majority of respondents except Kab. Lamongan and Kab. Mojokerto answered that they were satisfied, and Kota Mojokerto had a high level of 76%. On the other hand, the respondents who were not satisfied were the most at 40% in Kab. Lamongan and 12% to 20.3% in other municipalities.

Table 5-13. Summary of Question 8 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Yes, I am satisfied.	51.7%	54.0%	36.7%	53.7%	27.3%	76.3%
2. No, I am not satisfied	14.7%	19.3%	40.0%	20.3%	12.3%	19.3%
3. I do not know.	33.7%	15.3%	23.3%	26.0%	60.3%	4.3%
(Blank)		11.3%				

2) Reason not to be satisfied

Q9 (For those who not satisfied) What is the reason you are not satisfied? (MA)
1. Scattered waste
2. Bad smell
3. Mice and flies
4. Flooding of waterways blocked by garbage
5. Polluting TPA
6. Others

The reasons for dissatisfaction with the current waste management are that waste is scattered and bad smell, and mice and flies, and these accounts for about 50 to 80%.

For other reasons, the most respondents answered "no collection/transportation service" in Kab. Mojokerto. In other municipalities the respondents pointed out the poor quality of services, such as the fact that discharged waste is left for a long time, in addition to the lack of services.

Table 5-14. Summary of Question 9 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Scattered waste	81.8%	48.3%	50.0%	55.7%	10.8%	41.4%
2. Bad smell	27.3%	25.9%	11.7%	37.7%	5.4%	15.5%
3. Mice and flies	0.0%	8.6%	4.2%	14.8%	2.7%	0.0%
4. Flooding caused by garbage	2.3%	1.7%	5.0%	1.6%	0.0%	24.1%
5. Polluting TPA	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
6. Others	20.5%	46.6%	40.8%	19.7%	86.5%	55.2%
(Blank)			0.8%			3.4%

3) Improvements required for Municipality

Q10 (For those who not satisfied) To improve waste condition, what do you want to request the municipality to do? (MA)
1. To provide TPS more.
2. To increase waste haulage frequency from TPS.
3. To keep TPS clean.
4. To clean roads, parks and other public places more often.
5. To operate TPA more sanitarily.
6. To educate people for good manners.
7. Nothing particular.
8. I don't know.
9. Specify

In the question regarding the improvement measures required to Municipal Government for respondents who are not satisfied with the waste management in the previous section, the most respondents answered that they would increase the frequency of collecting waste discharged to TPS. It continued to expand TPS, clean public areas, and provide education to residents.

Table 5-15. Summary of Question 10 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. To provide TPS more.	43.2%	31.0%	31.7%	27.9%	43.8%	24.1%
2. To increase waste haulage frequency from TPS.	45.5%	32.8%	27.5%	65.6%	50.0%	37.9%
3. To keep TPS clean.	6.8%	8.6%	16.7%	6.6%	12.5%	10.3%
4. To clean roads, parks and other public places more often.	20.5%	8.6%	62.5%	21.3%	9.4%	10.3%
5. To operate TPA more sanitarily.	4.5%	5.2%	6.7%	3.3%	0.0%	1.7%
6. To educate people for good manners.	43.2%	19.0%	36.7%	9.8%	6.3%	31.0%
7. Nothing particular.	9.1%	5.2%	1.7%	0.0%	0.0%	
8. I don't know.	0.0%	1.7%	2.5%	0.0%	31.3%	
9. Specify	2.3%	19.0%	9.2%	3.3%	6.3%	32.8%
(Blank)		3.4%	0.8%	1.6%		

4) About cost burden of inhabitants required for improvement

Q11+12. (For those who not satisfied) To improve waste management to your satisfaction, the government will need a reasonable cost, but are you willing to pay it? If yes, How much can you pay to the municipality for improvement of waste management (Monthly)?

1. Yes, I can pay less than Rp. 10,000
2. Yes, I can pay Rp. 20,000 - Rp. 50,000
3. Yes, I can pay Rp. 50,000 - 100,000
4. Yes, I can pay more than Rp. 100,000

Regarding the cost burden required to improve the current waste management, about 85 to 90% of the respondents in all municipalities answered that they are willing to bear the burden if Rp50,000/month or less.

Table 5-16. Summary of Question 11+12 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Yes, I can pay less than Rp. 10,000	61.4%	17.2%	63.3%	41.0%	48.6%	32.8%
2. Yes, I can pay Rp. 20,000 - Rp. 50,000	38.6%	62.1%	35.8%	59.0%	32.4%	44.8%
3. Yes, I can pay Rp. 50,000 - 100,000	0.0%	3.4%			0.0%	1.7%
4. Yes, I can pay more than Rp. 100,000	0.0%	0.0%			5.4%	
5. No		0.0%				15.5%
6. Others		13.8%				3.4%
(Blank)		3.4%	0.8%		13.5%	1.7%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

(7) Distribution of TPS users by distance to TPS

The number of respondents using TPS and the number not using TPS which responded in "Q3 How do you handle the waste that is not recycled or composted (MA)" are calculated according to the distance between the sample point and TPS.

It was once again confirmed that the number of respondents using TPS decreases as the distance increases. The majority of respondents said that they would use TPS even if the distance to TPS was 1 to 2 km, but if it exceeds 2 km, it will be 16%.

Table 5-17. Distribution of TPS users by distance to TPS

		0-200m	200-500m	500-1000m	1-2km	2km-	Irregular	Total
Kab. Bangkalan	TPS use	15	24	10	2	2	1	54
	TPS not use	11	38	54	24	114	5	246
	Total	26	62	64	26	116	6	300
Kab. Gresik	TPS use	59	136	46	10	4		255
	TPS not use	5	11	15	11	3		45
	Total	64	147	61	21	7		300
Kab. Lamongan	TPS use	9	51	58	33	22		173
	TPS not use		9	31	20	67		127
	Total	9	60	89	53	89		300
Kab. Sidoarjo	TPS use	17	88	59	72	12		248
	TPS not use	3	5	10	17	17		52
	Total	20	93	69	89	29		300
Kab. Mojokerto	TPS use	10	6	7	46	10		79
	TPS not use	3	17	61	74	60	6	221
	Total	13	23	68	120	70	6	300
Kota Mojokerto	TPS use	28	139	99			10	276
	TPS not use		13	10				23
	(Blank)	1						1
	Total	29	152	109			10	300
Total	TPS use	138	444	279	163	50	11	1085
	TPS not use	22	93	181	146	261	11	714
	(Blank)	1						1
	Total	161	537	460	309	311	22	1800

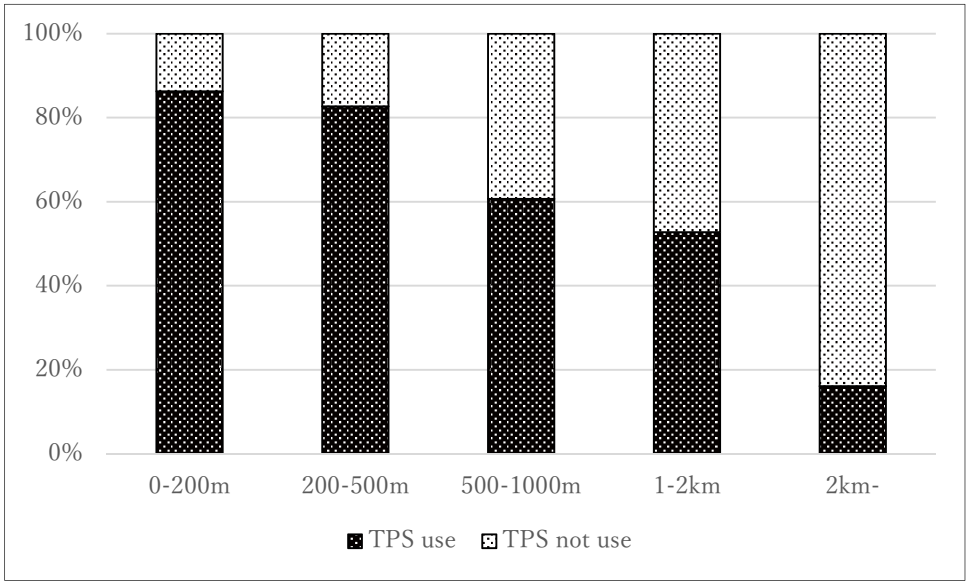


Figure 5-1. Distribution of TPS users by distance to TPS

5.4.2 Business Entities

(1) Material recycle or compost

1) How to treat food waste (Q1)

Q 1. How is your food waste managed?
1. Composted here by our staff.
2. Composted by the municipal facility. .
3. Composted by a private company.
4. Discharged for disposal.
5. Others

Only a small number of businesses are composting food waste, and 72% to 96% of businesses do not recycle it and discharge waste.

Table 5-18. Summary of Question 1 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Composted here by our staff.		2.0%	3.0%	1.0%	7.0%	2.0%
2. Composted by the municipal facility. .		1.0%	1.0%	1.0%	0.0%	
3. Composted by a private company.			0.0%	0.0%	2.0%	1.0%
4. Discharged for disposal.	91.0%	93.0%	72.0%	96.0%	84.0%	90.0%
5. Others	9.0%	4.0%	24.0%	2.0%	7.0%	7.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

2) How to treat green waste (Q2)

Q 2. How is your green waste managed?
1. Composted here by our staff.
2. Composted by the municipal facility.
3. Composted by a private company.
4. Discharged for disposal.
5. Others.

As with food waste, only a small number of businesses are composting green waste, and most businesses discharge it as general waste. In municipalities other than Kab. Bangkalan, the percentage of respondents answered "others" is high because some businesses do not generate green waste, but it has been confirmed that some are burning it.

Table 5-19. Summary of Question 2 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Composted here by our staff.		1.0%	6.0%	2.0%	4.0%	1.0%
2. Composted by the municipal facility.		3.0%	0.0%	1.0%	2.0%	
3. Composted by a private company.			1.0%	0.0%	2.0%	
4. Discharged for disposal.	92.0%	43.0%	69.0%	92.0%	89.0%	83.0%
5. Others.	8.0%	53.0%	24.0%	5.0%	3.0%	16.0%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

3) How to treat recyclable waste (Q3)

Q 3. How is your recyclable waste managed?
1. Sold to Buyers.
2. Sold to Waste Bank.
3. Discharged for disposal.
4. Others

In Kab. Bangkalan, Kab. Gresik, Kab. Sidoarjo, and Kota Mojokerto, 10-20% of businesses sell recyclable waste to Buyer. But Kab. Lamongan and Kab. Mojokerto have high rates of 42% and 66%, respectively. However, it can be seen that most of the resource waste that is not sold is discharged as general waste.

Table 5-20. Summary of Question 3 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Sold to Buyers.	12.0%	12.0%	42.0%	9.0%	66.0%	20.0%
2. Sold to Waste Bank.		3.0%	9.0%	0.0%	3.0%	7.0%
3. Discharged for disposal.	79.0%	55.0%	33.0%	90.0%	30.0%	60.0%
4. Others	9.0%	30.0%	16.0%	1.0%	1.0%	13.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

(2) Handling of waste that has not been recycled or composted

1) Overviews (Q4)

Q 4. How do you handle the waste that is not recycled or composted? (MA)
1. I bring it to TPS by myself
2. I bring it to TPA by myself
3. The collector I have contracted with carries it to TPA.
4. It is collected by municipality
5. I burn it.
6. I bury it.
7. I throw it into a road or open land or waterway.
8. Others

About the handling of non-recycled waste, respondents could make multiple answers to the eight prepared answers. The breakdown of the 8 answers is that 1 to 4 are so-called appropriate handlings that are eventually accumulated in the TPA using the existing collection system, and 5 to 8 are so-called inappropriate handlings that are burning or throwing the waste in an open land or waterways.

The table below shows the number of respondents with 1 to 4 (appropriate handling) including multiple responses, the number of respondents responding to both 1 to 4 & 5 to 8 (appropriate and inappropriate handling), and 5 to 8 (inappropriate handling).

Table 5-21. Number of Respondents of Question 4

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1 ~ 4	68	95	79	81	24	95
1 ~ 8	1	0	3	1	27	2
5 ~	31	5	18	18	49	3
Total	100	100	100	100	100	100

Compared to Households, a high percentage of respondents answered that the businesse handles waste appropriately. However, since there are 49 and 31 respondents in Kab. Mojokerto and Kab. Bangkalan

respectively, it seems important to raise awareness among businesses. On the other hand, it shows that the businesses in Kota Mojokerto and Kab. Gresik who answered to handle waste inappropriately were 3 and 5, respectively, and it can be said that the businesses in these municipalities have higher awareness.

Looking at the handling method from multiple answers, more than 15% of businesses have signed a collection contract, and Kota Mojokerto accounts for 65%. Of particular note compared to households, Kab. Bangkalan, Kab. Sidoarjo, and Kota Mojokerto have a large number of businesses that use Municipality collection services.

The most common type of improper handling is burning, with 72% of respondents answered that they are burning waste in Kab. Mojokerto, and 31% in Kab, Bangkalan.

Table 5-22. Summary of Question 4 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Bring it to TPS by myself	13.0%	45.0%	29.0%	3.0%	42.0%	11.0%
2. Collected by community collector	3.0%	9.0%	19.0%	12.0%	19.0%	14.0%
3. Collected by collector contracted	15.0%	37.0%	25.0%	34.0%	13.0%	65.0%
4. Collected by municipality	40.0%	13.0%	9.0%	34.0%	1.0%	25.0%
5. Burning	31.0%		18.0%	18.0%	72.0%	3.0%
6. Burying			3.0%		5.0%	
7. Throwing into open land or waterway.	17.0%		1.0%	1.0%	2.0%	1.0%
8. Others		4.0%				2.0%

2) Why behave inappropriately (question to respondents in 5-8 above) (Q5)

Q 5. (to those who chose the answers 5-8 above) Why do you handle your waste in that manner?
1. Because I couldn't find public collection service.
2. Because I don't want to pay for collection service
3. Because TPS is far from my house
4. Others

For the reason of inappropriate handling, "there is no public collection service" was the most common reason, with Kab. Bangkalan and Kab. Lamongan accounting for 75%. In Kab. Mojokerto, almost half of the respondents answered that there is no collection service and TPS is far.

Table 5-23. Summary of Question 5 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. No public collection service.	75.0%		76.2%	42.1%	50.0%	20.0%
2. Don't want to pay for collection service				5.3%		20.0%
3. TPS is far from my house	21.9%	20.0%	4.8%	5.3%	44.7%	
4. Others		80.0%	14.3%	47.4%	5.3%	20.0%
(Blank)			4.8%			40.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Respondents	32	5	21	19	76	5

(3) Payment for waste collection service

1) Payment to Community

Q 6.1 How much do you currently pay for waste collection service per month? (to Collector according to the contract)

The proportion of respondents who pay waste collection service according to the contract was over 50% in municipalities other than Kab. Bangkalan.

Table 5-24. Summary of Question 5.1 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
Pay	14%	54%	62%	50%	62%	76%
(Blank) = not pay	86%	46%	38%	50%	38%	24%
Average (among those who pay)	30,714	49,315	43,871	111,122	17,677	42,789
Overall average	4,300	26,630	27,200	55,000	10,960	32,520

2) Payment to Municipal Government

Q5.2 How much do you currently pay for waste collection service per month? (to Municipal Government)

Lamongan has no regulation to collect Retribution, and other municipalities have retribution regulation, but as seen in households, not all the business entities pay to municipal governments. Even the highest payment percentage is about 41% in Kab. Bangkalan.

Table 5-25. Summary of Question 5.2 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
Pay	41%	22%	6%	34%	4%	29%
(Blank) = not pay	59%	78%	94%	66%	96%	71%
Average (among those who pay)	25,427	38,909	8,000	45,147	76,250	58,179
Overall average	10,425	8,560	480	15,350	3,050	16,455

(4) Waste discharge frequency (Q7)

Q 7. How frequently do you discharge your waste? (Times per week)

The highest frequency of discharges from businesses is seven times a week, followed by three or four times. In Kab. Mojokerto, 14% of respondents answered that they were more than 8 times.

Table 5-26. Summary of Question 7 results

Answer	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1/week		3.0%		5.0%		
2/week		2.0%	2.0%	4.0%	9.0%	1.0%
3/week	3.0%	12.0%	17.0%	11.0%	19.0%	11.0%
4/week	1.0%	1.0%	17.0%	9.0%	12.0%	
5/week	3.0%		10.0%	10.0%	6.0%	9.0%
6/week	13.0%	1.0%	6.0%	1.0%	1.0%	2.0%
7/week	79.0%	76.0%	48.0%	58.0%	34.0%	73.0%
8/week						1.0%
9/week					1.0%	

14/week		2.0%			10.0%	
15/week					2.0%	
20/week					1.0%	
(No answer)	1.0%	3.0%		2.0%	5.0%	3.0%

(5) Awareness of TPA (Q8)

Q 8. Do you know at which TPA your waste is disposed of?
1. Yes (Name of disposal site: _____)
2. Yes, but I don't know the name
3. No

Almost half of businesses in Kab. Gresik and Kota Mojokerto who answered they knew the destination (TPA) of the waste they discharged, but in other municipalities, more than 70% did not know.

Table 5-27. Summary of Question 8 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Yes, I know name of TPS	8.0%	27.0%	29.0%	8.0%	3.0%	37.0%
2. Yes, but I don't know name	21.0%	23.0%		16.0%	3.0%	17.0%
3. No, I don't know	71.0%	50.0%	71.0%	76.0%	94.0%	46.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

(6) Satisfaction with Municipal waste management
1) Overviews (Q9)

Q 9. Are you satisfied with the municipal waste management you live in?
1. Yes, I am satisfied.
2. No, I am not satisfied
3. I do not know.

Other than Kota Mojokerto, the majority of respondents answered they were satisfied with Municipal waste management. On the other hand, Kab. Lamongan and KAb. Mojokerto accounted for a quarter of the respondents who were dissatisfied.

Table 5-28. Summary of Question 9 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Satisfied.	84.0%	61.0%	59.0%	55.0%	25.0%	70.0%
2. Not satisfied	6.0%	12.0%	26.0%	19.0%	5.0%	26.0%
3. I do not know.	10.0%	27.0%	15.0%	26.0%	70.0%	4.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

2) Reason not to be satisfied (Q10-MA)

Q 10. (For those who not satisfied) What is the reason you are not satisfied? (MA)
1. Scattered waste
2. Bad smell
3. Mice and flies
4. Flooding of waterways blocked by garbage
5. Polluting TPA
6. Others

Many of the respondents who were dissatisfied cited it because of scattered waste, bad smell, and mice and flies. In addition to these reasons, the frequency of TPS collection and poor manners of collection are also reported.

Table 5-29. Summary of Question 10 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Scattered waste	33.3%	83.3%	76.9%	52.6%	40.0%	34.6%
2. Bad smell			30.8%	57.9%	40.0%	15.4%
3. Mice and flies				21.1%		7.7%
4. Flooding by garbage		8.3%	3.8%			3.8%
5. Polluting TPA					40.0%	
6. Others	66.7%	50.0%	23.1%	21.1%	40.0%	69.2%
Respondents	6	12	26	19	5	26

3) Improvements required for Municipality (Q11-MA)

Q 11. (For those who not satisfied) To improve waste condition, what do you want to request the municipality to do? (MA)

1. To provide TPS more.
2. To increase waste haulage frequency from TPS.
3. To keep TPS clean.
4. To clean roads, parks and other public places more often.
5. To operate TPA more sanitarily.
6. To educate people for good manners.
7. Nothing particular.
8. I don't know.
9. Specify :

Expectations for Municipality in order to improve the unsatisfactory situation are most likely to increase TPS and increase the frequency of TPS collection, followed by cleaning public spaces such as roads and parks, and enlightening residents.

Table 5-30. Summary of Question 11 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. To provide TPS more.	66.7%	50.0%	57.7%	21.1%	20.0%	15.4%
2. To increase waste haulage frequency from TPS.	100.0%	33.3%	38.5%	84.2%		38.5%
3. To keep TPS clean.	16.7%	8.3%	11.5%	10.5%	60.0%	
4. To clean public places more often.	16.7%	33.3%	26.9%	21.1%		15.4%
5. To operate TPA more sanitarily.	16.7%		3.8%	10.5%	20.0%	
6. To educate people for good manners.	50.0%	8.3%	46.2%			19.2%
7. Nothing particular.						
8. I don't know.						
9. Specify :		16.7%	11.5%		20.0%	34.6%
Respondents	6	12	26	19	5	26

4) About cost burden of inhabitants required for improvement (Q12)

Q 12. (For those who not satisfied) To improve waste management to your satisfaction, the government will need a reasonable cost, but are you willing to pay it?
1. Yes
2. No

It was found that a majority of the respondents would be willing to pay for implementing the above remedial measures. Especially in Kab. Bangkalan, Kab. Lamongan and Kab. Sidoarjo, more than 80% of respondents are willing to pay.

Table 5-31. Summary of Question 12 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Yes	83.3%	58.3%	96.2%	100.0%	60.0%	76.9%
2. No	16.7%	41.7%	3.8%		40.0%	23.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Respondents	6	12	26	19	5	26

(7) Payment for waste collection service (Q6.1, Q6.2, Q13)

1) Payment to Collector

Q 6.1 How much do you currently pay for waste collection service per month? (to Collector according to the contract)

In 6 municipalities, an average of 53% of businesses pay fees for collection services by individual contract or community contract.

Payments were concentrated on Rp 20,000 to Rp.50,000, with the largest number of businesses replying Rp20,000.

Table 5-32. Summary of Question 6.1 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. Respondents pays fee	14.0%	54.0%	62.0%	50.0%	62.0%	76.0%
2. (Blank)	86.0%	46.0%	38.0%	50.0%	38.0%	24.0%
Average (among those who pay)	30,714	49,315	43,871	111,122	17,677	42,789
Overall average	4,300	26,630	27,200	55,000	10,960	32,520

2) Payment to Municipality

Q6.2 How much do you currently pay for waste collection service per month? (to Municipal Government)

An average of 22.7% of businesses in 6 municipalities pay collection services to municipality. In Kab. Lamongan and Kab. Mojokerto, the percentages paid are low at 6% and 4%, respectively, and for other municipalities it is high at 22% to 41%, which is a different situation.

The amount of payment is concentrated on Rp 10,000 to Rp50,000, but Rp20,000 was the largest, as in the previous section.

Table 5-33. Summary of Question 6.2 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
Respondents pays fee	41.0%	22.0%	6.0%	34.0%	4.0%	29.0%
(Blank)	59.0%	78.0%	94.0%	66.0%	96.0%	71.0%
Average (among those who pay)	25,427	38,909	8,000	45,147	76,250	58,179
Overall average	10,425	8,560	480	15,350	3,050	16,455

3) Impressions on Waste cost

Q 13. What do you think about the waste cost you are currently paying?
1. High
2. Reasonable
3. Cheap
4. Others

About 40 to 65% of businesses think that waste cost is appropriate. It was found that about 5% of the businesses recognize it as high, and 10 to 30% consider it rather cheap.

Table 5-34. Summary of Question 13 results

	Kab. Bangkalan	Kab. Gresik	Kab. Lamongan	Kab. Sidoarjo	Kab. Mojokerto	Kota Mojokerto
1. High			6.0%	6.0%	1.0%	4.0%
2. Reasonable	38.0%	49.0%	66.0%	42.0%	55.0%	63.0%
3. Cheap	23.0%	26.0%	11.0%	30.0%	10.0%	24.0%
4. Others	8.0%	25.0%	16.0%	22.0%	34.0%	9.0%
(Blank)	31.0%		1.0%			
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chapter 6 Estimation of Remaining Service Lifetime of the Existing Final Disposal Sites

6.1 Outline

6.1.1 Objectives

- To estimate the remaining service lifetime of the existing final disposal sites (those receiving most waste in each local government (regency/city) when there are more than two).
- To confirm the need for a new or wide-area disposal site.

6.1.2 Applied Methodology

The short-term experts conducted the work by the following steps.

Step 1. Calculation of the **remaining disposal capacity** of the existing disposal site (TPA).

Step 2. Estimation of the **current and future disposal amount** at the existing TPA.

Step 3. Estimate the **remaining service lifetime** of the existing TPA.

6.1.3 Calculation of the Remaining Disposal Capacity

The **remaining disposal capacity (m3)** of the existing TPA is calculated by the following procedure.

1. The aerial photo of the target TPA is taken by a drone (UAV), and a topographic map of the current state of the TPA is created.
2. A landfill plan, which shows the shape of the TPA at the completion of the landfill operation, is made on the current topographic map. The plan is made by the following conditions:
   - TPA boundary, location of facilities for TPA operation (e.g., weighbridges and offices), and Area for waste disposal are decided by the C/Ps of each regency/city.
   - Design conditions of the landfill: This basically follows the regulation of PUPR below, but site-specific exceptional conditions are determined when necessary.
     - Slope should be at 1:3.
     - Five-meter-wide steps to be provided at every 5m elevation.
3. The remaining disposal capacity (m3) is calculated by subtracting the current TPA terrain from the landfill plan terrain using software called “Cloud Compare”.

6.1.4 Estimation of the Current and Future Disposal Amount

The current and future disposal amounts at the existing TPA are estimated by the following procedure.

1. The current disposal amount (ton/day) of the existing TPA is obtained by analyzing the latest measurement data of the waste disposed of at the target TPA.
2. Analyze the above measurement data and WACS data to develop a Waste Flow of the current status of each local government in 2019.
3. The future disposal amount (ton/day) at the target TPA is predicted in the following two cases based on the current Waste Flow as described in Chapter 2.

   Case 1 Continue the current Waste Flow: The case where waste handling, reduction, disposal and un-management rate are the same with the current status. The rate not from the Jakstrada report but from the experts’ analysis is used. The amount of disposal will increase only due to the increase in population.

   Case 2 Waste Flow of Jakstrada Plan: The case where the Jakstrada targets (70% handling, 30% reduction) are achieved in 2025 and these rates remain the same onwards. The amount of disposal will increase as the population grows.

6.1.5 Estimation of the Remaining Service Lifetime

In order to estimate the remaining service lifetime of the existing TPA, the above current and future disposal amounts (ton/day) are converted to the accumulated disposal volumes (m3) as follows.

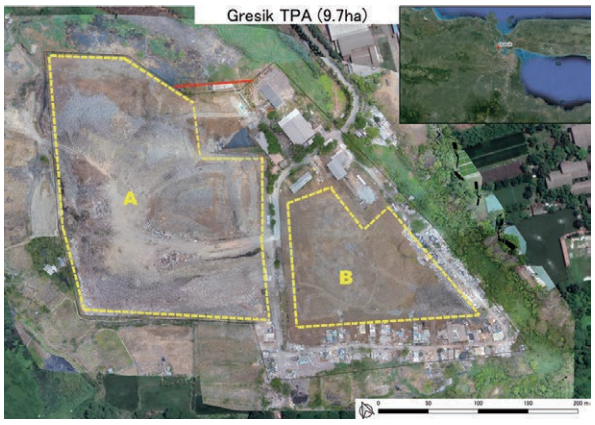
1. Calculate the yearly disposal amount (ton/year) from the current year (2019) to the planned year (2025) based on the above current and future disposal amounts (ton/day). For the year 2019, 100 days' worth was calculated because the aerial photos were taken by Drone in October 2019.
2. Convert the yearly disposal amount (ton/year) to the yearly disposal volume (m3/year) by assuming that the **unit weight of waste disposed** of at the TPA is **1 ton/m3** and the **rate of cover soil volume to disposed waste volume is 0.1**.
3. The accumulated disposal volume (m3) is calculated by using yeary disposal volume.
4. The remaining service lifetime is estimated by comparing the accumulated disposal volume (m3) and the remaining disposal capacity (m3).

6.2 Gresik Regency

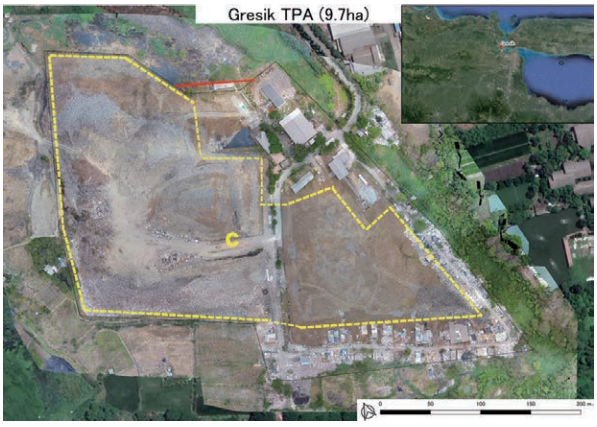
6.2.1 Calculation of the Remaining Disposal Capacity

(1) Target TPA and Disposal Area

Target TPA is TPA Ngipik. Areas for landfilling were determined as below.



Area A&B



Area C

(2) Landfill Plan

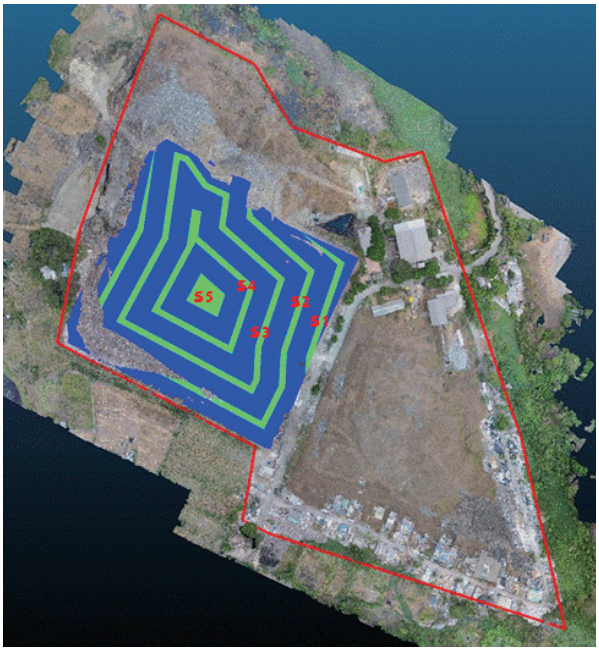
The following landfill plans are made as shown in the figure below.

Areas A and B:

In fact, Area B does not have remaining capacity because its slope is steeper than 1:3. Area B will be remained as it is. As shown in the figure below, Area A will be used with slope at 1:3 and 5m-wide steps at 5m (s1), 10m (s2), 15m (s3) and 20m (s4) height. Final height of the landfill will be 25m (s5). Elevation mentioned is based on the drone survey map.

Area C:

Area C is used after Areas A and B are full. Slope will be at 1:3 and 5m-wide steps are provided at 5m (s1), 10m (s2) and 15m (s3) height. Final height of the landfill will be 20m (s4).



Area A&B

Area C

Note: Bright green indicates 5m-wide steps and flat parts (final heights). Blue parts indicate slopes of 1:3.

(3) Remaining Disposal Capacity

The remaining disposal capacities of Area A&B and Area C are calculated **171,420 m3 and 232,362 m3** respectively.

6.2.2 Disposal Amount and Volume

(1) Disposal Amount

The current and future waste disposal amounts are as shown in the table below.

Table 6-1. Current and Future Waste Disposal Amount

	Current in 2019		Future Case 1 in 2025		Future Case 2 in 2025	
	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)
Generation	570.3	100	608.2	100	608.2	100
Reduction	17.4	3.0	18.7	3.0	182.5	30.0
Handling	410.5	72.0	437.7	72.0	425.7	70.0
Unmanaged	142.4	25.0	151.8	25.0	0.0	0.0
Disposal at TPA Ngipik	**128.6**	-	**137.2**	-	**133.4**	-

(2) Accumulate Disposal Volume

Based on the current and future waste disposal amount, the accumulated waste disposal volume of at TPA Ngipik is calculated in the Table below.

Table 6-2. Accumulated Disposal Volume of TPA Ngipik for Case 1 & 2

	Case 1				Case 2			
Year	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)
2019	128.6	12,860	14,146	14,146	128.6	12,860	14,146	14,146
2020	130.0	47,459	52,205	66,351	129.4	47,232	51,955	66,101
2021	131.5	47,979	52,777	119,128	130.2	47,524	52,277	118,377
2022	132.9	48,499	53,349	172,478	131.0	47,817	52,599	170,976
2023	134.3	49,020	53,921	226,399	131.8	48,109	52,920	223,896
2024	135.7	49,540	54,494	280,893	132.6	48,402	53,242	277,139
2025	137.2	50,060	55,066	335,958	133.4	48,695	53,564	330,703
2026	138.1	50,421	55,463	391,421	134.8	49,220	54,142	384,844
2027	139.1	50,784	55,863	447,284	136.3	49,750	54,725	439,569
2028	140.1	51,150	56,265	503,549	137.8	50,286	55,315	494,884
2029	141.1	51,519	56,671	560,220	139.3	50,829	55,911	550,796
2030	142.2	51,891	57,080	617,300	140.8	51,376	56,514	607,310

6.2.3 Remaining Lifetime Estimation

The remaining service lifetime is estimated by comparing the accumulated disposal volume (m3) and the remaining disposal capacity (m3) as shown in the Table below.

TPA Area	Remaining Disposal Capacity (m3)	Remaining Year of TPA (Year)	
		Case 1	Case 2
Area A + B	171,420	Until November 2022	Until December 2022
Area C	232,362	Until January 2024	Until January 2024

The above-mentioned work finds out the following aspects:

- There is no difference between Case 1 and Case 2 as the handling rates of the two are close.
- With the TPA guidelines of PU, there is no space for waste disposal at Area B. Then Area A&B will not be able to receive waste after Dec. 2022.
- Using Area C (combined of Area A&B), the TPA will be able to receive waste until January 2024.
- Gresik will need a new TPA to replace TPA Ngipik after 3 years.
- In addition, since final disposal amount waste at other than TPA Ngipik is quite big, official TPAs for remote area are necessary.

6.3 Bangkalan Regency

6.3.1 Calculation of the Remaining Disposal Capacity

(1) Target TPA and Disposal Area

Target TPA is TPA Buluh. Area for landfilling was determined as shown in the left figure below.

Disposal Area

Landfill Plan

(2) Landfill Plan

The landfill plan is made as shown in the right figure above. Landfilling area will be used with slope at 1:3 and 5m-wide steps at -10 m (s1) and -5m (s2). Final height of the landfill will be -2m (s3). Elevation mentioned is based on the drone survey map. In the figure bright green indicates 5m-wide steps and flat part (final height). Blue parts indicate slopes of 1:3.

(3) Remaining Disposal Capacity

The remaining disposal capacity is calculated **14,151 m3**.

6.3.2 Disposal Amount and Volume

(1) Disposal Amount

The current and future waste disposal amounts are as shown in the table below.

Table 6-3: Current and Future Waste Disposal Amount

	Current in 2019		Future Case 1 in 2025		Future Case 2 in 2025	
	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)
Generation	395.7	100	415.1	100	415.1	100
Reduction	30.1	7.6	31.6	7.6	124.5	30.0
Handling	154.4	39.0	162.0	39.0	290.6	70.0
Unmanaged	211.2	53.4	221.5	53.4	0.0	0.0
Disposal at TPA Buluh	**46.4**	-	**48.6**	-	**83.2**	-

(2) Accumulate Disposal Volume

Based on the current and future waste disposal amount, the accumulated waste disposal volume of at TPA Buluh is calculated in the Table below.

Table 6-4: Accumulated Disposal Volume of TPA Buluh for Case 1 & 2

	Case 1				Case 2			
Year	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)
2019	46.4	4,637	5,101	5,101	46.4	4,637	5,101	5,101
2020	46.7	17,063	18,769	23,870	52.5	19,165	21,081	26,182
2021	47.1	17,201	18,921	42,792	58.6	21,405	23,545	49,727
2022	47.5	17,339	19,073	61,865	64.8	23,645	26,009	75,737
2023	47.9	17,477	19,225	81,090	70.9	25,885	28,473	104,210
2024	48.3	17,616	19,377	100,467	77.1	28,124	30,937	135,147
2025	48.6	17,754	19,529	119,996	83.2	30,364	33,401	168,547
2026	49.0	17,882	19,670	139,666	83.9	30,608	33,668	202,216
2027	49.3	18,011	19,812	159,477	84.5	30,853	33,938	236,154
2028	49.7	18,140	19,954	179,432	85.2	31,100	34,210	270,364
2029	50.1	18,271	20,098	199,530	85.9	31,349	34,484	304,847
2030	50.4	18,403	20,243	219,773	86.6	31,600	34,760	339,607

6.3.3 Remaining Lifetime Estimation

The remaining service lifetime is estimated by comparing the accumulated disposal volume (m3) and the remaining disposal capacity (m3) as shown in the Table below.

TPA Area	Remaining Disposal Capacity (m3)	Remaining Year of TPA (Year)	
		Case 1	Case 2
13,069 m2	14,151	Until May 2020	Until May 2020

The above-mentioned work finds out the following aspects:

- The remaining disposal capacity is only 14,151 m3.
- With the TPA guidelines of PU, the TPA Buluh will not be able to receive waste after June 2020.
- Bangkalan will need a new TPA to replace TPA Buluh urgently.
- In addition, since final disposal amount waste at other than TPA Buluh is quite big, official TPAs for remote area are necessary.

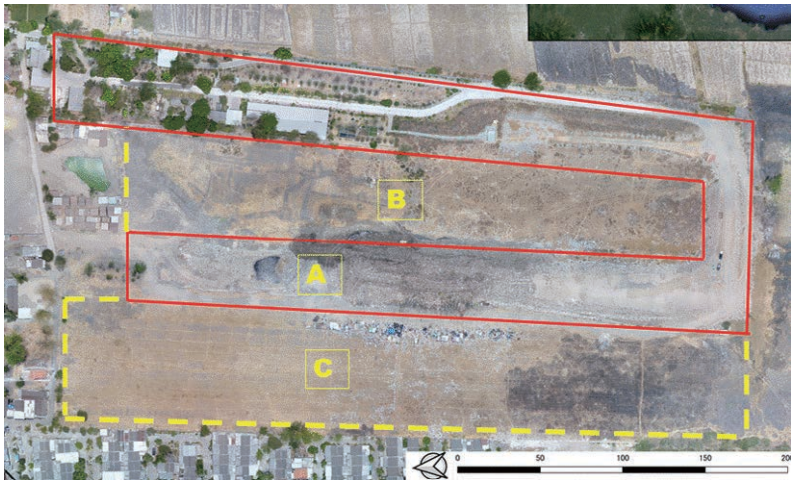
6.4 Mojokerto City

6.4.1 Calculation of the Remaining Disposal Capacity

(1) Target TPA and Disposal Area

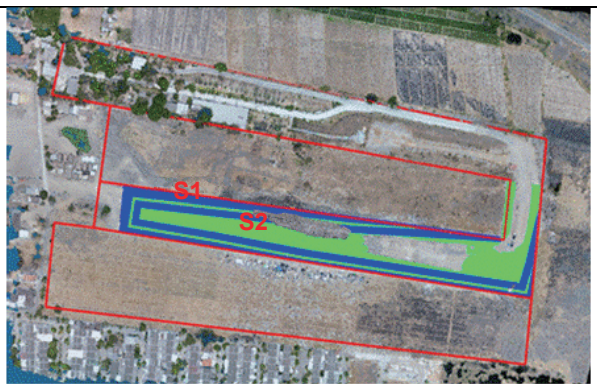
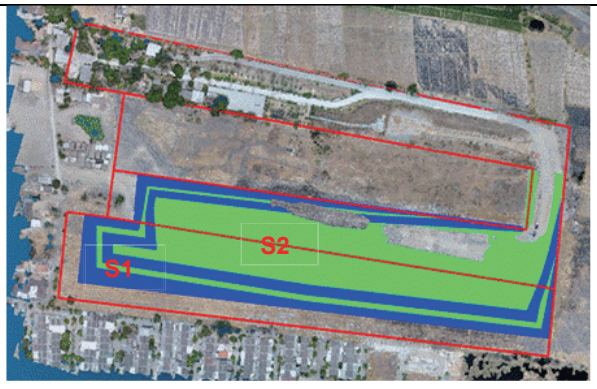
Target TPA is TPA Randegan. As shown in the figure below, possible landfill areas were determined as follows:

- Land owned by the Mojokerto City is narrow strip as shown in the red line (A).
- Lands marked B and C belong to the private owner(s).



(2) Landfill Plan and Remaining Capacity

The following landfill plans are made as shown in the figure below.

Target Area and Plan	Landfill Plan
Area A: **17,603 m2** **Landfill Plan:** Area A cannot follow the regulation of PUPR. As shown in the figure right, Area A will be used with slope at 1:2 and 2.5m-wide step at 0m (s1) height. Final height of the landfill will be 3m (s2). Elevation mentioned is based on the drone survey map. **Remaining Disposal Capacity**: **46,586 m3**	
Area B: **23,543 m2** **Landfill Plan:** Area B can follow the regulation of PUPR. As shown in the figure right, Area B will be used with slope at 1:3 and 5m-wide step at 0m (s1) height. Final height of the landfill will be 3m (s2). Elevation mentioned is based on the drone survey map. **Remaining Disposal Capacity**: **121,421 m3**	
Area C: **24,418 m2** **Landfill Plan:** Area C can follow the regulation of PUPR. As shown in the figure right, Area C will be used with slope at 1:3 and 5m-wide step at 0m (s1) height. Final height of the landfill will be 3m (s2). Elevation mentioned is based on the drone survey map. **Remaining Disposal Capacity**: **105,864 m3**	

Note: Bright green indicates steps and flat parts (final heights). Blue parts indicate slopes in the figure.

6.4.2 Disposal Amount and Volume

(1) Disposal Amount

The current and future waste disposal amounts are as shown in the table below.

Table 6-5: Current and Future Waste Disposal Amount

	Current in 2019		Future Case 1 in 2025		Future Case 2 in 2025	
	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)
Generation	87.1	100	90.7	100	90.7	100
Reduction	14.0	16.1	14.6	16.1	27.2	30.0
Handling	69.2	79.4	72.0	79.4	63.5	70.0
Unmanaged	3.9	4.5	4.1	4.5	0.0	0.0
Disposal at TPA Randegan	**62.2**	**-**	**64.8**	**-**	**57.1**	**-**

(2) Accumulate Disposal Volume

Based on the current and future waste disposal amount, the accumulated waste disposal volume of at TPA Randegan is calculated in the Table below.

Table 6-6: Accumulated Disposal Volume of TPA Randegan for Case 1 & 2

	Case 1				Case 2			
Year	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)
2019	62.2	6,217	6,839	6,839	62.2	6,217	6,839	6,839
2020	62.6	22,849	25,134	31,973	61.3	22,383	24,621	31,460
2021	63.0	23,006	25,307	57,279	60.5	22,074	24,281	55,741
2022	63.5	23,163	25,479	82,758	59.6	21,765	23,941	79,683
2023	63.9	23,320	25,652	108,410	58.8	21,456	23,602	103,284
2024	64.3	23,477	25,824	134,235	57.9	21,147	23,262	126,546
2025	64.8	23,634	25,997	160,232	57.1	20,838	22,922	149,468
2026	65.2	23,804	26,185	186,416	57.5	20,988	23,087	172,554
2027	65.7	23,976	26,373	212,790	57.9	21,139	23,253	195,808
2028	66.2	24,149	26,564	239,353	58.3	21,292	23,421	219,229
2029	66.6	24,323	26,755	266,108	58.8	21,445	23,590	242,819
2030	67.1	24,498	26,948	293,056	59.2	21,600	23,760	266,579

6.4.3 Remaining Lifetime Estimation

The remaining service lifetime is estimated by comparing the accumulated disposal volume (m3) and the remaining disposal capacity (m3) as shown in the Table below.

TPA Area	Remaining Disposal Capacity (m3)	Remaining Year of TPA (Year)	
		Case 1	Case 2
Area A	46,586	Until June 2021	Until July 2021
Area A + B	168,007	Until March 2026	Until Sep. 2026
Area A + C	152,450	Until August 2025	Until January 2026
Area A + B + C	273,871	Until March 2030	Until March 2031

The above-mentioned work finds out the following aspects:

- No significant difference between Cases 1 and 2, because current handling rate of waste is already over 70% and most of collected waste is disposed of at TPA Randegan.
- Without purchasing private land nearby, the TPA will not be able to operate after mid-2021.

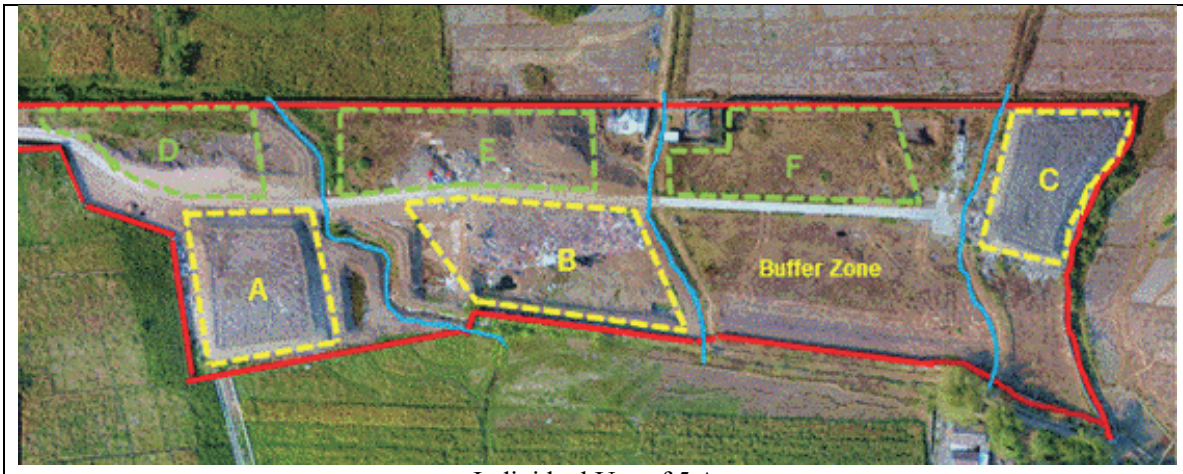
6.5 Mojokerto Regency

6.5.1 Calculation of the Remaining Disposal Capacity

(1) Target TPA and Disposal Area

Target TPA is TPA Desa Belahan Tengah. There are 6 possible areas for landfilling in TPA Desa Belahan Tengah. C/P determined the areas for landfilling as follows:

- **Individual Use of 5 Areas**: Areas of A, B, C, E and F will be separately used. Wastes were disposed of at Areas of A, B and C in October 2019 when aerial photo taken. Area D will be used as nursery.
- **Integrated Use of 5 Areas**: The five areas of A, B, C, E, and F will be combined and used for landfilling.



Individual Use of 5 Areas

Integrated Use of 5 Areas

(2) Landfill Plan

The following two landfill plans are made.

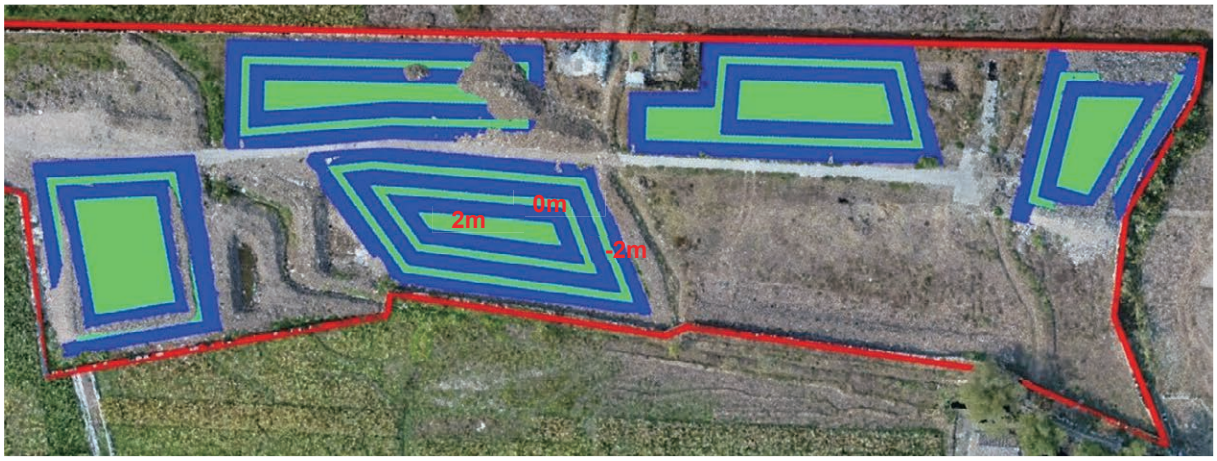
1) Individual Use of 5 Areas

All 5 Areas cannot follow the regulation of PUPR. In addition, the site condition of each area differs. Dimension of landfill plan for each area is set as shown in the table below.

Area / Items	A	B	C	E	F
Slope	1:2	1:2	1:2	1:2	1:2
Step width	2m	2m	2m	2m	2m
Step Height	0m	- 2m, 0m	- 1m	- 2m	- 2m
Final Height	2m	2m	1m	0m	0m

Note: Elevation mentioned is based on the drone survey map.

Landfill Plans for 5 areas are made as shown in the figure below. In the plan, Bright green indicates steps and flat parts (final heights). An example of steps and flat part height is shown in the Area B. Blue parts indicate slopes.



2) Integrated Use of 5 Areas

Target area of this case can follow the regulation of PUPR. As shown in the figure below, target area will be used with slope at 1:3 and 5m-wide step at 1m height. Final height of the landfill will be 1m and 3m. Elevation mentioned is based on the drone survey map.

(3) Remaining Disposal Capacity

The remaining disposal capacity is calculated as follows:

- Individual Use of 5 Areas: **22,707 m3**
- Integrated Use of 5 Areas: **39,905 m3**

6.5.2 Disposal Amount and Volume

(1) Disposal Amount

The current and future waste disposal amounts are as shown in the table below.

Table 6-7: Current and Future Waste Disposal Amount

	Current in 2019		Future Case 1 in 2025		Future Case 2 in 2025	
	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)
Generation	573.0	100	601.8	100	601.8	100
Reduction	73.3	12.8	77.0	12.8	180.5	30.0
Handling	30.3	5.3	31.8	5.3	421.3	70.0
Unmanaged	469.4	81.9	493.0	81.9	0.0	0.0
Disposal at TPA Desa Belahan Tengan	**28.6**	**-**	**30.1**	**-**	**398.1**	**-**

(2) Accumulate Disposal Volume

Based on the current and future waste disposal amount, the accumulated waste disposal volume of at TPA Desa Belahan Tengah is calculated in the Table below.

Table 6-8: Accumulated Disposal Volume of TPA Desa Belahan Tengan for Case 1 & 2

	Case 1				Case 2			
Year	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)
2019	28.6	2,861	3,147	3,147	28.6	2,861	3,147	3,147
2020	28.9	10,530	11,583	14,730	90.2	32,919	36,211	39,358
2021	29.1	10,618	11,680	26,410	151.8	55,395	60,934	100,292
2022	29.3	10,705	11,776	38,186	213.3	77,871	85,658	185,950
2023	29.6	10,793	11,872	50,058	274.9	100,347	110,382	296,332
2024	29.8	10,881	11,969	62,027	336.5	122,823	135,105	431,437
2025	30.1	10,968	12,065	74,092	398.1	145,299	159,829	591,266
2026	30.3	11,047	12,152	86,244	401.3	146,491	161,140	752,406
2027	30.5	11,127	12,240	98,484	404.6	147,692	162,461	914,867
2028	30.7	11,207	12,328	110,812	408.0	148,903	163,793	1,078,660
2029	30.9	11,288	12,417	123,229	411.3	150,124	165,136	1,243,797
2030	31.1	11,369	12,506	135,735	414.7	151,355	166,490	1,410,287

6.5.3 Remaining Lifetime Estimation

The remaining service lifetime is estimated by comparing the accumulated disposal volume (m3) and the remaining disposal capacity (m3) as shown in the Table below.

TPA Area	Remaining Disposal Capacity (m3)	Remaining Year of TPA (Year)	
		Case 1	Case 2
Individual Use of 5 Areas	22,707	Until August 2021	Until June 2020
Integrated Use of 5 Areas	39,905	Until January 2023	Until December 2020

The above-mentioned work finds out the following aspects:

- There is big difference between Case 1 and Case 2 due to extreme difference of handling rates.
- In Individual Use of 5 Areas, TPA Tengah will not be able to receive waste after August 2021 in Case 1 and after June 2020 in Case 2.
- In Integrated Use of 5 Cells, TPA Tengah will not be able to receive waste after January 2023 in Case 1 and after December 2020 in Case 2.
- Mojokerto Regency requires a new TPA for replacing the TPA Tengah urgently.
- In addition, if the Mojokerto Regency intends to extend collection service to the remote area, official TPAs for the area are necessary.

6.6 Sidoarjo Regency

6.6.1 Calculation of the Remaining Disposal Capacity

(1) Target TPA and Disposal Area

Target TPA is TPA Jabon. There were two Areas for landfilling at TPA Jabon at the time of October 2019 as shown in the left figure below. The remaining disposal capacity calculation work is conducted in the Active Cell shown in the right figure below.

Whole Areas for Landfilling

Active Cell

(2) Landfill Plan

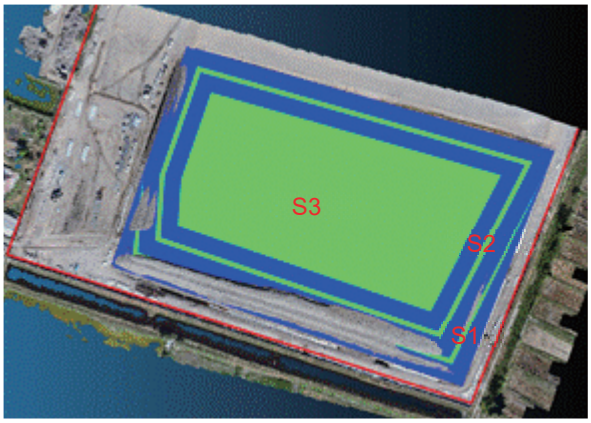
The following landfill plans are made as shown in the figure below.

Final Height 15m:

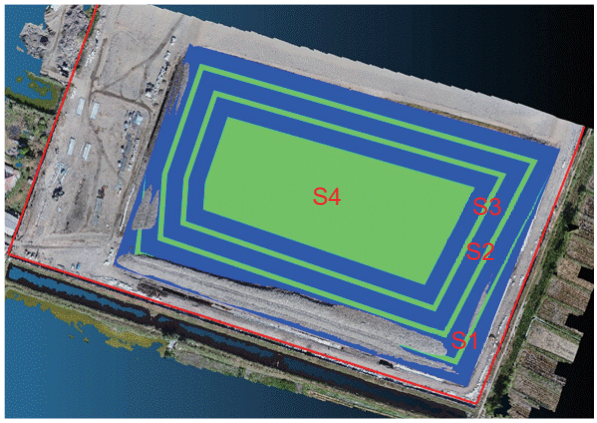
As shown in the left figure below, the active cell will be used with slope at 1:3 and 5m-wide steps at 5m (s1), and 10m (s2) height. Final height of the landfill will be 15m (s3). Elevation mentioned is based on the drone survey map.

Final Height 20m:

As shown in the right figure below, the active cell will be used with slope at 1:3 and 5m-wide steps at 5m (s1), 10m (s2) and 15m (s3) height. Final height of the landfill will be 20m (s4).



Final Height 15m



Final Height 20m

Note: Bright green indicates 5m-wide steps and flat parts (final heights). Blue parts indicate slopes of 1:3.

(3) Remaining Disposal Capacity

The remaining disposal capacity is calculated as follows:

- Final Height 15m: **304,073 m3**
- Final Height 20m: **437,919 m3**

6.6.2 Disposal Amount and Volume

(1) Disposal Amount

The current and future waste disposal amounts are as shown in the table below.

Table 6-9: Current and Future Waste Disposal Amount

	Current in 2019		Future Case 1 in 2025		Future Case 2 in 2025	
	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)
Generation	1,234.8	100	1,350.8	100	1,350.8	100
Reduction	129.0	10.5	141.1	10.5	405.2	30.0
Handling	647.2	52.4	708.0	52.4	945.6	70.0
Unmanaged	458.6	37.1	501.7	37.1	0.0	0.0
Disposal at TPA Jabon	**384.2**	**-**	**420.3**	**-**	**561.4**	**-**

(2) Accumulate Disposal Volume

Based on the current and future waste disposal amount, the accumulated waste disposal volume of at TPA Jabon is calculated in the Table below.

Table 6-10: Accumulated Disposal Volume of TPA Jabon for Case 1 & 2

	Case 1				Case 2			
Year	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)
2019	384.2	38,423	42,265	42,265	384.2	38,423	42,265	42,265
2020	390.2	142,440	156,684	198,949	413.8	151,022	166,125	208,390
2021	396.3	144,636	159,100	358,049	443.3	161,801	177,981	386,371
2022	402.3	146,832	161,515	519,564	472.8	172,579	189,837	576,208
2023	408.3	149,028	163,931	683,496	502.4	183,358	201,694	777,902
2024	414.3	151,224	166,347	849,842	531.9	194,136	213,550	991,451
2025	420.3	153,420	168,762	1,018,605	561.4	204,915	225,406	1,216,858
2026	423.4	154,527	169,979	1,188,584	569.9	208,005	228,805	1,445,663
2027	426.4	155,641	171,205	1,359,789	578.5	211,141	232,256	1,677,918
2028	429.5	156,763	172,439	1,532,228	587.2	214,325	235,758	1,913,676
2029	432.6	157,893	173,682	1,705,911	596.0	217,558	239,313	2,152,990
2030	435.7	159,032	174,935	1,880,845	605.0	220,838	242,922	2,395,912

6.6.3 Remaining Lifetime Estimation

The remaining service lifetime is estimated by comparing the accumulated disposal volume (m3) and the remaining disposal capacity (m3) as shown in the Table below.

Landfill Plan	Remaining Disposal Capacity (m3)	Remaining Year of TPA (Year)	
		Case 1	Case 2
Final Height 15m	304,073	Until July 2021	Until June 2021
Final Height 20m	437,919	Until May 2022	Until March 2022

The above-mentioned work finds out the following aspects:

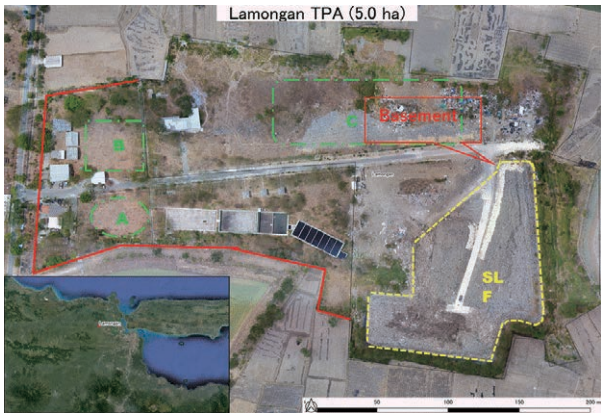
- There is a little difference between Case 1 and Case 2 due to small change of handling (collection) rates, i.e., 54.2% in Case 1 and 70.0 % in Case 2.
- In final height 15m, TPA Jabon will not be able to receive waste after July 2021 in Case 1 and after June 2021 in Case 2.
- In final height 20m, TPA Jabon will not be able to receive waste after May 2022 in Case 1 and after March 2022 in Case 2.
- If Sidoarjo Regency intends to extend collection service to the remote area, an official TPA for the area is necessary.

6.7 Lamongan Regency

6.7.1 Calculation of the Remaining Disposal Capacity

(1) Target TPA and Disposal Area

Target TPA is TPA Tambakrigadung. There were several Areas for landfilling at TPA Tambakrigadung at the time of October 2019 as shown in the left figure below. The remaining disposal capacity calculation work is conducted in the Active Cell shown in the right figure below.



Whole Areas of TPA

Active Cell

(2) Landfill Plan

The following landfill plans are made as shown in the figure below.

Final Height 12m:

As shown in the left figure below, the active cell will be used with slope at 1:3 and 5m-wide steps at 10m (s1) height. Final height of the landfill will be 12m (s2). Elevation mentioned is based on the drone survey map.

Final Height 15m:

As shown in the right figure below, the active cell will be used with slope at 1:3 and 5m-wide steps at 10m (s1) height. Final height of the landfill will be 15m (s2).

Final Height 12m

Final Height 15m

Note: Bright green indicates 5m-wide steps and flat parts (final heights). Blue parts indicate slopes of 1:3.

(3) Remaining Disposal Capacity

The remaining disposal capacity is calculated as follows:

- Final Height 12m: **22,218 m3**
- Final Height 15m: **29,534 m3**

6.7.2 Disposal Amount and Volume

(1) Disposal Amount

The current and future waste disposal amounts are as shown in the table below.

Table 6-11: Current and Future Waste Disposal Amount

	Current in 2019		Future Case 1 in 2025		Future Case 2 in 2025	
	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)	Amount (ton/day)	Rate (%)
Generation	704.0	100	712.5	100	712.5	100
Reduction	198.4	28.2	200.8	28.2	213.8	30.0
Handling	442.8	62.9	448.1	62.9	498.7	70.0
Unmanaged	62.8	8.9	63.6	8.9	0.0	0.0
Disposal at TPA Tambakrigadung	**39.6**	**-**	**40.1**	**-**	**44.6**	**-**

(2) Accumulate Disposal Volume

Based on the current and future waste disposal amount, the accumulated waste disposal volume of at TPA Tambakrigadung is calculated in the Table below.

Table 6-12: Accumulated Disposal Volume of TPA Tambakrigadung for Case 1 & 2

	Case 1				Case 2			
Year	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)	Daily disposal (ton/day)	Yearly disposal by weight (ton)	Yearly disposal by volume (m3)	Waste accumulations (m3)
2019	39.6	3,958	4,354	4,354	39.6	3,958	4,354	4,354
2020	39.7	14,476	15,923	20,277	40.4	14,751	16,226	20,580
2021	39.7	14,505	15,955	36,233	41.2	15,055	16,561	37,141
2022	39.8	14,534	15,987	52,220	42.1	15,359	16,895	54,036
2023	39.9	14,563	16,019	68,240	42.9	15,664	17,230	71,266
2024	40.0	14,592	16,051	84,291	43.7	15,968	17,565	88,831
2025	40.1	14,621	16,084	100,374	44.6	16,272	17,899	106,730
2026	40.3	14,727	16,199	116,574	44.7	16,305	17,935	124,666
2027	40.6	14,833	16,316	132,890	44.8	16,337	17,971	142,636
2028	40.9	14,940	16,434	149,324	44.8	16,370	18,007	160,643
2029	41.2	15,048	16,552	165,877	44.9	16,402	18,042	178,685
2030	41.5	15,156	16,672	182,548	45.0	16,435	18,078	196,764

6.7.3 Remaining Lifetime Estimation

The remaining service lifetime is estimated by comparing the accumulated disposal volume (m3) and the remaining disposal capacity (m3) as shown in the Table below.

Landfill Plan	Remaining Disposal Capacity (m3)	Remaining Year of TPA (Year)	
		Case 1	Case 2
Final Height 12m	22,218	Until January 2021	Until January 2021
Final Height 15m	29,534	Until June 2021	Until June 2021

The above-mentioned work finds out the following aspects:

- There is no difference between Case 1 and Case 2 due to similar handling (collection) rates.
- In final height 12m, TPA Tambakrigadung will not be able to receive waste after January 2021 both in Case 1 and 2.
- In final height 15m, TPA Tambakrigadung will not be able to receive waste after June 2021 both in Case 1 and 2.
- Lamongan Regency requires a new TPA for replacing the current cell of TPA Tambakrigadung.
- In addition, since final disposal amount waste at other than official 3 TPAs is quite big, official TPAs for remote area are necessary.

Chapter 7 Water Quality Survey at Existing TPA

7.1 Outline

7.1.1 Objectives

- To know whether there is a possibility that the leachate generated at the main final disposal site (it receives most waste in each local government (regency/city) when there are more than two) will have an impact on the surrounding environment.

7.1.2 Applied Methodology

(1) Contractor of the Work

The water sampling and analysis works were outsourced to UPT LAB. LINGKUNGAN DINAS LINGKUNGAN HIDUP PROVINSI JAWA TIMUR selected in bidding.

(2) Water Sampling

Water samples were basically taken at the following points from mid-January to mid-February, 2020:

I. Leachate at the outlet of the disposal site;
II. Water from the upper stream of the canal to which leachate from the disposal site is discharged; and
III. Water from the lower stream of the same canal.

(3) Water Quality Analysis

- **Items for water quality analysis**: Total Suspended Solids (TSS), pH, BOD, COD, Total Nitrogen (N-Total), Cadmium (Cd) and Mercury (Hg),
- The **Leachate Quality** analysis results were compared with the **Effluent Standard** values (KLHK Regulation No.59 Year 2016) as shown in the table below.
- The **Water Quality** analysis results of the samples collected from the water body were compared with the **Environmental Standard** values (Governmental Regulation No.82 Year 2001) as shown in the table below.

Table 7-1: Effluent and Environmental Standards

Items for Analysis Standards		TSS (mg/l)	pH	BOD (mg/l)	COD (mg/l)	N-Total (mg/l)	N-NO3 (mg/l)	N-NH3 (mg/l)	Cd (mg/l)	Hg (mg/l)
Effluent Standards		100	6 - 9	150	300	60	-	-	0.00935	0.0002005
Environmental Standards	Type I*1	50	6 - 9	2	10	-	10	0.5	0.01	0.001
	Type II*2	50	6 - 9	3	25	-	10	-	0.01	0.002
	Type III*3	400	6 - 9	6	50	-	20	-	0.01	0.002
	Type IV*4	400	5 - 9	12	100	-	20	-	0.01	0.005

Note:
*1 Type I: Water that can be used for drinking water or other applications that require water quality equivalent to drinking water.
*2 Type II: Water available for recreation, freshwater fish aquaculture, irrigation of agriculture and plantations, or for any other application requiring equivalent water quality.
*3 Type III: Water available for freshwater fish aquaculture, animal husbandry, and irrigation of plantations, or any other use application where equivalent standards are required.
*4 Type IV: Water available for irrigation of plantations or other uses application where equivalent standards are required.

7.2 Gresik Regency

7.2.1 Sampling Points

Water samples were taken at the following 3 points in and around TPA Ngipik.

- Gresik-2: Outlet of leachate treatment facility of TPA Ngipik for treated leachate
- Gresik-1: Water from a canal before treated leachate discharge (Upstream from the treated leachate outlet)
- Gresik-3: Water from a canal after treated leachate discharge (Downstream from the treated leachate outlet)

7.2.2 Results of the Analysis

The results of the analysis are shown in the table below.

Table 7-2: Results of the Analysis for TPA Ngipik

Items for Analysis		TSS (mg/l)	pH	BOD (mg/l)	COD (mg/l)	N-Total (mg/l)	Cd (mg/l)	Hg (mg/l)
Sample No.	Standards							
Gresik-2	Effluent	67	8.08	**624.1**	**1542.2**	**476**	<0,00935	<0,0002005
Gresik-1	Environment	5	7.35	**23.9**	59.8	12.6	<0,00935	<0,0002005
Gresik-3	Environment	24	7.53	**89.6**	**223.6**	**90.6**	<0,00935	<0,0002005

7.2.3 Findings

(1) Treated Leachate: Sample No. Gresik-2

- Comparing the water quality data of Leachate with the Effluent standard, the values of BOD (624.1 > 150), COD (1542.2 > 300) and N-Total (476 > 60) exceed the standard values.
- It is considered that the treatment facility may not function sufficiently.
- It is recommended to recover or improve the function of the leachate treatment facility.

(2) Water Body Outside TPA: Sample No. Gresik-1 (Upstream) and Gresik-3 (Downstream)

- Comparing the water quality of the upstream and downstream, the water quality of the downstream is poorer in all items.
- Poor water quality on the downstream side may be due to inflow of (treated) leachate.
- Neither the upstream nor downstream meet the environmental standard values of Type IV on BOD. It is desirable to check the usage of these waters and, if there is any usage, countermeasures should be considered taking into account of other potential pollution sources.

7.3 Bangkalan Regency

7.3.1 Sampling Points

Due to the lack of leachate in TPA Buluh and the lack of a canal in the surrounding area, the samples were taken from wells of three private houses located about 500 -700 m north of the TPA.

- Bangkalan-1: Well of private house
- Bangkalan-2: Well of private house
- Bangkalan-3: Well of private house

7.3.2 Results of the Analysis

The results of the analysis are shown in the table below.

Table 7-3: Results of the Analysis for TPA Buluh

Items for Analysis		TSS (mg/l)	pH	BOD (mg/l)	COD (mg/l)	N-Total (mg/l)	Cd (mg/l)	Hg (mg/l)
Sample No.	Standards							
Buluh-1	Effluent	1	7.45	**3.79**	9.47	0.4976	<0,00935	<0,0002005
Buluh-2	Effluent	1.5	7.25	**2.92**	5.22	1.05	<0,00935	<0,0002005
Buluh-3	Effluent	0.5	7.31	**2.91**	6.2	0.247	<0,00935	<0,0002005

7.3.3 Findings

(1) Leachate

- Not applicable for this analysis because Leachate could not be sampled at the Buluh disposal site.

(2) Water Body Outside TPA: Sample No. Buluh-1, Buluh-2 and Buluh-3

- All samples are well water from private houses.
- All samples have a BOD slightly exceeding the environmental standard Type 1 values and are not suitable for drinking water. Sample No. Buluh-1 clears all Type III standard values, and Buluh-2 and Buluh-3 clear all Type II standard values.
- Since these sample points are more than 500m away from TPA Buluh, it is unlikely that they are affected by leachate.

7.4 Mojokerto City

7.4.1 Sampling Points

Water samples were taken at the following 3 points in TPA Randegan.

- Kota Mojokerto-1: Aeration pond of TPA Randegan for treated leachate
- Kota Mojokerto-2: Infiltration (open-cast) pond of TPA Randegan for leachate
- Kota Mojokerto-3: Monitoring well of TPA Randegan for water

7.4.2 Results of the Analysis

The results of the analysis are shown in the table below.

Table 7-4: Results of the Analysis for TPA Randegan

Items for Analysis		TSS (mg/l)	pH	BOD (mg/l)	COD (mg/l)	N-Total (mg/l)	Cd (mg/l)	Hg (mg/l)
Sample No.	Standards							
Kota Mojokerto-1	Effluent	26	7.98	135.1	**300.3**	20	<0,00935	<0,0002005
Kota Mojokerto-2	Effluent	**381**	7.63	**1561.6**	**3473**	**413.9**	<0,00935	<0,0002005
Kota Mojokerto-3	Environment	17.6	7.27	2.31	4.28	1.1	<0,00935	<0,0002005

7.4.3 Findings

(1) Leachate: Sample No. Kota Mojokerto-1 and 2

- Regarding the water quality of the treated leachate (Kota Mojokerto-1) sampled from the Aeration pond, the COD value is slightly above the Effluent standard value, but other items are below the standard. It is used for watering plants in the site and is not discharged outside.
- The water quality of the leachate from the infiltration pond (Kota Mojokerto-2) is allowed to seep into ground, but its quality exceeded the effluent standard values on TSS, BOD, COD and N-Total as shown in the table above. The leachate of the pond potentially influences groundwater.
- The water quality of the monitoring well (Kota Mojokerto-3) does not show groundwater pollution, but it is recommended to collect information about the groundwater usage in the surrounding area and to consider necessary measure.

(2) Monitoring Well Water: Sample No. Kota Mojokerto-3

- The quality of the water sampled from the monitoring well satisfies the environmental standard Type II.

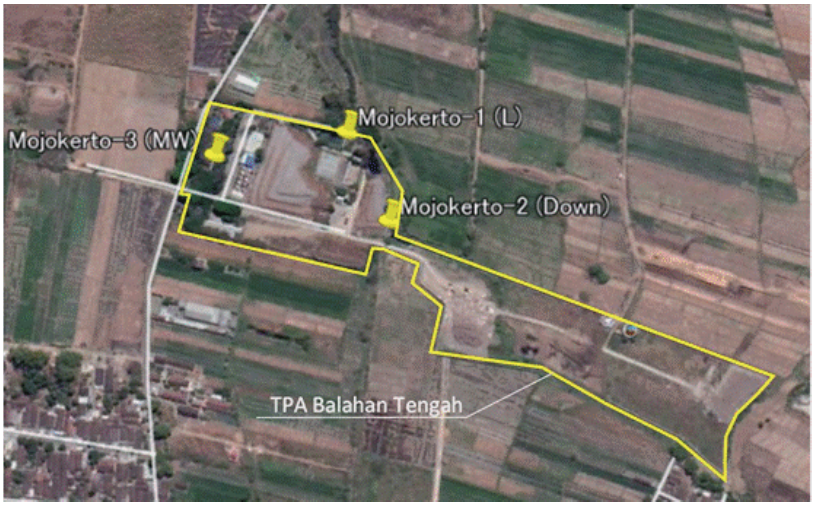
- Therefore, it can be used for purposes other than beverages.

7.5 Mojokerto Regency

7.5.1 Sampling Points

Water samples were taken at the following 3 points in TPA Belahan Tengah.

- Mojokerto-1: Outlet of leachate treatment facilities of TPA Balehan Tengah for treated leachate
- Mojokerto-2: Downstream of TPA Balehan Tengah for canal water
- Mojokerto-3: Monitoring well of TPA Balehan Tengah for well water



7.5.2 Results of the Analysis

The results of the analysis are shown in the table below.

Table 7-5: Results of the Analysis for TPA Belahan Tengah

Items for Analysis		TSS (mg/l)	pH	BOD (mg/l)	COD (mg/l)	N-Total (mg/l)	Cd (mg/l)	Hg (mg/l)
Sample No.	Standards							
Mojokerto-1	Effluent	23.2	7.39	71.3	192.7	**68.1**	<0,00935	<0,0002005
Mojokerto-2	Environment	232	7.14	**15.9**	43.9	1.11	<0,00935	<0,0002005
Mojokerto-3	Environment	2	6.89	**4.71**	11.7	1.1	<0,00935	<0,0002005

7.5.3 Findings

(1) Treated Leachate: Sample No. Mojokerto-1

- Regarding the water quality of treated leachate, N-Total (68.1 > 60) is slightly above the effluent standard value, but the values of the other items than N-Total are below the standard value.
- The sample of the treated leachate was collected at the outlet of the treatment facility, so it seems that the treatment function may be not working sufficiently. For this reason, it is advisable to restore or improve the functioning of the treatment facilities.

(2) Water Body Outside TPA: Sample No. Mojokerto-2 and Mojokerto-3

- As for the treated water of Leachate (Mojokerto-1), only N-Total was a little over the effluent standard as shown in the above table. In addition, the treated leachate is not released to the outside of the site but is used for watering plants inside the site and for composting.

- The water quality of the monitoring well (Mojokerto-3) almost meets Type II except BOD, and no groundwater pollution is observed.
- Downstream water (Mojokerto-2) does not meet all types of environmental standards, but from the above two points, it cannot be said that the TPA is a pollution source.
- Depending on the use of water, it may be necessary to take measures considering also the existence of other pollution sources.

7.6 Sidoarjo Regency

7.6.1 Sampling Points

Water samples were taken at the following 3 points in and around TPA Jabon.

- Sidoarjo-1: Leachate regulation pond of TPA Jabon
- Sidoarjo-2: Upstream of the leachate outlet from TPA Jabon on Porong River (Old Porong Highway Bridge)
- Sidoarjo-3: Downstream of the leachate outlet from TPA Jabon on Porong river (Bangun Sari Sand mine)

7.6.2 Results of the Analysis

The results of the analysis are shown in the table below.

Table 7-6: Results of the Analysis for TPA Jabon

Items for Analysis		TSS (mg/l)	pH	BOD (mg/l)	COD (mg/l)	N-Total (mg/l)	Cd (mg/l)	Hg (mg/l)
Sample No.	Standards							
Sidoarjo-1	Effluent	99	8.28	**424.8**	**936.9**	**183.3**	<0,00935	<0,0002005
Sidoarjo-2	Environment	15.6	7.81	6.72	15.2	0.632	<0,00935	<0,0002005
Sidoarjo-3	Environment	**587**	7.78	5.8	13.1	1.11	<0,00935	<0,0002005

7.6.3 Findings

(1) Treated Leachate: Sample No. Sidoarjo-2

- The sample was taken from the leachate regulation pond of TPA Jabon.
- Comparing the water quality data of Leachate with the Effluent standard, the values of BOD, COD and N-Total exceed the standard values.
- When the regulation pond is full, the water is discharged to the Porong River.
- It is recommended to treat the water from the pond before discharged to the river.

(2) Water Body Outside TPA: Sample No. Sidoarjo-2 (Upstream) and Sidoarjo-3 (Downstream)

- Comparing the water quality between upstream and downstream, TSS and N-Total are worse in the downstream, but BOD and COD are worse in the upstream.
- Due to the large amount of water in the Porong River, the effect of TPA is not considered to have appeared.
- The downstream water quality has a TSS value that exceeds the environmental standard value of Type IV. However, the TSS of leachate is 99 mg/l, which is lower than the value of Type III of the environmental standard, so it is not considered to be due to the effect of TPA alone. It is desirable to confirm the use of water and take action if necessary.

7.7 Lamongan Regency

7.7.1 Sampling Points

Water samples were taken at the following 3 points in and around TPA Tambakrigadung.

- Lamongan-1: Outlet of Leachate treatment facilities of TPA Tambakrigadung
- Lamongan-3: Upstream of the leachate outlet from TPA Tambakrigadung
- Lamongan-2: Downstream of the leachate outlet from TPA Tambakrigadung

7.7.2 Results of the Analysis

The results of the analysis are shown in the table below.

Table 7-7: Results of the Analysis for TPA Tambakrigadung

Items for Analysis		TSS (mg/l)	pH	BOD (mg/l)	COD (mg/l)	N-Total (mg/l)	Cd (mg/l)	Hg (mg/l)
Sample No.	Standards							
Lamongan-1	Effluent	**526**	7.27	**1307.7**	**3275.1**	**63.6**	<0,00935	<0,0002005
Lamongan-2	Environment	128.4	6.69	**21.7**	54.6	3.19	<0,00935	<0,0002005
Lamongan-3	Environment	119	7.27	**106.62**	**258.5**	11.8	<0,00935	<0,0002005

7.7.3 Findings

(1) Treated Leachate: Sample No. Lamongan-1

- Comparing the water quality data of Leachate with the Effluent standard, the values of TSS (526 > 100), BOD (1307.7 > 150), COD (3275.1 > 300) and N-Total (63.6 > 60) exceed the standard values.
- It is considered that the treatment facility may not function sufficiently.

- It is recommended to recover or improve the function of the leachate treatment facility.

(2) Water Body Outside TPA: Sample No. Lamongan-2 (Upstream) and Lamongan-3 (Downstream)

- Comparing upstream and downstream water quality, BOD, COD, and N-Total show that downstream water quality is poorer.
- Poor water quality on the downstream side may be due to inflow of leachate.
- Neither the upstream nor downstream meet the environmental standard values of Type IV. It is desirable to check the usage of these waters and, if there is any usage, countermeasures should be considered taking into account of other potential pollution sources.

添付資料 3

インドネシア国内における
廃棄物広域処理事例集

Contents

This report is prepared by JICA expert team on the project to identify model cases of regional waste management system for the project team including PUPR, East Java Province, municipalities and regencies concerned the project to get lesson and learn from existing regional waste management system all over the Indonesia. Chapter 1 is composed of legal background that provides us important information. Stakeholders need to pass through on those legal bases. Nine existing regional waste management systems are confirmed through our survey to provide us the outline of each case such as capacity, waste amount and documents including maps of user local governments. This is described in chapter 2. Further in chapter 3, four model cases (including one case under construction stage) are surveyed to seek more detailed information so that the project can get clear consultation for establishing a regional waste management system in the target area of the project.

Most of information was taken through interview via tele-communication tool to officers of each system's operators or documents and websites available. In most of cases operators are the organization under provincial governments which user local governments belong to.

1 Legal Background

1.1 Law

1.1.1 Law Number 17 year of 2003 concerning State Finance

This is a very basic law regarding the funding of the central and local governments. It states in Article 22 that:

- The central government allocates balance funds and also can provide loans and/or grants to the local government.
- The local government can provide loans to other local governments.

The balance funds mentioned above, according to the Law Number 33 of 2004 concerning Financial Balance between the Central Government and Local Governments, include DAU (Dana Alokasi Umum or General Budget Allocation), DBH (Dana Bagi Hasil or Revenue Sharing Fund) and DAK (Dana Alokasi Khusus, or Special Budget Allocation). DAU is the general purpose grant and important revenue source for most local governments. DBH is another important source of general budget derived mainly from the revenue from natural resources. DAK is allocated for physical infrastructure development in the local governments.

1.1.2 Law Number 18 Year 2008 concerning Waste Management

This is a basic law of waste management as a whole of the country.

In terms of duties of central, provincial and municipal governments, it says in Articles 7, 8 and 9 that:

- The central government sets national policies, strategies and overall regulations, and promote local government performance.
- The provincial governments sets the provincial policies and strategies, facilitate inter-municipal cooperation and supervise the performance of municipalities.
- The local governments (cities and regencies) sets its policies and strategies and implement waste management including determination of the location of waste management facilities and monitoring of closed TPA.

Article 26 is about cooperation between local governments, saying that the local government may cooperate

with other local governments for SWM in a form of cooperation or the establishment of a joint business.

Further provisions regarding guidelines for cooperation and forms of joint business between regions is regulated in a governmental regulation No. 50 of year 2007, which is further amended to a governmental regulation No. 28 of year 2018.

1.1.3 Law Number 23 of 2014 concerning Local Government

This is a basic law of local government, i.e. what responsibilities and rights are bestowed to local government. Solid waste management is dealt with from two aspects: governmental affairs of public works and housing and those of environment, and responsibilities are distributed to central, provincial and local (regency/city) governments as below.

- Distribution of Governmental affairs of Public Works and Housing

Table 1 Distribution of Governmental affairs of Public Works and Housing

Central Government	Provincial Government	Regencies/Cities
a. Determination of national waste management system development. b. Development of cross-regional solid waste management systems and provincial solid waste management systems for national strategic interests.	Regional waste management and system development.	System development and waste management in regency / city regions.

- Distribution of Governmental affairs of Environment

Table 2 Distribution of Governmental affairs of Environment

Central Government	Provincial Government	Regencies/Cities
a. Issuance of permits for processing waste into electricity. b. Issuance of methane gas utilization permits (landfill gas) for electrical energy in the regional final processing site (TPA) by the private sector. c. Guidance and supervision of handling waste in the regional integrated landfill / waste disposal site (TPST) by the private sector. d. Determination and supervision of producer responsibilities in waste reduction. e. Guidance and supervision of producer responsibilities in waste reduction.	Waste management in regional TPA / TPST.	a. Waste management. b. Issuance of licenses for recycling / processing of waste, transportation of waste and final processing of waste organized by the private sector. c. Guidance and supervision of waste management organized by the private sector.

1.2 Government Regulations (GR)

1.2.1 GR No. 50 year 2007 about Procedures for Regional Cooperation

This was replaced with GR No. 28 year 2018.

The steps in the Local Government cooperation are explained in this regulation. According to Article 7, the steps includes:

- Offering cooperation plans
- Establish MoU (KSB / Kesepakatan Bersama)
- Prepare a draft of cooperation agreement (PKS/ Perjanjian Kerjasama)

The local government may ask the assistance of experts, provincial regional apparatus, the Minister and the Ministers / Heads of relevant Non Departmental Government Institutions to prepare this cooperation agreement, and the draft should contains at least:

- cooperation subject;
- cooperation object;
- scope of cooperation;
- rights and obligations of the parties;
- the period of cooperation;
- termination of cooperation;
- forced state; and
- dispute resolution.

The implementation of the cooperation agreement can be carried out by the local work unit (mentioned in Article 8).

Ministers and Heads of Non-Departmental Government Institutions function as general guidance and supervision of Local Government cooperation as mentioned in Article 22.

If Regional cooperation is carried out continuously or it takes a minimum of 5 (five) years, then the local government may establish a cooperation Body, which have the task of managing, monitoring, evaluating, providing input, suggestions and making reports. And the operational costs that arise is become the responsibility of collaborating parties (as mentioned in Articles 24 and 25).

1.2.2 GR No. 2 year 2012 about Local Government Grants;

In Article 2 it stated that Local Grants include grants **to** local governments and grants **from** local governments. Grants to local Government, in Article 4, originated from:

- Central Government, sourced from APBN
- domestic agencies, institutions or organizations
- community groups or individuals within the country. And Grant to local governments sourced from abroad is through the Central Government, as mentioned in Article 5

Grants from local Government, in Article 8, are given to:

- Central government;
- Other Local Governments;
- state-owned or regional-owned enterprise; and / or
- Indonesian bodies, institutions and social organizations.

1.2.3 GR No. 81 year 2012 about Management of Household Waste and Household-like Waste

This is the regulation concerning waste management under the Law No.18 of year 2008. It states in Article 4 that:

- The central government establishes national policies and strategies in waste management

- The local governments formulate and determine district / city policies and strategies waste management.

In regard to regional cooperation, Article 26 mentions that in carrying out the transportation, processing and final processing of waste, local government may cooperate with other regency / city governments.

Article 27 also says that the provincial governments will carry out transportation, treatment and final processing of solid waste in a certain special occasion.

1.2.4 GR No. 18 year 2016 about Regional Apparatus

The regulation explains about the assignment and function of local government.

It states that the province may form UPTD (unit pelaksana teknis dinas) to carry out certain operational services and/or certain supporting activities. UPTD is further regulated by the regulation of MoHA No. 12 of year 2017.

1.3 Presidential Decree (PD)

1.3.1 PD No. 16 / 2018 about Government Goods / Services Procurement;

This decree describes the policies and procedures of the procurement of consultancy services, goods, construction works and other services by central and local governmental agencies using public budget either wholly or partially.

1.3.2 PD No. 97 / 2017 about National Policy and Strategy on Management of Household Waste and Household-like Waste;

This decree was issued following the governmental regulation No.81 of year 2012 to describe national policy and strategy on solid waste management (household waste and household-like waste). It sets out the target of waste reduction and waste handling at 30% and 70% respectively in the year 2025. The provincial and regency/city governments shall formulate their policy and strategy following this decree.

1.4 Ministerial Regulation (MR)

1.4.1 MoHA No.22/2009: Technical Guidelines for Regional Cooperation;

This regulation is issued according to the governmental regulation No. 50 of year 2007 concerning regional cooperation. It is to be noted, however, that this governmental regulation was replaced with the governmental regulation No. 28 of year 2018 and this new regulation does not have the ministerial regulations underneath yet at the moment.

Its Appendix 1 shows the procedure of regional cooperation, which includes preparation, offer, MOU arrangement, signing MOU, cooperation agreement arrangement, signing cooperation agreement and implementation.

1.4.2 MoHA No.23/2009: Procedures for Coaching and Supervising the Regional Cooperation;

This regulation explains about the guidance and supervision over the regional cooperation. The MoHA guides and supervises the provincial cooperation while the provincial governor does the regional cooperation between regencies/cities in his area.

In carrying out this guidance and supervision of the KSAD, Minister of Home Affair establish a Joint

Secretariat, that help the Local Government having good coordination with the Minister / Head of Non-Departmental Government Institutions, to support the KSAD agreement, as stated in Article 5-9. This Joint Secretariat report to the Ministry of Home Affair.

And at the Local Government level, Regional Cooperation Coordination Team (TKKSD: Tim Koordinasi Kerja Sama Daerah) carry out supervision and report to the Governor, as stated in Article 10-12. Its supervision will be executed at the exploratory stage, negotiation stage, signing stage, implementation stage and termination stage.

1.4.3 Regulation of Minister of Public Works No. 03/PRT/M/2013 about Implementation of Solid Waste Infrastructure and Facilities in Household Waste and Household-like Waste Management

This regulates solid waste management from the technical aspects. It says that the individual local government may consider to plan regional facilities when it is difficult to secure land (Appendix III, 1.1).

1.4.4 MoHA No. 80 year 2015 about Formation of Local Government Legal Products

This regulation explain about the types of local government legal product, as mentioned in Article 3.

In Article 7, local governments may make joint regulations, which are called joint regional heads regulations (PB KDH: Peraturan Bersama Kepala daerah). They may be joint regulations of the governor or joint regulations of regents / mayors.

1.4.5 MoHA No. 19 year 2016 about Guidelines for State / Local Government Property Management

The regulation explain about the scope of how the Central /Local Government manage their property. It cover the explanation of property management officers, planning and budgeting, procurement, usage, utilization, security and maintenance, assessment, alienation, annihilation, deletion, administration, guidance, supervision and control, management of local government assets and compensation and sanctions.

1.4.6 Regulation of Minister of Public Works and Public Housing No. 29 year 2016 about Formation of MoU (KSB) and Cooperation agreements (PKS) in the Ministry of Public Works and Public Housing

In order for the Ministry of Public Works and Public Housing to carry out duties and functions that need cooperation with ministries / non-ministerial government agencies, local government, universities / institutions education and training, and related parties, this regulation outline the procedure for MoU (KSB) and Cooperation agreement (PKS), from planning through signing.

1.4.7 Regulation of MoHA No. 12 year 2017 about Guidelines for Establishment and Classification of Branch Agencies and UPTD

Provincial governments and regency/city governments can establish UPTD, a technical implementation unit to carry out certain operational technical activities and / or supporting technical activities. Its duty will be the continuous supply of goods and/or services.

For UPTD's operational and activities, it shall be financially supported by Local Government Budget.

2 Regional Waste Management Systems in Indonesia

2.1 Aceh Besar Regency

Table 3 Summary information of Regional System in Aceh Besar Regency

	English	Bahasa
TPA Name	TPA Regional Blang Bintang	TPA Regional Blang Bintang
TPA Location	Aceh Besar regency Peurumping, Montasik, Aceh Besar Regency, Aceh 23373	Kabupaten Aceh Besar Peurumping, Montasik, Kabupaten Aceh Besar , Aceh 23373
Province	Naggroe Aceh Darussalam (NAD) Province	Provinsi Naggroe Aceh Darussalam (NAD)
Area (Ha)	200	
Participating Local Governments	1 Aceh Besar regency 2 Banda Aceh city,	1 Kabupaten Aceh Besar, 2 Kota Banda Aceh.
Capacity	140-180	140-180
Daily Waste Amount	1 2	1 2
Start Operation	2015	2015
Type of SWM Activities	open dumping , control landfill, sanitary landfill.	open dumping , control landfill, sanitary landfill.
Operator	UPTD-BPSR (Technical Unit - Regional Waste Management), under Department of Environment and Forestry of NAD Province UPTD-BPSR at first was under Department of Housing and Settlements of NAD Province, then taken over by Department of Environment and Forestry of NAD Province in 2019 to have better waste management	UPTD-BPSR (Unit Pelaksana Teknis Daerah- Balai Penanganan Sampah Regional) , DLHK Provinsi NAD UPTD BPSR pada awalnya di bawah Dinas Perkim Provinsi NAD, lalu dipindah ke DLHK pada tahun 2019 untuk memaksimalkan pengelolaan sampah.
Document	Cooperation Agreement	Perjanjian Kerja Sama (PKS)
Remarks	** Funded by United Nations Development Programme (UNDP), GTZ, Unicef and BRR. ** UNDP handed over on December 2014 to the Ministry of Public Works, and the Ministry of Public Works has submitted to the local government. ** TPA Gampong Jawa now function as a transfer station.	** Di biayai oleh UNDP, GT, Unicef dan BRR. ** UNDP menyerahkan pada Kementrian PUPR pada bulan Desember 2014, lalu diserahterimakan ke Pemda ** TPA Gampong Jawa sekarang berfungsi sebagai transfer sampah untuk proses pemilahan

2.2 Denpasar City

Table 4 Summary information of Regional System in Denpasar City

	English	Bahasa
TPA Name	TPA Regional Suwung SARBAGITA	TPA Regional Suwung SARBAGITA
TPA Location	Denpasar city Suwung di Denpasar Selatan	Kota Denpasar Suwung di Denpasar Selatan
Province	Bali	Bali
Area (Ha)	32,4	32,4
Participating Local Governments	1. Denpasar city , 2. Badung regency, 3. Gianyar regency, 4. Tabanan regency	1. Kota Denpasar, 2. Kabupaten Badung, 3. Kabupaten Gianyar, 4. Kabupaten Tabanan.
Capacity	1432	1432
Daily Waste Amount	1. 650; 2. 300; 3. 00; 4. 00.	1. 650; 2. 300; 3. 00; 4. 00.
Start Operation	**2018**	**2018**
Type of SWM Activities	open dumping, semi-sanitary landfill	open dumping, semi-sanitary landfill
Operator	UPT - BPKS (Technical Unit - Sarbagita Sanitation Management Agency), under Public Work Agency of Bali Province	UPT - BPKS (Unit Pelaksana Teknis - Badan Pengelola Kebersihan Sarbagita), PU Provinsi Bali
Document	Cooperation Agreement	Perjanjian Kerja Sama (PKS)
Remarks	** In 2017- 2019, PUPR revitalizes of 22,4 ha TPA area with construction of green open space on land that is already full and supports 5 ha area for the construction of a Waste to Energy Power Plant (PLTSa / PSEL) ** this revitalization extend the landfill life until 2024 from 2020/2021 at first. While the PLTSa construction is carried out through the Government and Business Entity (PPP) scheme with an investment value of up to USD 240 million with potential electricity capacity of 15-20 MW. The construction of PLTSa refers to Presidential Regulation No. 35 of 2018 concerning the Acceleration of the Development of Waste Installation into Electric Energy Based on Environment-Friendly Technology.	**Pada tahun 2017-2019 , Kementrian PUPR melakukan revitalisasi terhadap lahan seluas 22,4 ha dengan lahan terbuka hijau untuk lahan yang sudah penuh dan menyiapkan 5 ha lahan untuk pembangunan instalasi Pembangkit Energi dari Sampah ** Revitalisasi ini memperpenjang usia TPA hingga tahun 2024 yang sebelumnya hanya sampai tahun 2020/2021. Sementara untuk pembangunan PLTSa dilakukan melalui skema Kerjasama Pemerintah dan Badan Usaha (KPBU) dengan nilai investasi yang dibutuhkan mencapai USD 240 juta dengan potensi kapasitas listrik 15-20 MW. Pembangunan PLTSa mengacu pada Peraturan Presiden No. 35 tahun 2018 tentang Percepatan Pembangunan Instalasi Sampah Menjadi Energi Listrik Berbasis Teknologi Ramah Lingkungan.

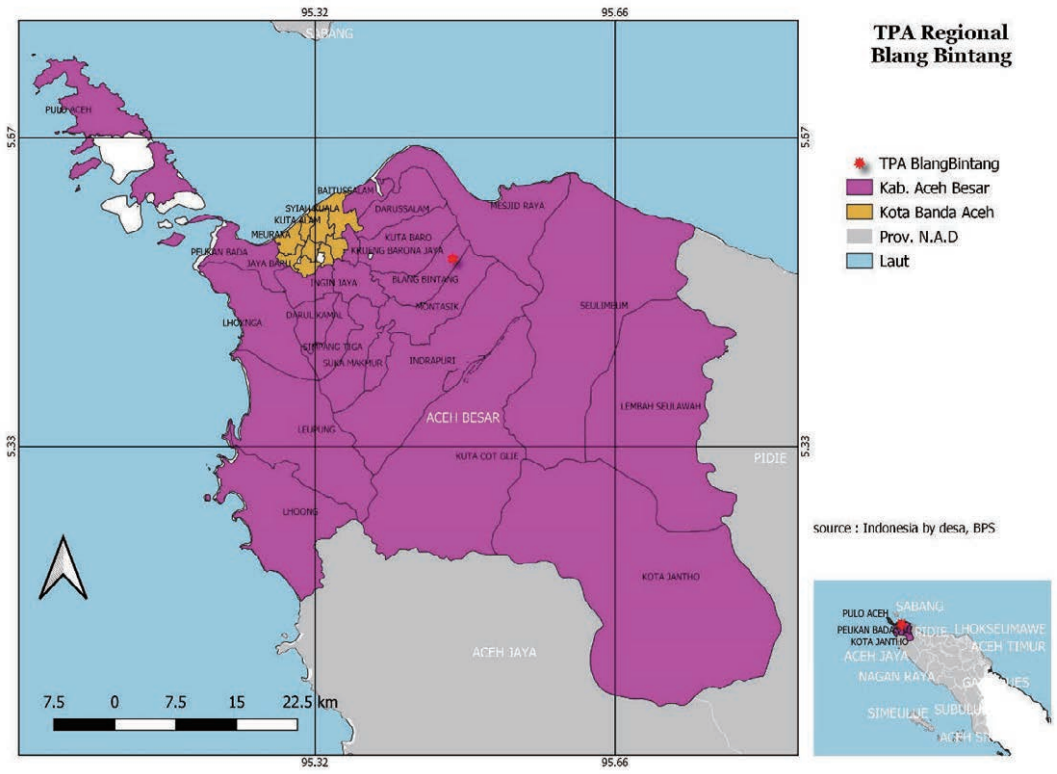


Figure 1 Map of Regional System in Aceh Besar Regency

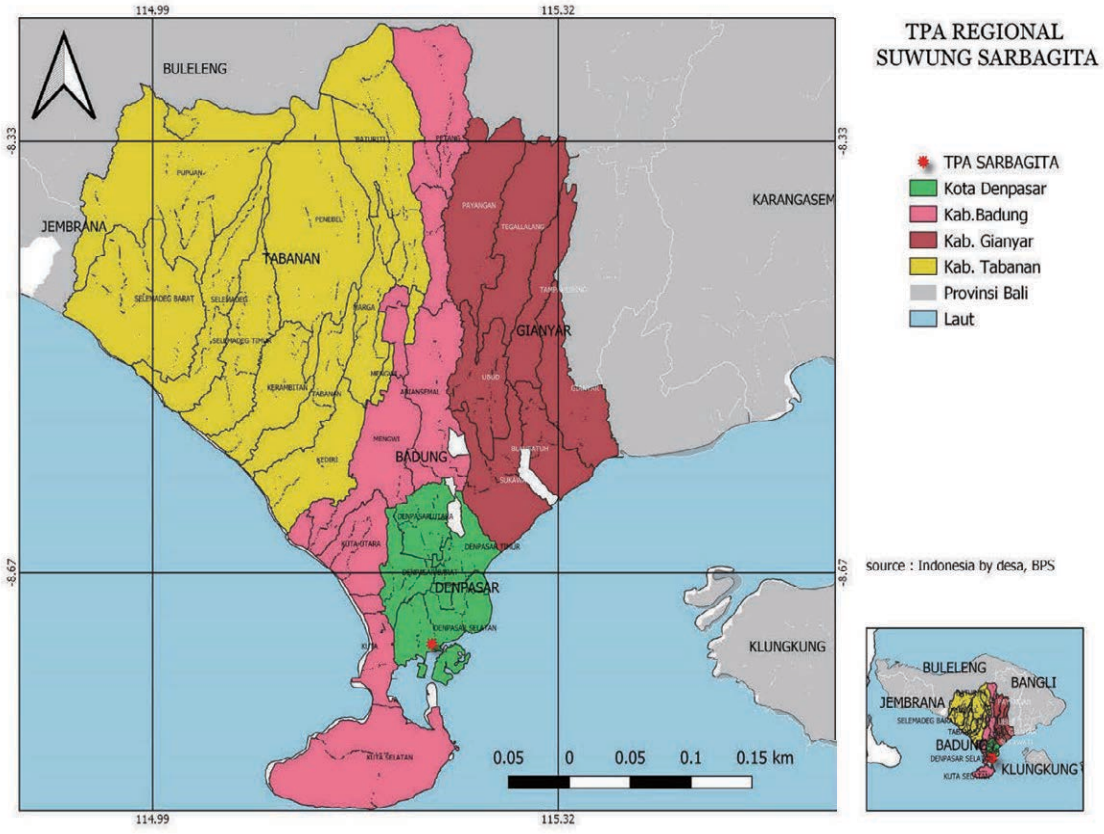


Figure 2 Map of Regional System in Denpasar City

2.3 Bantul City

Table 5 Summary information of Regional System in Bantul City

	English	Bahasa
TPA Name	TPA Regional Piyungan KARTAMANTUL	TPA Regional Piyungan KARTAMANTUL
TPA Location	Bantul regency Desa Sitimulyo, Kecamatan Piyungan	Kabupaten Bantul Desa Sitimulyo, Kecamatan Piyungan
Province	DI Yogyakarta (DIY)	DI Yogyakarta (DIY)
Area (Ha)	13	13
Participating Local Governments	Jogyakarta city, Bantul regency, Sleman regency	Kota Jogyakarta, Kabupaten Bantul, Kabupaten Sleman.
Capacity	580	580
Daily Waste Amount	250; 000; 000.	250; 000; 000.
Daily Waste Amount	1996	1996
Type of SWM Activities	sanitary landfill	sanitary landfill
Operator	(1995) PU Province; (2001) Joint Secretariat Kartamantul; (2015)DLHK Province	(1995) PU Provinsi; (2001) Sekretariat Bersama, Kartamantul; (2015) DLHK Provinsi
Document	Cooperation Agreement	Perjanjian Kerja Sama (PKS)
Remarks	** TPA regional life is for the next 2 years, ** To reduce waste transport to TPA, Province ask the tradiotional market to process the waste at source.	** Umur TPA regional 2 tahun ke depan ** Untuk mengurangi sampah masuk ke TPA regional, Pemerintah Provinsi meminta pasar-pasar tradisional mengotah sendiri sampahnya dari sumber

2.4 Gorontalo Regency

Table 6 Summary information of Regional System in Gorontalo Regency

	English	Bahasa
TPA Name	TPA Regional Talumelito	TPA Regional Talumelito
TPA Location	Gorontalo regency	Kabupaten Gorontalo
Province	Gorontalo	Gorontalo
Area (Ha)	19	19
Participating Local Governments	Gorontalo regency, Bone Bolango regency, Gorontalo city	Kabupaten Gorontalo; Kabupaten Bone Bolango; Kota Gorontalo
Capacity	80	80
Daily Waste Amount	17,78%; 4,4 %: 78,8%	17,78%; 4,4 %: 78,8%
Start Operation	2011	2011
Type of SWM Activities	sanitary landfill	sanitary landfill
Operator	UPTD-PUPR (Technical Unit) of Gorontalo Province	UPTD-PUPR (Technical Unit) of Gorontalo Province
Document	Cooperation Agreement	Perjanjian Kerja Sama (PKS)
Remarks	**Tipping fee Rp.47.551/ton+Rp7,127 Kecamatan Kabila, Tilongkabila and Suwawa from Bone Bolango Regency. Kecamatan Telaga Cs, Limboto and Limboto Barat from Gorontalo Regency. https://pojok6.id/2019/08/15/tampung-sampah-tiga-daerah-tpa-talumelito-nyaris-penuh/	**Tipping fee Rp.47.551/ton+Rp7,127 Kecamatan Kabila, Tilongkabila dan Suwawa dari Bone Bolango Regency. Kecamatan Telaga Cs, Limboto dan Limboto Barat dari Gorontalo Regency. https://pojok6.id/2019/08/15/tampung-sampah-tiga-daerah-tpa-talumelito-nyaris-penuh/

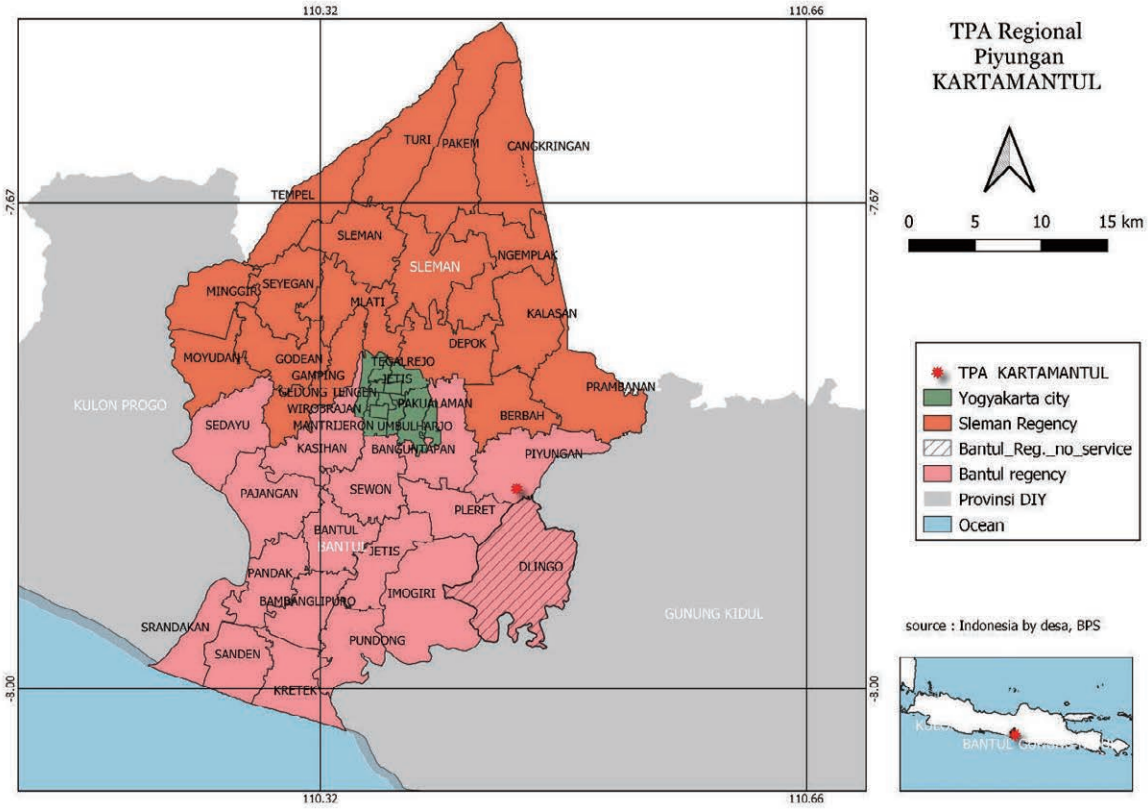


Figure 3 Map of Regional System in Bantul City

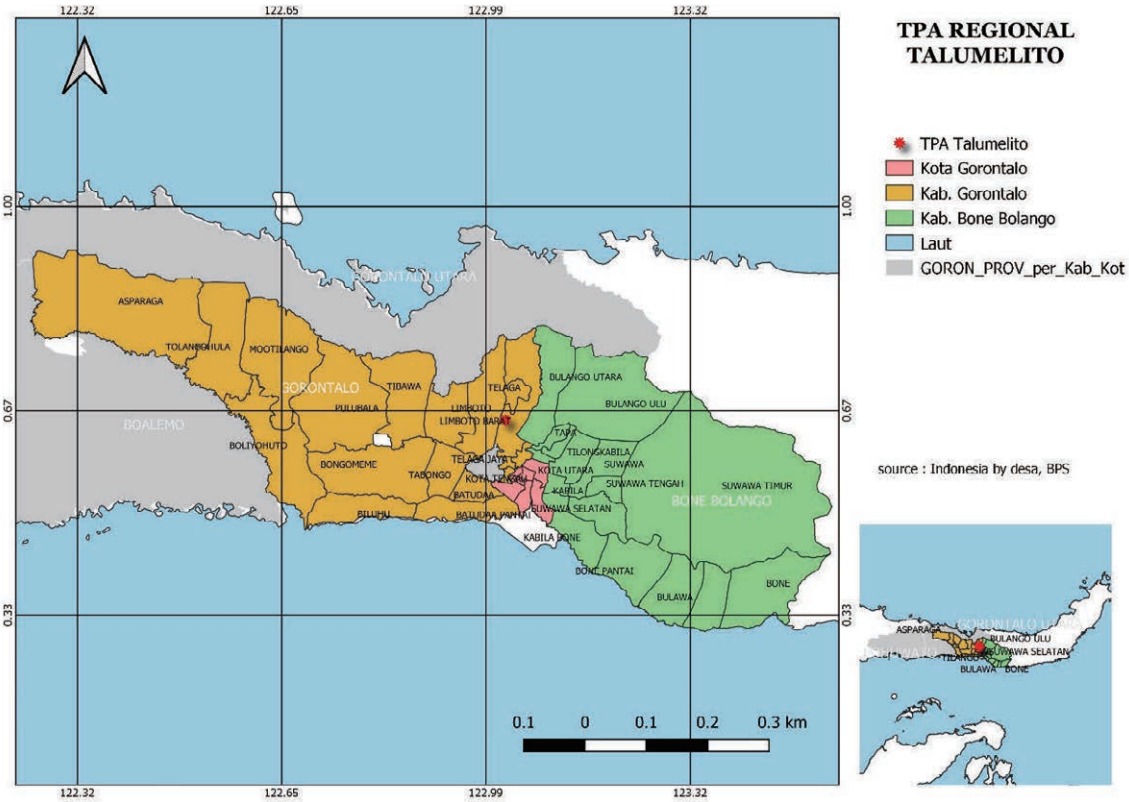


Figure 4 Map of Regional System in Gorontalo Regency

2.5 West Bandung Regency

Table 7 Summary information of Regional System in Bandung Regency (Sarimukti)

	English	Bahasa
TPA Name	TPA Regional Sarimukti	TPA Regional Sarimukti
TPA Location	Bandung Barat regency Cipatat District	Kabupaten Bandung Barat Kecamatan Cipatat
Province	West Jawa 1	Jawa Barat 1
Area (Ha)		
Participating Local Governments	1. Bandung Barat regency, 2. Bandung regency, 3. Cimahi city; 4. Bandung city;	1. Kabupaten Bandung Barat.; 2. Kabupaten Bandung; 3. Kota Cimahi; 4. Kota Bandung;
Capacity	2400	2400
Daily Waste Amount	1. 140; 2. 200; 3. 270; 4. 1.310	1. 140; 2. 200; 3. 270; 4. 1.310
Daily Waste Amount	2006	2006
Type of SWM Activities	sanitary landfill	sanitary landfill
Operator	UPTD - BPSR (Technical Unit - Regional Waste Management), DLH West Java Province	UPTD - BPSR ((Unit Pelaksana Teknis Daerah- Balai Penanganan Sampah Regional), DLH provinsi Jawa Barat
Document	Cooperation Agreement	Perjanjian Kerja Sama (PKS)
Remarks	**Jawa Barat province extend the life of TPA to 2025 with area additional for 40 ha, before TPA Regional Legok Nangka finish the construction, ** in mid 2020, support by UK, the Local government will start the construction of Plastic to Energy development in 5 cities, start from Sarimukti	**Provinsi Jawa Barat memperpanjang umur TPA hingga tahun 2025 dengan penambahan area seluas 40 ha, sebelum TPA Regional Legok Nangka selesai pembangunannya, ** Pertengahan tahun 2020, bekerja sama dengan UK, Prov Jawa Barat akan memulai pembangunan fasilitas Plastic to Energy di 5 kota, dimulai dari TPA Sarimukti

2.6 Bandung Regency

Table 8 Summary information of Regional System in Bandung Regency (Legok Nangka)

	English	Bahasa
TPA Name	TPA Regional Legok Nangka	TPA Regional Legok Nangka
TPA Location	Bandung regency	Kabupaten Bandung
Province	West Java	Jawa Barat
Area (Ha)	90	90
Participating Local Governments	Bandung regency, Bandung Barat regency, Bandung city, Cimahi city, Sumedang regency, Garut regency	Kabupaten Bandung, Kabupaten Bandung Barat; Kota Bandung, Kota Cimahi, Kabupaten Sumedang, Kabupaten Garut.
Capacity	1800	1800
Daily Waste Amount ***(not actual as it is not operated yet.)***	345; 86; 1300; 250; 32; 115.	345; 86; 1300; 250; 32; 115.
Start Operation	2022/2023	2022/2023
Daily Waste Amount	sanitary landfill; ITF; Waste to Energy	sanitary landfill; ITF; Waste to Energy
Operator	UPTD - BPSR,under DLH West Java Province	UPTD - BPSR DLH provinsi Jawa Barat
Document	Cooperation Agreement	Perjanjian Kerja Sama (PKS)
Remarks		

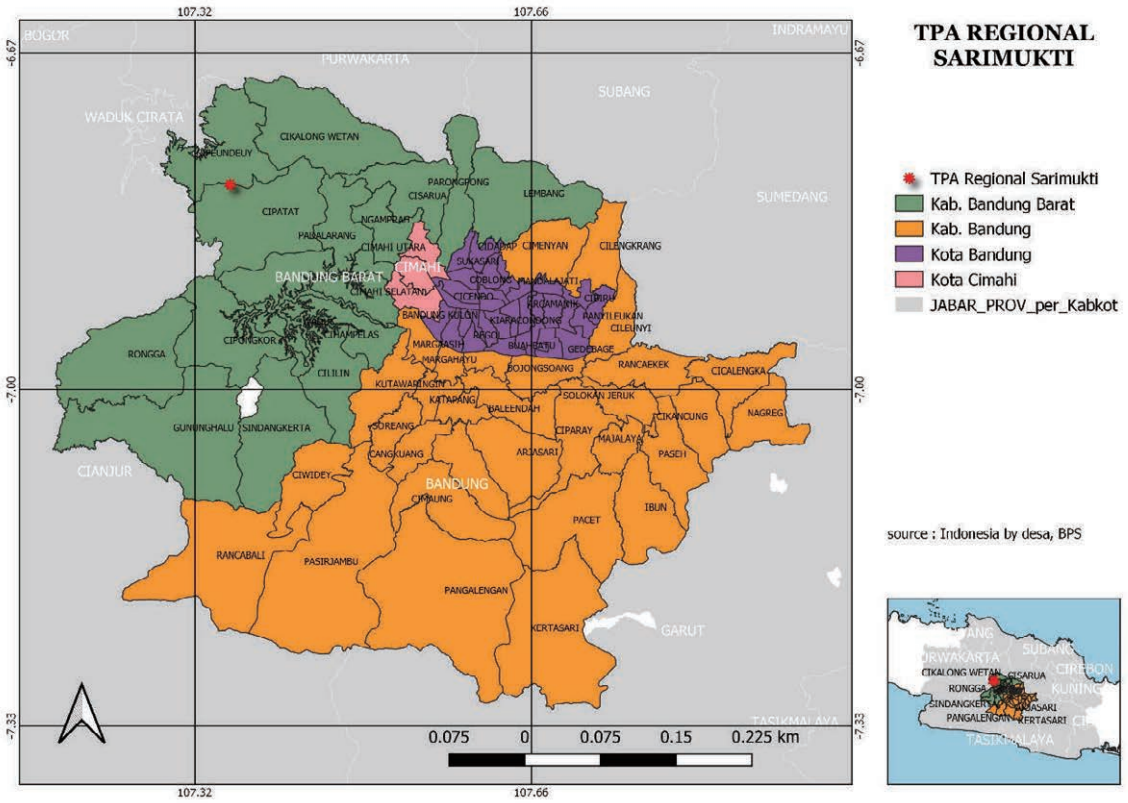


Figure 5 Map of Regional System in Bandung Regency (Sarimukti)

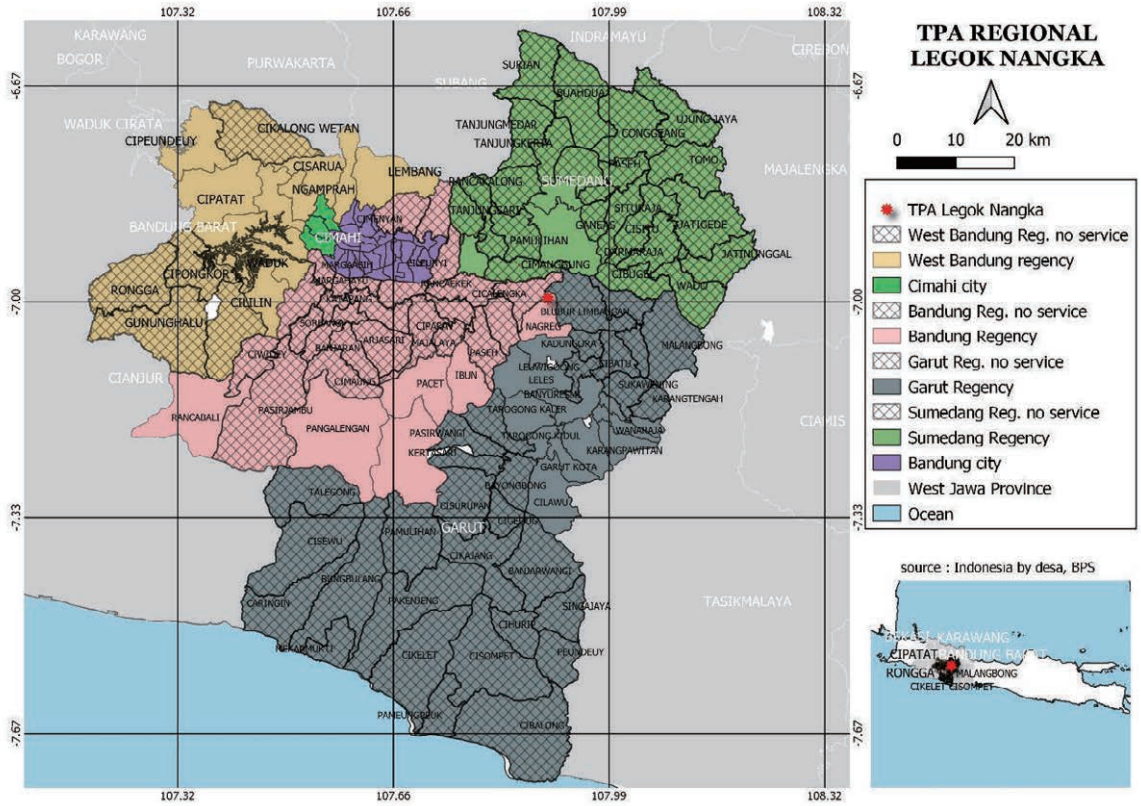


Figure 6 Map of Regional System in Bandung Regency (Legok Nangka)

2.7 Bogor City

Table 9 Summary information of Regional System in Bogor City (Lulut Nambo)

	English	Bahasa
TPA Name	TPA Regional Lulut Nambo	TPA Regional Lulut Nambo
TPA Location	Bogor city	Kota Bogor
Province	West Jawa	Jawa Barat
Area (Ha)	55	55
Participating Local Governments	Bogor regency, Bogor city, Depok city, Tangerang Selatan city	Kabupaten Bogor, Kota Bogor, Kota Depok , Kota Tangerang Selatan
Capacity	1800	1800
Daily Waste Amount	600 ; 500: 300; 000.	600 ; 500: 300; 000.
Start Operation	2021	2021
Type of SWM Activities	sanitary landfill, MBT.	sanitary landfill, MBT.
Operator	UPTD - BPSR, under DLH West Java Province	UPTD - BPSR DLH provinsi Jawa Barat
Document		
Remarks	**MBT (Mechanical Biological Treatment), change waste to Refuse Derived Fuel (RDF)	MBT (Mechanical Biological Treatment) untuk mengubah sampah menjadi Refuse Derived Fuel (RDF) atau bahan bakar alternatif pengganti batu bara.

2.8 Banjarbaru City

Table 10 Summary information of Regional System in Banjarbaru City (Banjarbakula)

	English	Bahasa
TPA Name	TPA Regional Banjarbakula	TPA Regional Banjarbakula
TPA Location	Banjarbaru City Kecamatan Cempaka	Kota Banjar Baru Kecamatan Cempaka
Province	South Kalimantan	Kalimantan Selatan
Area (Ha)	17	17
Participating Local Governments	Banjarmasin city, Banjarbaru city, Banjar regency, Barito Kuala regency, Tanah Laut regency	Banjarmasin city, Banjarbaru city, Banjar region; Barito Kuala region; Tanah Laut region.
Capacity	790	790
Daily Waste Amount	440 ; 200; 70; 40; 40;	440 ; 200; 70; 40; 40;
Start Operation	Jan 2019	Jan 2019
Daily Waste Amount	**sanitary landfill**	**sanitary landfill**
Operator	UPT TPA Banjarbakula under Provincial Government	UPT TPA Banjarbakula di bawah Provinsi Kalimantan Selatan
Document	Cooperation Agreement	Perjanjian Kerja Sama (PKS)
Remarks	TPA Banjarbakula landfill started the operational since 2018 and stop in May 2019 after the protest of the community because of bad access for the truck. Then the Provincial Government is completing the access road and start again in January 2020 Landfill life is expeced for the next 10 year	TPA Banjarbakula mulai beroperasi di taun 2018 dan sempat di stop di bukan Mei 2019 karena ada penolakan dari warga terkair buruknya akses jalan. Kemudian Pemprov membenahi jalan akses dan dibuka kembali pada bukan Januari 2020 Masa manfaat setiap sel TPA diharapkan bisa digunakan selama 10 tahun.

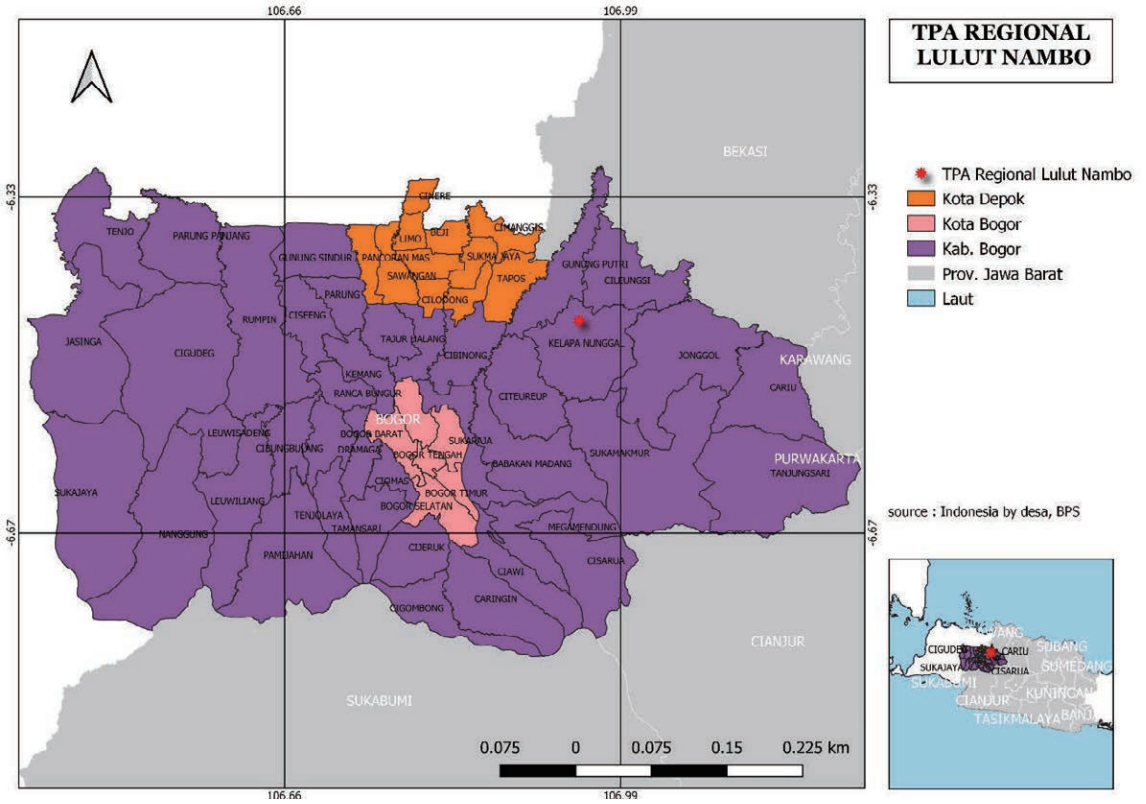


Figure 7 Map of Regional System in Bogor City (Lulut Nambo)

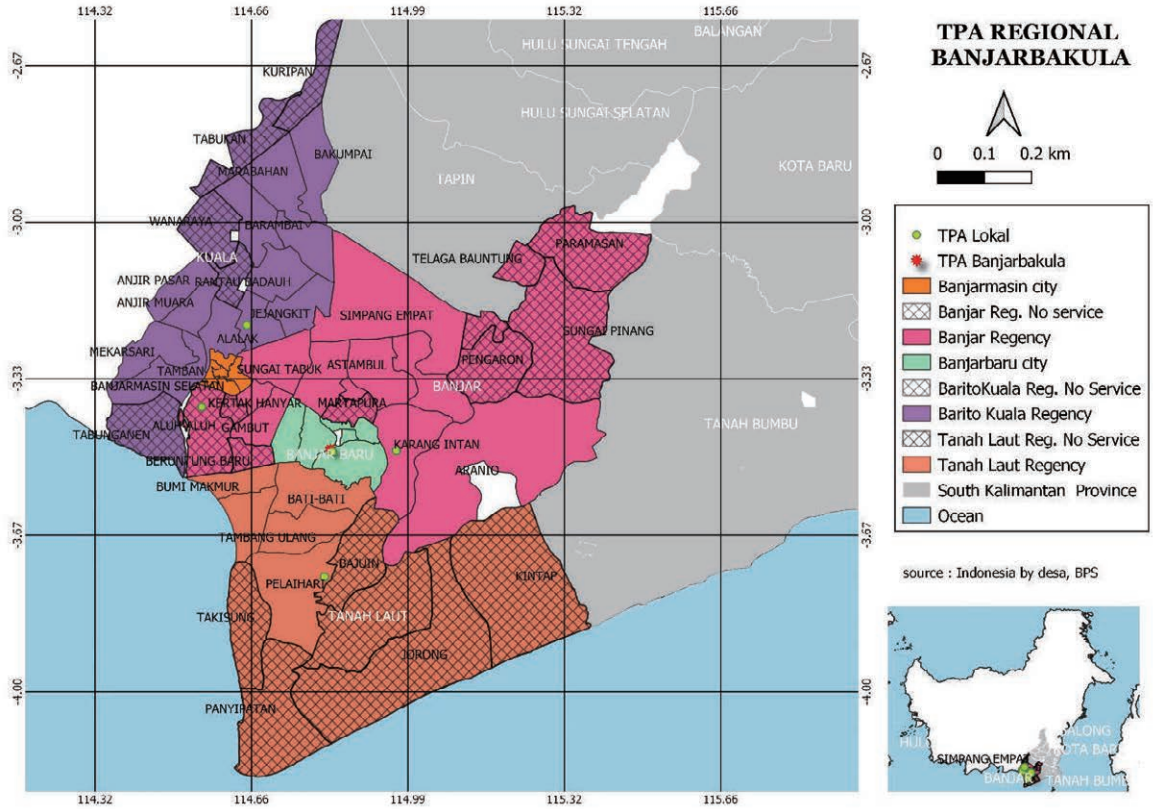


Figure 8 Map of Regional System in Banjarbaru City (Banjarbakula)

2.9 Payakumbuh city

Table 11 Summary information of Regional System in Payakumbuh City

	English	Bahasa
TPA Name	TPA Regional Payakumbuh	TPA Regional Payakumbuh
TPA Location	Payakumbuh city	Kota Payakumbuh
Province	West Sumatera	Sumatera Barat
Area (Ha)	15	15
Participating Local Governments	1. Payakumbuh city, 2. Bukit Tinggi city 3. Agam regency, 4. Lima Puluh Kota regency	1. Payakumbuh city, 2. Bukit Tinggi city 3. Agam regency, 4. Lima Puluh Kota regency
Capacity	250	250
Daily Waste Amount	1. 000; 2. 000; 3. 000; 4. 000.	1. 000; 2. 000; 3. 000; 4. 000.
Start Operation	2013	2013
Daily Waste Amount	sanitary landfill	sanitary landfill
Operator	UPTD under Road and Spatial Planning and Settlements of West Sumatra Province.	UPTD Dinas Prasarana Jalan dan Tata Ruang dan Pemukiman Provinsi Sumatera Barat.
Document	Cooperation Agreement	Perjanjian Kerja Sama (PKS)
Remarks	**Tipping fee Rp.20.000/ton	

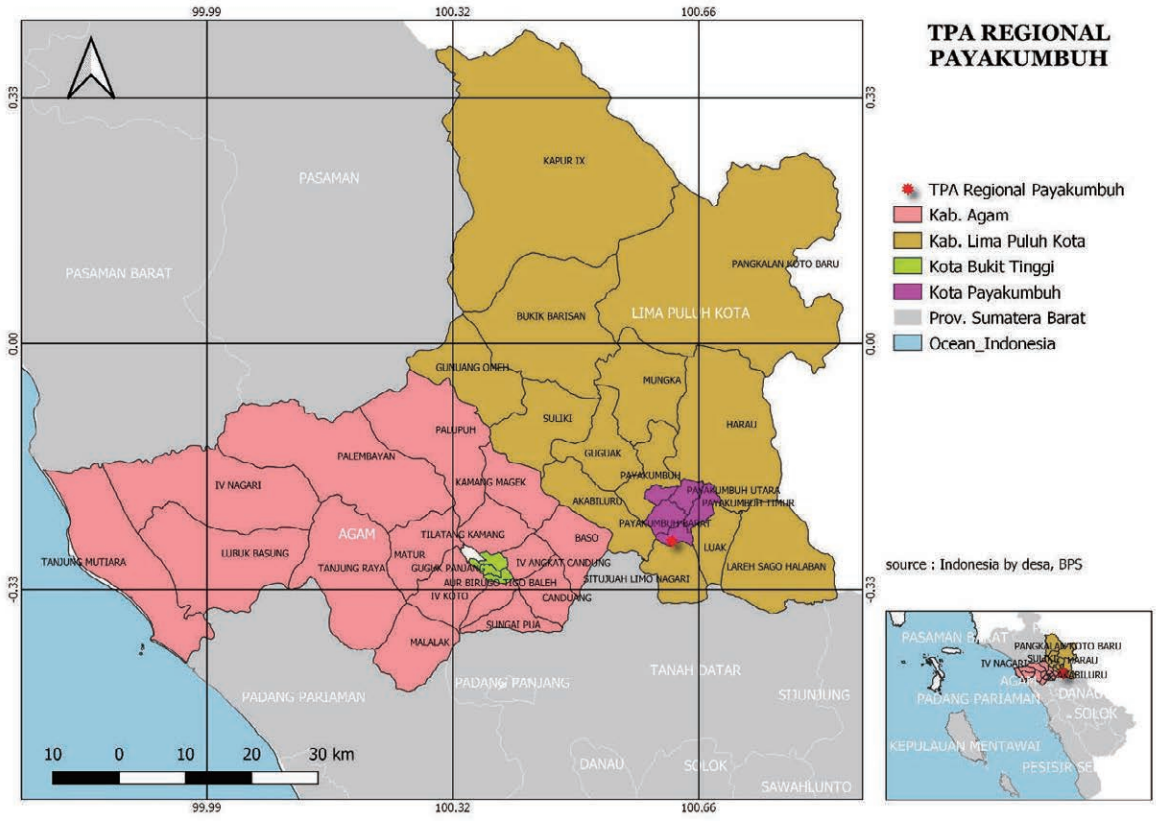


Figure 9 Map of Regional System in Payakumbuh city

3 Selected Regional Systems for Municipal Solid Waste (MSW) Management

3.1 Regional Landfill KARTAMANTUL (TPA Piyungan)

Located in Ngablak, Watugender village, Sitimulyo village, Piyungan district, Bantul regency.

Brief information of this system was shown in 2.3.

This TPA regional administers Municipal Solid Waste (MSW) for three Local Government (LG) in Special Province of Yogyakarta (*DIY-Daerah Istimewa Yogyakarta)*: Yogyakarta city, Sleman regency, and Bantul regency.

The name of Kartamantul is an acronym for these three LGs:

- **Karta** taken from the Yogya**karta** city
- **Man** taken from the Sle**man** regency
- **Tul** taken from the Ban**tul** regency

The waste amount transported to Piyungan Integrated Landfill is in the range of 530-580 tons per day and the final disposal site operating for 24 hours per day 7 days a week including Holidays.

3.1.1 Historical Summary

Table 12 Historical Summary of regional system KARTAMANTUL

1994-96	Piyungan Landfill constructed by Province
1996	Start operation by the province with three users (Sleman, Yogyakarta, Bantul)
1999	Law No. 22 of 1999 concerning Regional Government
2000	Governor Regulation No.18
2003	GIZ technical and assistance
2004	MoU /KSB/joint decree) ➔ Sekber Kartamantul (Joint Secretariat) established.
2005	Private sector participation decided (WtE)
2009	Methane gas plant established (Shimuzu)
2011	Cooperation Agreement (PKS)
2014	Governor Regulation No.99 of 2014 ➔ TPA management taken over by Provincial Public Works Department (DPUP-ESDM) from January 2015.
2015	TPA was nearly full. PUPR (with World Bank) planned to expand the site. FS by AusAID. Not realized yet due to difficulty in additional land acquirement. Governor Regulation No.92 of 2015 to establish UPT PISAMP (Balai) supervised by DPUP-ESDM.
2019	New PKS dated October 18th 2019 in Jogyakarta Management was taken over to Waste Management Center under Provincial DLH.
2020	Province prepared budget to extend the service life for another two years. Private technology to be introduced through PPP scheme.

Piyungan Integrated Landfill (*TPST Piyungan)* was built in 1994-1996 by DIY Province and started operation since 1996. The management was carried out under authority of Public Work Human Settlement (PU Cipta Karya) of DIY Province. And it has been utilized by 3 (three) LGs : Yogyakarta City , Sleman Regency, and

Bantul Regency.

Based on Law No. 22 of 1999 concerning Regional Government, from 2001 to 2014, the management of TPST Piyungan was carried out jointly by Yogyakarta City, Sleman Regency, and Bantul Regency.

The Joint Secretariat of Kartamantul (*Sekber Kartamantul: Sekretariat Bersama Kartamantul*) as an inter-municipal cooperation was established in 2001 based on:

- DIY Governor Regulation No. 18. 2000;
- Joint Decree / MoU (*KSB: Surat Keputusam Bersama*) Regent of Bantul, Regent of Sleman, and Mayor of Yogyakarta Number: 152a/2004, 02/SKB.KDH/A/2004, 03/2001 concerning Cooperation Management of Urban Infrastructure and Facilities between Bantul regency, Sleman regency and Yogyakarta city;
- Cooperation Agreement (*PKS: Perjanjian Kerja Sama*) among these local governments concerning Waste Management of Integrated Landfill (TPST) in Piyungan, Bantul Regency Number: 01 / Perj.YK / 2011, 02 / PK.KDH / A / 2011, 03 / Perj / Bt / 2011

Kartamantul Joint Secretariat (Sekber Kartamantul) functioned as facilitator, coordinator and mediator among the LGs. The top 4 (four) management personnel for position of Head, Secretary, Finance and Verifier, changes every 2 (two) years from these cooperating local governments. The Sleman regency is currently on duty.

As stated in the Joint Decrees (KSB and PKS), the cooperation put focus on the six sectors of (1) solid waste management, (2) sewerage/waste water management, (3) water resource management, (4) urban transportation management, (5) urban road management and (6) urban drainage management.

In 2003, the German Organization for Technical Cooperation (GIZ), under its Urban Quality Project, technically and financially supported at the early stage of the Joint Secretariat Kartamantul establishment. It thus became independent of the member local governments' respective departments of regional development. It also manages its professional officers and office.

The strategic issues of Sekber Kartamantul was how to improve the roles and capabilities of the regions in the implementation of inter-municipal cooperation and choose an appropriate model of cooperation, and involved community aspirations.

Based on Cost Sharing, each local government pays cost depend on the amount of waste disposed. Yogyakarta is the largest waste contributor, while Bantul Regency, where the Piyungan Integrated landfill is located, is the smallest contributor of waste disposed.

The cost for landfill management become the biggest challenge for the three local governments because it cannot cover the management cost that increased gradually. Thus, involving the private sector was chosen in 2005. The private sector had a role in managing the transformation of waste to energy.

In March 2009, a methane gas installation plant was established at the landfill. This plant was built by a Japanese investor, Shimizu.

The utilization of the Piyungan Integrated Landfill that covering area of 13 hectares has reached 90%. It is estimated that the operation will end in 2015 because the existing land is no longer able to accommodate waste. For this reason, in 2015, the Ministry of Public Works through the Directorate General of Human Settlements in collaboration with the World Bank had planned to expand and develop Piyungan Integrated Landfill and its supporting facilities. The Feasibility Study (FS) assisted by the Australian Government through AusAID has been completed to fulfill the requirements of the Solid Waste Improvement Project. However, the plan is not carried out until now, because the DIY Province face the land acquisition difficulties with above standard price for 2 Ha area.

Since January 2015 the Piyungan Integrated landfill has been taken over by the Sanitation and Water Supply Infrastructure Management Office, under the Public Works, Housing and Energy and Mineral Resources Agency of DIY Province (*DPUP-ESDM: Dinas Pekerjaan Umum dan Perumahan dan Energi Sumber Daya MineralProvinsi DIY*) in accordance with DIY Governor Regulation No. 99 of 2014 concerning *Implementation of Use of Facilities and Services for Waste Management in Regional LAndfill at the Municipal Sanitation and Water Supply Infrastructure Management Office*.

And based on the DIY Governor Regulation No. 92 of 2015 concerning *Establishment of Organizational Structure Description of Duties and Functions and Work Procedures of Technical Implementation Unit (UPT)*, then a UPT PISAMP Office (*Balai PISAMP: Balai Pengelolaan Infrastruktur Sanitasi dan Air Minum Perkotaan*) was formed which was directly supervised by DPUP-ESDM.

In 2019, the Piyungan Landfill was taken over to Waste Management Center, under Environment and Forestry Agency (DLH) of DIY province. (the DIY Governor Regulation No. 95 of 2018)

In February 2020, DIY Province through PUP-ESDM DIY and DLHK has budgeted Rp 14 billion to extend the life of TPST Piyungan by building slopes and arranging the dock for truck traffic. So it can be operated for the next two years.

For a long-term solution for handling TPST Piyungan, DIY Province now collaborate with companies on technology choices for waste management that are cheap, environmentally friendly, and efficient with the PPP (KPBU) scheme. This collaboration now is still in progress.

3.1.2 Payment Obligations

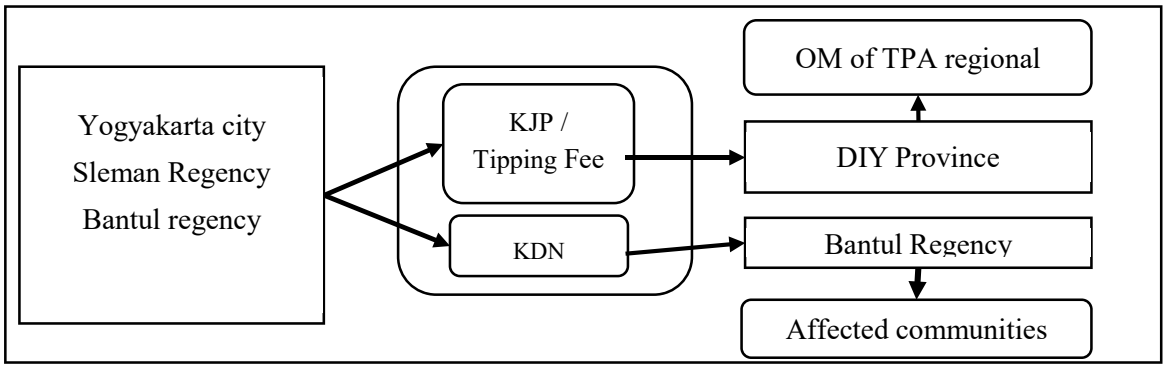


Figure 10 Payment Structure of Regional System Kartamantul

DIY Province took part in handling waste management together with Joint Secretariat (Sekber Kartamantul). The supervision cover from the collection of retribution fee, waste collection from source to TPS, transporting waste at TPS to Piyungan Integrated landfill by vehicles which operates in three regions Yogyakarta city, Sleman, and Bantul.

KJP is the amount that paid by 3 (three) regencies/cities as the service receiver and to be used as fund for the solid waste treatment and final processing technically, socially, and environmentally. KJP is calculated based on the operational and maintenance cost of Regional TPA

Retribution/ KJP is regulated by Municipal Regulation Of DIY Number 3 Year 2013 Concerning Management Of Household Waste and Household-like Waste And Waste As A Type Of Waste. The rate is stipulated in Municipal Regulation of DIY Number 2 Year 2016 at Rp 24.383/ton of waste disposed of.

KDN is a payoff to personage, group of people, and/or legal entity which negatively affected by waste management activities at Regional TPA Piyungan Kartamantl. KDN is calculated with the proportion of 10% from amount of KJP,

3.1.3 Land Acquisition

Piyungan Integrated Landfill acquired land area of 12.5 ha (10 ha for landfill waste, 2.5 ha of office land and facilities) through DIY Province. The technical age of TPST based on Environmental Impact Assessment (AMDAL Analisis Dampak Lingkungan) is 17 years since built and operated in 1995.

3.1.4 Initial Investment

The original Piyungan Landfill was built in 1995 with the fund of DIY Province using Regional Revenue and Expenditures Budget (APBD: Anggaran Pendapatan dan Belanja Daerah).

3.1.5 Areal Coverage

The waste are collected from TPS or transfer depo that spread in all Districts, then transported to regional TPA. Bantul and Sleman regency do not have local TPA.

Below are regencies/cities that join the regional TPA Piyungan Kartamantul:

Table 13 Regencies/Cities in Regional System Kartamantul

No.	Regencies/Cities	Number of District	Number of District with waste collection service	Population	Waste Amount disposed of at Piyungan
1	Yogyakarta city	14	14	431,939	370 ton/day (100%)
2	Sleman regency	17	16	1,219,640	600 m3 (23%)
3	Bantul regency	17	17	1,018,402	100 ton (14%)

Population: taken from https://yogyakarta.bps.go.id/dynamictable/2017/08/02/32/jumlah-penduduk-menurut-kabupaten-kota-di-d-i-yogyakarta-jiwa-2010-2019.html

% is the rate of waste disposal amount to the total waste generation (0.7 kg x municipality's population) but its max value is set at 100%.

Waste unit volume: 1 m3 = 1 ton

3.1.6 Yogyakarta city

- Consist of 14 (fourteen) districts, and all districts are already served by the local government for waste collection. Waste collected daily about 370 ton and transported to Regional TPA Piyungan.
- Districts of Yogyakarta city that receive the waste collection service :

Table 14 Districts of Yogyakarta city that receive the waste collection service

No	District Name	No	District Name	No	District Name
1	Danurejan	6	Kotagede	11	Pakualaman
2	Gedong Tengen	7	Kraton	12	Tegalrejo
3	Gondokusuman	8	Mantrijeron	13	Umbul Harjo
4	Gondomanan	9	Mergangsan	14	Wirobrajan
5	Jetis	10	Ngampilan		

3.1.7 Sleman Regency

- Consist of 17 (seventeen) districts, and all districts are already served by the local government for waste collection. Waste collected daily about 500-600 m3 and transported to regional TPA Piyungan.
- Districts of Sleman regency that receive the waste collection service :

Table 15 Districts of Sleman regency that receive the waste collection service

No	District	No	District	No	District	No	District
1	Barbah	5	Godean	9	Moyudan	13	Prambanan
2	Cangkringan	6	Kalasan	10	Ngaglik	14	Seyegan
3	Depok	7	Minggir	11	Ngemplak	15	Sleman
4	Gamping	8	Mlati	12	Pakem	16	Tempel
						17	Turi

3.1.8 Bantul Regency

- Consist of 17 (seventeen) districts, and 16 (sixteen) districts are already served by the local government for waste collection. Waste collected daily about 90-100 ton and transported to regional TPA Piyungan.
- Districts of Bantul regency district with no background colour served by local government for waste collection: (only Dlingo is not served.)

Table 16 Districts of Bantul regency district (served and not served)

Served						Not served	
1	Bambanglipuro	6	Kasihan	11	Pleret	17	Dlingo
2	Banguntapan	7	Kretek	12	Pundong		
3	Bantul	8	Pajangan	13	Sanden		
4	Imogiri	9	Pandak	14	Sedayu		
5	Jetis	10	Piyungan	15	Sewon		
				16	Srandakan		

3.2 Regional Landfill SARBAGITA (TPA Suwung)

Located in Suwung village, South Denpasar regency, Denpasar city with 32,8 Ha areas.

The brief information was presented in Section 2.2.

TPA regional Sarbagita is for Municipal Solid Waste (MSW) from four regions in Bali Province: Denpasar city, Badung regency, Gianyar regency and Tabanan regency. The name of **Sarbagita** is also an acronym for these four regencies/ cities:

- **Sar** taken from the Denpa**sar** city
- **Ba** taken from the **Ba**dung regency
- **Gi** taken from the **Gi**anyar regency
- **Ta** taken from the **Ta**banan regency

Below are the local landfill owned by each regencies/cities:

- Denpasar city : TPA Suwung, in South Denpasar District (regional)
- Badung regency : TPA Mengwi, in Mengwi district (active)
- Gianyar regency : TPA Temisi, in Gianyar district (active)
- Tabanan regency : TPA Mandung, Sembung Gede, in Kerambitan district (active)

3.2.1 Historical Summary

Table 17 Historical Summary of regional system Sarbagita

1986	Suwung landfill in Denpasar started operation. Used only by Denpasar.
2000	Joint Regulation
2001	Provincial Regulation No.5 of 2011 regarding waste management

	MOU (SKB) among local govs in Sarbagita BPKS = Badan Pengelola Kebersihan Sarbagita established.
2004	BPKS- Sarbagita and a private sector entered a contract for 20 years aiming at service life extension by IPST (WtE called GALFAD which use landfill gas taken from old landfill area to produce energy).
2011	Governor Regulation No.100 of 2011 concerning UPT in Provincial PU.
2012	UPT established by Local Regulation No.4, 2011.
2016	GALFAD project stopped, not being able to use the incoming waste and generating too small amount of energy to sustain without tipping fee.
2018	Tabanan and Gianyar stopped waste disposal at Suwung as it is already full. They manage waste at TPS3R.
	Because it is full, PUPR prepared a budget for site expansion and PLTSa through the PPP scheme is anticipated. (Denpasar is the city designated as a city where WtE is accelerated by the Presidential Decree.)
2019	Badung stopped waste disposal as the site is full. The WtE plant is in the market sounding stage

Bali province is very famous as tourism sites, so it is difficult to find a new location for landfill site and the largest one, Suwung landfill in Denpasar, was almost full of capacities.

Suwung landfill in Denpasar with the area around 32.8 hectares was determined (said to be in 2000) to be used as the regional landfill for Sarbagita area. The capacity was only sufficient until 2021, since started operation in 1986 with open-dumping system.

Waste management in Sarbagita regional landfill is regulated in:

- Bali Provincial Regulation Number 5 year 2011 Regarding Waste Management
- Joint Regulation was developed in July 24, 2000 concerning Main Points of Government cooperation and community development in Waste Management among Local Governments in Sarbagita regions.
- Joint Decree / MoU (*SKB- **S**urat **K**eputusan **B**ersama*) on April 16, 2001 among the head of regents/mayors of Sarbagita area, concerning:
    - Waste Management Guidelines in Sarbagita Area
    - Facilitation of Establishing an Agency for Cleanliness Cooperation Sarbagita (*BPKS = Badan Pengelola Kebersihan Sarbagita*). BPKS-Sarbagita is a non-structural institution, which is the institution formed through certain laws and regulations to support the implementation of government functions, which can involve government, private and civil society elements, and are financed by the state budget. (*wikipedia, March 2020*)
- Bali Governor Regulation Number 100 of 2011 concerning the Organization and Details of the Main Duties of the Technical Implementing Unit (UPT) in the Bali Province in Public Works Office, which authorizes UPT to manage waste in the Sarbagita region
    - In 2012, UPT was formed based on Local Regulation No. 4 of 2011 concerning the organization and work procedures of the regional apparatus of Bali Province.

Financing scheme in the Sarbagita regional landfill cooperation:

- from provinces sides:
    - the province facilitates the study of legality and technical aspects of cooperation among local governments
    - the province facilitates the formation of the BPKS institutions and provides initial operational facilities for BPKS (offices, vehicles)
- from the local government Sarbagita:
    - financing for institutional operations is based on the cost sharing of each Sarbagita local governments. The amount of sharing of each regional government is proportional based on

the calculation of the volume of waste and Locally-generated Revenue (*PAD Pendapatan Asli Daerah*) of each Local Government. (PKS does not mention about PKS, thus details are not known.)

Suwung regional landfill receive waste from four regions daily with detail as follow (media dated 2019). (As Tabana dan Gianyar already stopped transporting waste to Suwung landfill, the data below must be the data in the past.)*:*

- Denpasar city : 815 tons
- Badung regency : 127 tons
- Tabanan regency : 85 tons
- Gianyar regencies : 4 tons

In 2004, BPKS- Sarbagita invited and determined prospective investors to develop Integrated Waste Processing Installation (IPST = *Instalasi pengolah sampah terpadu*) in order to extend the landfill life. The contract started on April 2, 2004 for a period of 20 years. This partnership aimed to manage IPST in order to convert waste to energy and then sold the resulted energy to National Electricity Enterprise (PLN = *Perusahaan Listrik Negara*). The partnership between the Sarbagita regional government and the third party was on a build own and operate (BOO) basis. The obligation of the Sarbagita regional government in this partnership was to provide waste of at least 500 tonnes/day and land for the development of the IPST.

This determined investor which was an Indonesian private company partnered with the United Kingdom Company, carried out a feasibility study, and introducing GALFAD system. GALFAD is derived from gasification, landfill, and anaerobic digestion.

In May 2004, the GALFAD project covered about 85% of Suwung site for MSW and allocated 10 Ha for IPST project including 6.7 Ha for GALFAD installation.

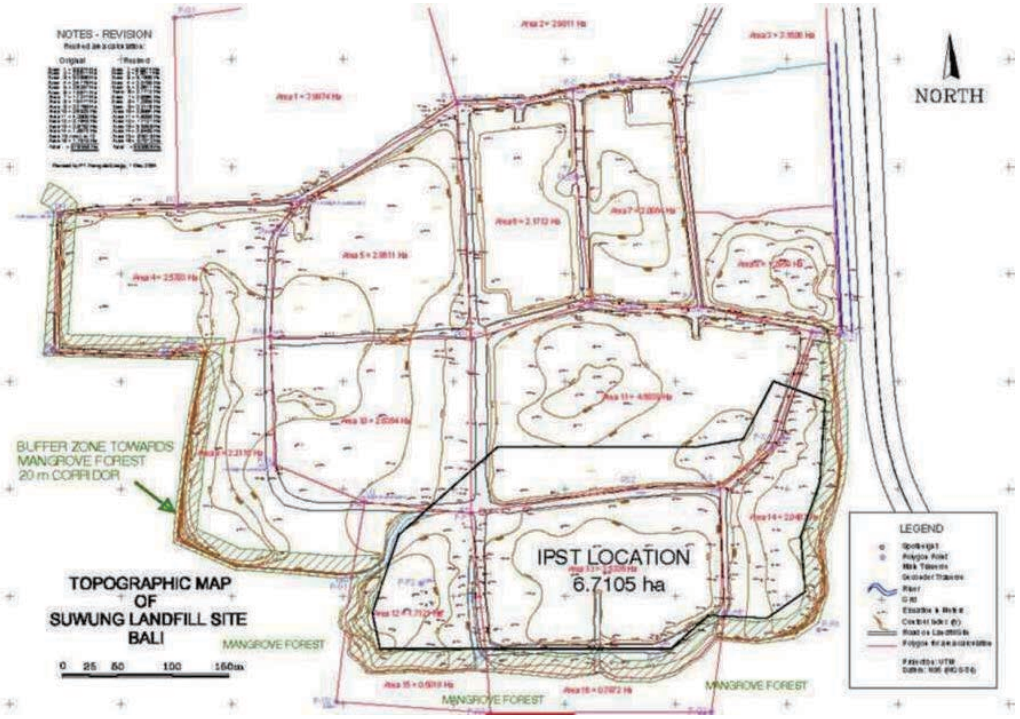


Figure 11 Map of TPA Suwung

Source:

https://simdos.unud.ac.id/uploads/file_penelitian_1_dir/56d2c83817bd5bed48593df433ef3757.pdf

The operation of the IPST Sarbagita project began on December 2007 with biogas recovery activity from the old landfill in the concession area, while BPKS-Sarbagita still managed a large portion of the land.

Until June 2016, the IPST Sarbagita facility was unable to handle the incoming waste. And the third party could generate only 0.86 MW out of 9 MW of electricity. With no tipping fee basis, the consortium seems failed to manage waste and relied on only on biogas from landfills that can be sold to PLN (National Power Company). Finally, the Sarbagita regional government officially terminated the cooperation contract on June 2016.

The height of waste reached 6 to 8 meters, Gianyar and Tabanan have stopped dumping waste at the Suwung landfill since 2018. Instead, these two regions started to process their own waste at TPS3R.

The Ministry of Public Works and Public Housing (PUPR) is revitalizing with allocatiing budget of 250 billion the Sarbagita Suwung Regional Landfill to increase service life, develop green open space on a full area (22 Ha) and support the construction of a Waste to Power Plant (*PLTSa Pembangkit Listrik Tenaga Sampah*).

The development includes the installation of the waste water treatment plant and the construction of 2 cell of sanitary landfills (5Ha) which will be able to accommodate waste up to year 2024 and the preparation of 5 hectares of land for the PLTSa site. The project will also be expanded by taking up 1.4 hectares of mangrove land around it.

The PLTSa construction is planned through the Government and Business Entity (PPP) (*KPBU Kerjasama Pemerintah dan Badan Usaha*) scheme with an investment value of up to 250 billion for potential electricity capacity of 15-20 MW. The construction of PLTSa refers to Presidential Regulation No. 35 of 2018 concerning the Acceleration of the Development of Waste to Energy Installation on Environment-Friendly Technology based. Around 1,300-1,500 tons per day of waste will be directly processed into 20 Megawatts of electricity. And prepared with approximately 1.5 Ha land to accommodate residues that are estimated to be less than 10%.

The work period is three years, 2017-2019 and is targeted to be completed by the end of November 2019.

And on 30 November 2019, Badung did not dispose any waste temporarily since the landfill is full. And there are many protests from Denpasar communites and they did not allow the trucks from outside Denpasar to come. So, at this time only Denpasar city disposes waste in Suwung landfill Sarbagita. Badung started managing their own waste by utilizing TPS managed by a third party and also at the TPS 3R owned by DLHK on a 2 hectare area in Mengwi village.

3.2.2 Payment Obligations

The information regarding payment obligations was not available in this survey.

3.2.3 Land Acquisition

The land used for the Regional Landfill SARBAGITA is the existing Suwung landfill in Denpasar city. The determination of the location of the Suwung landfill because Suwung landfill the largest landfill in Bali and the cooperation aims to rehabilitate the condition of the landfill. The willingness of the Denpasar municipal government to accept to become a "host" is also based on consideration of the largest waste volume among others member of Sarbagita.

3.2.4 Initial Investment

The Landfill was the existing landfill that has been used since 1986.

3.2.5 Areal Coverage

Below are regencies/cities that transporting the waste to Regional TPA Suwung Sarbagita before Tabanan and Gianyar district stop participating:

Table 18 Regencies/Cities in Regional System Sarbagita

No.	Regencies/Cities	Number of District	Number of District with waste collection service	Population (2010)	Waste collected and disposed of
1	Denpasar city	4	4	788,589	850 ton/day (100%)
2	Badung regency	6	6	543,332	280 ton/day (74%)
3	Gianyar regency	7	7	469,777	305 ton/day (93%)
4	Tabanan regency	10	10	420,913	No information

Population: taken from https://bali.bps.go.id/statictable/2018/02/15/37/penduduk-provinsi-bali-menurut-kabupaten-kota-jenis-kelamin-dan-status-migrasi-seumur-hidup-hasil-sensus-penduduk-2010.htmlhttps://yogyakarta.bps.go.id/dynamictable/2017/08/02/32/jumlah-penduduk-menurut-kabupaten-kota-di-d-i-yogyakarta-jiwa-2010-2019.html

% is the rate of waste disposal amount to the total waste generation (0.7 kg x municipality's population).

3.2.6 Denpasar city

- Consist of 4 (four) districts, and all district are already served by the local government for waste collection. Waste collected daily from TPS in all Districts about 850 ton.
- Districts of Denpasar city that receive the waste collection service :

Table 19 Districts of Denpasar city that receive the waste collection service

No	District
1	Denpasar Selatan
2	Denpasar Utara
3	Denpasar Timur
4	Denpasar Barat

3.2.7 Badung Regency

- Consist of 6 (six) districts, and all districts are already served by local government for waste collection. Waste collected daily from TPS in all Districts about 280 ton.
- Districts of Badung regency that receive the waste collection service :

Table 20 Districts of Badung regency that receive the waste collection service

No	District		
1	Abiansemal	4	Kuta Utara
2	Kuta	5	Mengwi
3	Kuta Selatan	6	Petang

3.2.8 Gianyar Regency

- Consist of 7 (seven) districts and all districts are already served by local government for waste collection. Waste collected daily from TPS in all Districts about 305 ton. For the last 6(six) months (since October

2019), Gianyar stop transporting waste to Regional TPA Suwung, and manage their waste at local TPA Temesi in Gianyar district.

- Districts of Gianyar regency that receive the waste collection service:

Table 21 Districts of Gianyar regency that receive the waste collection service

No	District	No	District	No	District
1	Blahbatu	3	Payangan	5	Tampaksiring
2	Gianyar	4	Sukawati	6	Tegallalang
				7	Ubud

3.2.9 Tabanan Regency

- Consist of 10 (ten) districts, and all districts are already served by the local government for waste collection.
- For the last 2 (two) years, Tabanan district no longer transported the waste to regional TPA Suwung.
- Districts of Tabanan regency that receive the waste collection service:

Table 22 Districts of Tabanan regency that receive the waste collection service

No	District	No	District	No	District
1	Baturiti	4	Marga	7	Selemadeg
2	Kediri	5	Penebel	8	Selemadeg Barat
3	Kerambitan	6	Pupuan	9	Selemadeg Timur
				10	Tabanan

3.3 Regional Landfill Legok Nangka (construction in progress)

This system was briefly presented in Section 2.6.

Located in Legoknangka, Ciherang village and Nagreg villages, Nagrek district, Bandung Regency.

Regional Landfill Legok Nangka will provide processing and treatment of household waste and household like waste covering Bandung city, West Bandung Regency, Bandung Regency, Sumedang Regency, Cimahi city and Garut Regency. The Landfill has total area about ±74.6 Ha.

Below are the landfills currently used by each regency/city:

- Bandung city : TPA Sarimukti (no TPA available in their area)
- West Bandung Regency : TPA Sarimukti, located in Cipatat District
- Bandung Regency : TPA Babakan located in Arjasari district (and probably Sarimukuti)
- Sumedang Regency : TPA Cibeureum Wetan, Paseh district
- Cimahi city : TPA Baros, Leiwigajah village, South Cimahi district, and (probably) Sarimukuti
- Garut Regency : TPA Pasir Bajing, in Sukaraja village, Banyuresmi district.

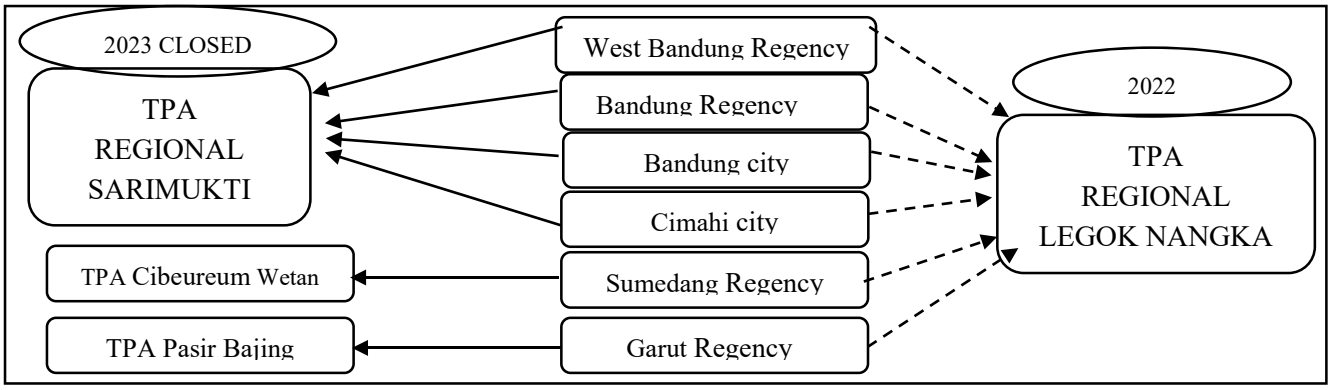


Figure 12 Transition plan of Regional Landfill from Sarimukti to Legok Nangka

3.3.1 Historical Summary

Table 23 Historical Summary of Regional System Legok Nangka

2009	Joint Agreement (KSB) between Province and local governments, valid for 5 years
2010	- Joint Decision between Head of Province and local governments; - Joint Agreement (KSB) between Central government, Province and local governments;
2013	AMDAL was issued
2014	Cooperation Agreement (PKS) was signed in 08 April 2014 in Bandung , valid for 20 years
2015	Landfill construction by PUPR and West Java Province, until 2017
2017	AMDAL revision for WTE plant
2018	The Presidential Decree 35/2018 → national WtE project
2019	AMDAL third revision. JICA, IFC and MoF signed a Cooperation Agreement for providing Transaction Advisory Services.
2020	Waste to Energy Plant is on progress for procurement

The West Java Provincial Government took the initiative to establish the regional landfill (*TPPAS-Tempat Pengolahan dan Pemrosesan Akhir Sampah*) because each region has limitations so that the provincial government were looking for solutions to the waste problem.

In January 29th 2009 in Bandung, the Joint Agreement (KSB) between West Java Province Government and six municipalities concerning Regional Solid Waste Treatment and Final Processing Management Cooperation in Bandung Metropolitan Area was signed.

This KSB states that it aimed at the inter-municipal cooperation for better waste management among the six municipalities and the regional SWM facility was to be located in Legok Nangka.

The KSB resulted the signing of Joint Decision among head of Province and Regencies/cities concerning Designation Place of Regional Solid Waste Treatment and Final Processing Management Cooperation in Bandung Metropolitan Area.

In June 25th 2010, Joint Agreement between Ministry of Public Works, West Java Province and six municipalities concerning Regional Cooperation in Implementation of Infrastructure Development Programs for Drinking Water, Solid Waste, and Wastewater at Bandung Urban Area and its surrounding was signed.

Head of Investment and Licensing Board of Bandung Regency has issued environmental permit No

667/001/BPMP/ 2013 (AMDAL) (not including incineration at that time) related to the development of regional landfill Legok Nangka. The scope of this permit consists of pre – construction phase, construction phase, operational phase and post – operation.

In April 8th 2014 in Bandung, Cooperation Agreement (PKS) was signed between West Java Province Government and six municipalities concerning regional solid waste treatment and final processing management service Legok Nangka in Bandung Raya urban area and its surrounding. The agreement valid for the next 20 years.

Local Regulations background:

1. Local Regulation of West Java Province Number 12 of 2010 about Solid Waste Management in West Java Province;
2. Local Regulation of West Java Province Number 22 of 2010 about West Java Province Spatial Plans Year 2009-2029;
3. Local Regulation of Bandung Regency Number 3 of 2008 about Bandung Regency Spatial Plans Year 2007-2027.

The West Java Provincial Government responsible to prepare the construction plan, Environment Impact Analysis (AMDAL), Detailed Engineering Design (DED), permits documents, land procurement, construct and maintain the Regional TPA, administrate the operational management by appointing the Regional Waste Management Center (BPSR).

BPSR is under the Department of Housing and Settlement of West Java with the main task as the Regional TPPAS Services Provider.

Waste disposal amount is described in PKS as shown in this table below. Each service receiver should follow the quota agreed.

Table 24 Waste Quota of Regencies/Cities in Regional System Legok Nangka

No.	Regencies/Cities	Quota quantity min-max (ton/day)	Waste generated*
1	Bandung city	500 – 1.200	1300
2	Cimahi city	150 – 250	…
3	Bandung Regency	100 - 300	1440
4	West Bandung Regency	50 - 200	1000
5	Sumedang Regency	20 - 30	---
6	Garut Regency	100 - 200	1000
	Total	920 - 2.180	---

Table 3.1 Processing Capacity, *source: PKS year 2014 (*taken from other source (internet, etc.))*

Regional TPA facilities construction covers:

1. Construction of waste treatment facilities (may thru PPP scheme, not intending incineration)
2. Construction of waste processing facilities (sanitary landfill).

PUPR and West Java Province started the construction of Regional Landfill Legok Nangka for landfill zones, retention ponds and leachate processing plant.

The Governor decided to have incineration technology to process and manage the waste, otherwise the life of TPA will be short. The Governor signed the MoU with Government Goods / Services Procurement Policy

Agency (Lembaga Kebijakan Pengadaan /Jasa Pemerintah (LKPP) for PPP scheme.

The WtE project through PPP scheme (cooperation between the government and business entities) of the Legok Nangka Regional Landfill was listed as a national project in accordance with Presidential Decree No.58 of 2017 regarding the acceleration of the implementation of the PSN (National Strategic Project) and priority projects.

The Presidential Decree 35/2018 selected 12 cities, including the Bandung metropolitan area, as the places where WtE projects are to be accelerated.

On August 21st 2019, the Japan International Cooperation Agency (JICA) signed a Cooperation Agreement with the Ministry of Finance of the Republic of Indonesia, then on September 13 JICA concluded a Project Services Agreement with the International Finance Corporation (IFC). Under these contracts, JICA, in cooperation with the IFC, will provide Transaction Advisory Services in support of procurement procedures by the Indonesian Government agencies for selecting Private Project Operator in the Legok Nangka Waste to Energy Project in West Java province. This newly lauched Transaction Advisory Services is going to support the Indonesian government's procurement of Waste to Energy Private Project Operator (preparation of bidding documents and evaluation of proposals and so on) as well as related negotiations. The TPA is expected to operate in 2023.

In 2019, West Java province will submit a VGF (viability gap fund) application letter to the Ministry of Finance to provide initial investment support of 30% of the total project value. Previously, the financing scheme was a project development facility (PDF).

Recent commitment regarding waste disposed average by each service receiver:

- - Bandung city : 1.200-1.303 ton/day
- - Cimahi city : 150-250 ton/day
- - Bandung egency : 300-345 ton/day
- - Bandung Barat regency : 78-86 ton/day
- - Sumedang regency : 28-32 ton/day
- - Garut regency : 100-115 ton/day

With the total 1.853-2.131 ton/day.

The change of details in PKS, such as technology used and tipping fee amount, now is still waiting for approval from the Regional House of Representatives.

Based on Minister Regulation No. 3 of 2013, Intermediate Transfer Station (SPA: Sasiun Peralihan Antara) will be feasible for an area with the distance to TPA over 25 km. Therefore, its construction is being discussed. The tipping fee amount will include the fee of the new facility of the SPA. Transportation of waste to the Legok Nangka TPA will be carried out by trucks facilitated by the West Java Provincial Government. Trucks from the regency / city only need to transport waste from their respective areas to the SPA.

3.3.2 Payment Obligations

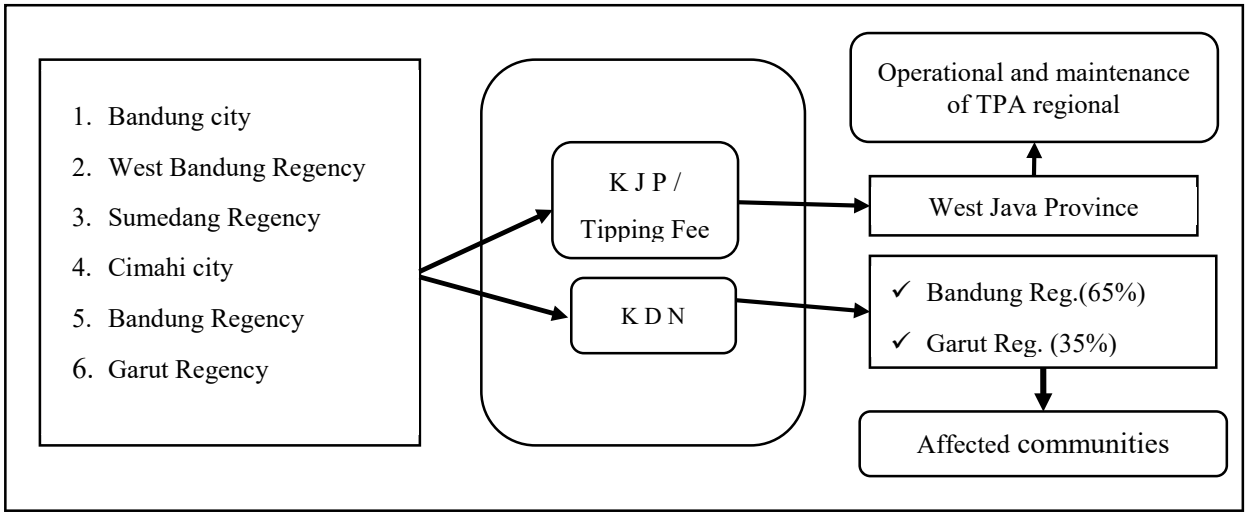


Figure 13 Payment obligation stated in PKS 2014

a. Tipping Fee/ Service Compensation (*KJP : Kompensasi Jasa Pelayanan*)

KJP is the amount that is paid by 6 (six) regencies/cities as the service receiver and to be used as fund for the solid waste treatment and final processing technically, socially, and environmentally.

KJP is calculated based on the operational and maintenance cost of Regional TPA, divided by waste amount average that transported to the Regional TPA for 1 (one) year, for Rp. 123.000/ton per month. And this amount enacted by West Java Province Governor Decree.

According to PKS 2014, after calculating the operational and maintenance cost, tipping fee was set to Rp. 123.000/ton. This is for sanitary landfill system without WTE plant.

With WTE plant, on October 9, 2017, based on the results of the calculation of the consultant, the tipping fee rationalization was about Rp 386,000 per ton. The amount is based on a capital expenditure calculation of Rp 2.6 trillion, an interest rate of 10 percent, an equity ratio of 70 percent (loans): 30 percent (own funds), a model and a 20-year BOT cooperation period and an IRR of 15 percent (common for infrastructure in Indonesia) .

All six municipals in West Java Province agreed on tipping fee of Rp. 386,000/ton. The West Java Provincial Government will subsidize 30 percent (Rp. 115.600/ton) of tipping fee and the user will pay 70% (Rp. 270.200/ton). The tipping fee to Sarimukti landfill was Rp. 125.000/ton.[1]

In 2019, the tipping fee changed again to Rp. 483.000/ton. It is still a plan sounding by the West Java Province.[2] (from media which report the statement by DLH Sumedang regency. According to the communication with BPSR, it was just a plan and they still have no idea how big the tipping fee will be, as well as the cost sharing ratio.)

[1] https://www.slideshare.net/infosanitasi/ppsp-desain-kemitraan-pengelolaan-tpa-regional-sarbagitabali
[2] https://www.pikiran-rakyat.com/jawa-barat/pr-01310081/pemkab-sumedang-pelajari-kenaikan-tipping-fee-legoknangka

The high cost of tipping fee will be not a problem for Bandung city, according to their Mayor. The Mayor said, he will reduce the waste transported to TPA by doing "Kang Pisman" program (Kurang- Pisah _ Manfaatkan) /(Reduce – Separate – Reuse).

b. Negative Impact Compensation (*KDN: Kompensasi Dampak Negatif*)

KDN is a payoff to personage, group of people, and/or legal entity which negatively affected by waste management activities at Regional TPA Legok Nangka.

KDN for Regional TPA Legok Nangka cover the following affected area :

- Bandung Regency in Nagrek District (village: Ciherang, Nagrek and Nagrek Kendan), maintain 65% of total KDN fund.
- Garut Regency in Balubur Limbangan District (village: Simpen Kidul and Simpen Kaler), maintain 35% of total KDN fund.

KDN is calculated with the proportion of 10% from amount of KJP, which is Rp. 12.500/ton per month. And this amount enacted by West Java Province Governor Decree. (no/year not found yet.)

Bandung Regency and Garut city local government then facilitate the community that affected negatively in the form of monitoring, technical assistance in the form of planning, assistance and arrangements for the use of compensation funds to increase the value of benefits and welfare of the community.

3.3.3 Land Acquisition

Pre-feasibility study indicates that some of the land owned by the local people and therefore required land acquisition. Land acquisition done

3.3.4 Initial Investment

According to PKS 2014, the investment cost for facilities and infrastructures of TPA Regional Legok Nangka were estimated as follows: (not including incinerator)

Table 25 Investment cost for facilities and infrastructures of TPA Regional Legok Nangka

NO.	Facilities And Infrastructures	PRICE (Rp)
a	TPPAS land procurement	35,000,000,000
b	Building construction	23,039,000,000
c	Landfill site construction	113,168,000,000
d	Waste treatment unit construction	381,000,000,000
	D.1. Pre-sorting and Sorting	65,000,000,000
	D.2. Composting	65,000,000,000
	D.3. Recycle	6,500,000,000
	D.4. Waste as Fuel	244,500,000,000
e	Facilities and infrastructures construction	11,280,000,000
f	Supporting facilities construction	21,762,000,000
	Total	585,249,000,000

Table 3.2 Initial investment stated in PKS 2014

And for operational and maintenance cost were as follows:

Table 26 Cost for Operation and Maintenance

NO.	COMPONENT	COST/YEAR (Rp)
I	Workers Fees	16,824,300,000
II	Fuels	37,586,160,000
III	Vehicles and Engine Care and Maintenance	5,125,500,000
IV	Materials	3,674,550,000
V	Building Maintenance	3,501,000,000
VI	Overhead and Administration	385,500,000
	Total of TPPAS operational and maintenance cost (Rp/year)	67,097,010,000
	Total of treated and processed waste (Ton/year)	547,500
	TPPAS operational and maintenance cost unit (Rp/year)	122,552
	Rounding Off (Rp/year)	123,000

Table 3.3 Operational and Maintenance cost stated in PKS 2014

So, based on PKS 2014, the investment cost for TPPAS Legok Nangka for sanitary landfill was about USD 43.73 million (Rp. 585,249,000,000) while the operation and maintenance cost is estimated for about USD 4.97 million or equal to USD 9.1 /ton (Rp. 123.000/ton)).

Financing composition will be divided into 9.43% from APBD, 26.10% from APBN and 64.47% from private investment. And with such governmental finance, land acquisition and road construction were carried out by West Java Province government, while landfill development was carried out by PUPR.

Construction for waste processing treatment has not yet been carried out, currently still in the auction stage, this is because West Java province still waiting for approval from The Ministry of Finance.

3.3.5 Areal Coverage

Below are regencies/cities that will joint the Regional TPA Legok Nangka :

Table 27 Regencies/Cities in Regional System Legok Nangka

No.	Regencies/Cities	Number of District	Number of District with waste collection service	Population	Quota (middle value) ton/day	% of Quota to Waste Total
1	Bandung city	30	30	2,503,708	1,250 ton/day	71%
2	Cimahi city	3	3	607,811	200 ton/day	47%
3	Bandung Regency	31	6	3,717,291	322 ton/day	12%
4	West Bandung Regency	16	10	1,683,711	82 ton/day	7%
5	Sumedang Regency	26	3	1,149,906	30 ton/day	3.7%
6	Garut Regency	42	11	2,606,399	107 ton/day	6%

Population: https://jabar.bps.go.id/statictable/2019/04/21/591/proyeksi-penduduk-menurut-kabupaten-kota-di-jawa-barat-2010-2018.html

Quota is taken from https://www.galamedianews.com/?arsip=236060&judul=skenario-ridwan-kamil-untuk-tppas-legok-nangka.

3.3.6 Bandung city

- Consist of 30 (thirty) districts and all district are currently served by the local government for waste collection. Waste collected about 1300 ton, will transported 1200 to regional TPA and the rest managed by the city. The city has about 178 Bank Sampah and is planning to construct 16 TPST in order to reduce waste transported to regional TPA.
- Districts of Bandung city :

Table 28 Districts in Bandung City

No	District	No	District	No	District
1	Andir	11	Bojongloa Kidul	21	Kiaracondong
2	Antapani	12	Buahbatu	22	Lengkong
3	Arcamanik	13	Cibeunying Kaler	23	Mandalajati
4	Astanaanyar	14	Cibeunying kidul	24	Panyileukan
5	Babakan Ciparay	15	Cibiru	25	Rancasari
6	Bandung Kidul	16	Cicendo	26	Regol
7	Bandung Kulon	17	Cidadap	27	Sukajadi
8	BandungWetan	18	Cinambo	28	Sukasari
9	Batununggal	19	Coblong	29	Sumur Bandung
10	Bojongloa Kaler	20	Gedebage	30	Ujung Berung

3.3.7 Cimahi city

- Consist of 3 (three) districts, and all district are served by the local government for waste collection. Districts of Cimahi city :

Table 29 Districts in Cimahi City served by Waste Collection

No	District
1	Cimahi Tengah
2	Cimahi Selatan
3	Cimahi Utara

3.3.8 Bandung regency

- Consist of 31 (thirty one) districts and just (six) districts are served by the local government for waste collection. The other districts are very far from the city , small populated and many agriculture area. Some farmer prefer to use the organic waste for composting. Waste generated is 1440 ton /day and 320 ton will transported to Regional TPA.
- Districts of Bandung regency currently served or not served by local government for waste collection are shown below.

Table 30 Districts of Bandung served/not served by Waste Collection

Served		Not Served			
1	Ibun	7	Arjasari	20	Dayeuhkolot
2	Kertasari	8	Baleendah	21	Katapang
3	Nagrek	9	Banjaran	22	Kutawaringin

4	Pacet	10	Bojongsoang	23	Majalaya
5	Pengalengan	11	Cangkuang	24	Margaasih
6	Ranca Bali	12	Cicalengka	25	Margahayu
		13	Ciakncung	26	Pameungpeuk
		14	Cilengkrang	27	Paseh
		15	Cileunyi	28	Pasirjambu
		16	Cimaung	29	Rancaekek
		17	Cimenyan	30	Solokan Jeruk
		18	Ciparay	31	Soreang
		19	Ciwidey		

3.3.9 West Bandung regency

- Consist of 16 (sixteen) districts and 10 (ten) district are served by the local government for waste collection. Waste generated is about 1000 ton, will transported 150 ton to regional TPA and the rest managed by the city. The city has about 2 (two) TPS 3R constructed by PUPR.
- Districts of West Bandung regency currently served or not served by local government for waste collection are shown below.

Table 31 Districts of West Bandung served/not served by the Waste Collection

Served		Not served	
1	Batujajar	11	Cikalong wetan
2	Cihampelas	12	Cipongkor
3	Cililin	13	Gununghalu
4	Cipatat	14	Ronnga
5	Cipendeuy	15	Sindangkerta
6	Cisarua	16	Waduk
7	Lembang		
8	Ngamprah		
9	Padalarang		
10	Parongpong		

3.3.10 Sumedang regency

- Consist of 26 (twenty six) districts and just 3 (three) districts are served by the local government for waste collection and also 6 (six) market waste.
- Districts of Sumedang regency currently served or not served by local government for waste collection are shown below.

Table 32 Districts of Sumedang Regency served/not served by Waste Collection

Served		Not Served					
1	Sumedang Utara	4	Buahdua	12	Ganeas	20	Surian
2	Sumedang Selatan	5	Cibugel	13	Jatigede	21	Tanjungkerta
3	Jatinangor	6	Cimalaka	14	Jatinunggal	22	Tanjungmedar
		7	Cimanggung	15	Pamulihan	23	Tanjungsari
		8	Cisarua	16	Paseh	24	Tomo
		9	Cisitu	17	Rancakalong	25	Ujung Jaya
		10	Conggeang	18	Situraja	26	Wado
		11	Darmaraja	19	Sukasari		

3.3.11 Garut regency

- Consist of 42 (forty two) districts and 11 (eleven) districts are served by the local government for waste collection. Garut regency divide the waste management into 5 zones, North, Middle and 3 (three) in the South. At present Pasir Bajing Landfill only serve the middle area. In the future, the waste from North area will utilize Legok Nangka regional landfill.
- Districts of Garut regency currently served or not served by local government for waste collection are shown below.

Table 33 Districts of Garut Regency served/not served by Waste Collection

Served		Not Served			
1	Banyuresmi	12	Banjarwangi	28	Kersamanah
2	Cilawu	13	Bayongbong	29	Leuwigoong
3	Garut Kota	14	Blubur limbangan	30	Malangbong
4	Kadungora	15	Bungbulang	31	Mekarmukti
5	Karangpawitan	16	Caringin	32	Pakenjeng
6	Leles	17	Cibalong	33	Pemeungpeuk
7	Pangatikan	18	Cibatu	34	Pamulihan
8	Sucinaraja	19	Cibiuk	35	Pasirwangi
9	Tarohong Kaler	20	Cigeduk	36	Peundeuy
10	TarogongKidul	21	Cihurip	37	Semarang
11	Wanaraja	22	Cikajang	38	Selaawi
		23	Cikelet	39	Singajaya
		24	Cisewu	40	Sukaresmi
		25	Cisompet	41	Sukawening
		26	Cisurupan	42	Talegong

3.4 Regional Landfill Banjarbakula

Located in village Cempaka, Cempaka district, Banjarbaru city, South Kalimantan.

This system was briefly presented in Section 2.8.

TPA regional Banjarbakula administers Municipal Solid Waste (MSW) from five municipalities in South Kalimantan Province: Banjarmasin city, Banjarbaru city, Banjar regency, Tanah Laut regency and Barito Kuala regency.

Located 11 km from the Banjarbaru city center, the landfill has an area of 31 hectares (but reported 15ha in Kompas.com) with four landfill cells for waste collection with capacity of 790 tons per day.

Below are the local landfill owned by each regencies/cities:

- Banjarbaru city : TPA Gunung Kupang and regional TPA in Cempaka District (active) (1 km apart each other)
- Banjarmasin city : TPA Basirih , in Aluh Aluh District (active)
- Banjar regency : TPA Cahaya Kencana, in Karang Inan district (active)
- Barito Kuala regency: TPA Tabing Rimbah, in Mandastana district (active)
- Tanah Laut regency: TPA Bakunci, in Pelaihari district (active)

3.4.1 Historical Summary

Table 34 Historical Summary of Regional System Banjarbakula

2016	MoU / SKB was signed on April 11th 2016 in Banjarbaru AMDAL issued in this year.
2017	• Cooperation Agreement (PKS) was signed on April 10th 2017 in Jakarta • PUPR start the construction
2018	Cooperation Agreement addendum (PKS) was signed on December 10th 2018 in Jakarta

In April 11th 2016 in Banjarbaru, the Joint Agreement between South Kalimantan Province and four municipalities concerning Regional Solid Waste Management Cooperation in BANJAR BAKULA Metropolitan Area was signed, which was valid for the next 12 (twelve) months.

The scope of work covered is the utilization of regional landfill located in Hutan Panjang in Banjarbaru city, utilization of regional Incinerator and other cooperation related of waste management.

In April 10th 2017 in Jakarta, Cooperation Agreement (PKS) between Directorate Environment Sanitation Development (PPLP) Directorate General of Human Settlement (CK) Ministry of Public Works, South Kalimantan Province and four municipalities concerning regional solid waste management in the concerned region was signed. The agreement valid for the next 5 (five) years.

Implementation of landfill is going to use the Sanitary Landfill method.

South Kalimantan Province formed the responsible unit for regional Landfill, in the form of UPTD which implement the Public Service Unit (BLUD: Badan Layanan Umum Daerah) scheme, and each service receiver should appoint their agency (Dinas, UPTD), to transport their waste to regional landfill.

PUPR started the construction.

In December 10th 2018 in Jakarta, Addendum on Cooperation Agreement (PKS) between Directorate Environment Sanitation Development (PPLP) Directorate General of Human Settlement (CK) Ministry of Public Works and Housing, South Kalimantan Province and four municipalities concerning regional solid waste management was signed.

This addendum make a change of tonnage quota, as follows:

Table 35 Regencies/Cities in Regional System Banjarbakula

No.	Regencies/Cities	Quota quantity max (ton/day) PKS 2017	Quota quantity min- max (ton/day) PKS 2018	Population	% of waste disposal to waste total
1	Banjarbaru city	200	50-90 (70)	262,719	38%
2	Banjarmasin city	440	80 – 105 (92)	708,606	19%
3	Banjar regency	70	50 – 60 (55)	588,066	13%
4	Barito Kuala regency	40	0 – 10 (5)	313,595	2%
5	Tanah Laut regency	40	0 – 10 (5)	343,890	2%
	Total	790	180 - 275		

Table 4.1 Treatment Capacity *source : PKS*

Start operations in early April 2019 and planned to be used for the next eight years. Tipping fee was implemented according to the PKS 2018 for Rp.68,350/ton.

In May 2019, local residents protested and were about to stop the operation of the Banjarbakula landfill, because of the activity of trucks passing through their small, narrow and damaged road of their village. Residents insisted that local government develop alternative access road for the waste transport to the Banjarbakula Landfill.

Therefore, PUPR of Banjarbaru City took the step to seek an alternative road location and the PUPR province construct the road in October through a budget change allocation.

Officially resumed operation in January 2020, Banjarbakula Regional Landfill is equipped with 1.5 liter/second leachate treatment technology and implement a sanitary landfill system

3.4.2 Payment Obligations

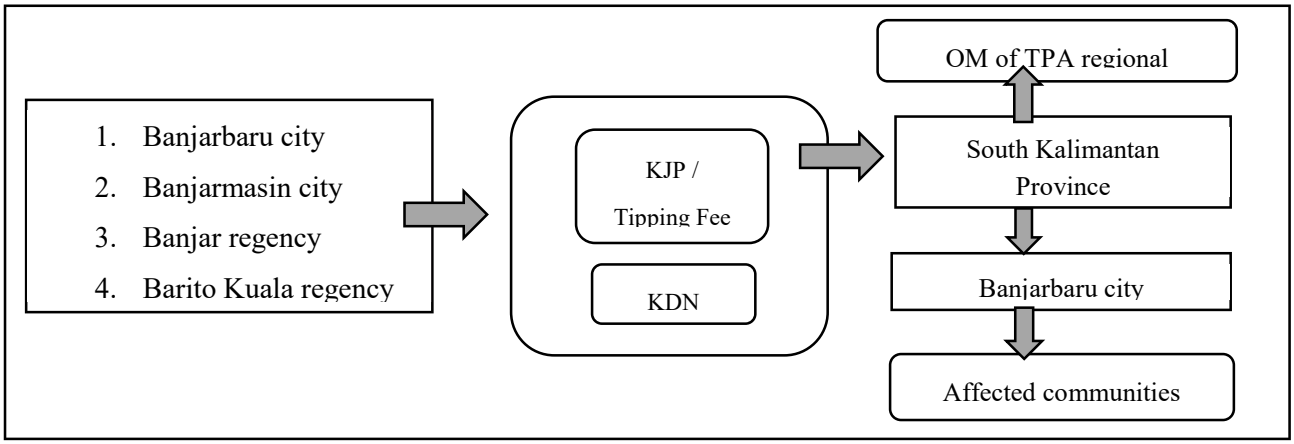


Figure 14 Payment obligation

Tipping fee is regulated by PKS at the rate of Rp.68,350/ton of waste disposed (and 10% KDN).

3.4.3 Land Acquisition

The land needed for regional landfill was 31 ha. Available land that owned by Banjarbaru city was 11.18 Ha,

therefor the South Kalimantan Province has the responsibility to procure the area of 19.82 Ha.

Banjarbaru city handed over their land to South Kalimantan Province as grant. The South Kalimantan Province has done land acquisition for 17 hectares in year 2017 and 14 hectares in 2018. (As mentioned earlier, internet information says that the land area is 15ha. The land purchase by the province is not sure.)

3.4.4 Initial Investment

Developed by the Ministry of Public Works and Housing (PUPR) since May 12, 2017 and completed on November 30, 2018 cost a budget of Rp 149 billion. The facility building with a total construction cost of more than Rp 158 billion from the APBN (National Budget).

3.4.5 Areal Coverage

Almost all local governments do not cover all their districts with the waste collection service. It is because some of the topography reason, some of small populated or some are in very remote area. And due to the waste quota and waste collection rules are applied, some choose to transport the waste to local TPA because of still cannot meet the agreement requirement. The waste that cannot transported to regional TPA because of maximum quota, then processed by TPS 3R, waste picker at TPA and waste banks.

Below are regencies/cities that join the regional TPA Banjarbakula:

Table 36 Regencies/cities in the Regional System Banjarbakula

No.	Regencies/Cities	Number of District	Number of District with waste collection service	Quota quantity (ton/day) PKS 2018 (middle value)	Population	Actual disposal amount at Regional TPA	Other waste disposal (previous TPA)
1	Banjarbaru city	5	5	50-90	262,719	100	30-50
2	Banjarmasin city	5	5	80 – 105	708,606	5	?
3	Banjar regency	19	10	50 – 60	588,066	0	
4	Barito Kuala regency	17	12	0 – 10	313,595	16-18	9-12
5	Tanah Laut Regency	11	4	0 – 10	343,890	?	?

Population: https://kalsel.bps.go.id/dynamictable/2020/04/23/1068/jumlah-penduduk-kalimantan-selatan-menurut-kabupaten-kota-dan-jenis-kelamin-2010-2019.html

3.4.6 Banjarbaru city

- Consist of 5 (five) districts, and all district are served by the local government for waste collection. Waste collected about 100 ton transported to regional TPA and 30-50 tons transported to local TPA Gunung Kupang. This local TPA is only 1 km away from regional TPA.
- Districts of Banjarmasin city :

Table 37 Districts of Banjarmasin city

No	District	3	Banjarmasin Barat
1	Banjarmasin Utara	4	Banjarmasin Timur
2	Banjarmasin Selatan	5	Banjarmasin Tengah

3.4.7 Banjarmasin city

- Consist of 5 (five) districts, and all district are served by the local government for waste collection. First, all waste from all Districts are collected to local TPA Basirih, then 5 (five) tons are transported to regional TPA Banjarbakula.
- Districts of Banjarmasin city :

Table 38 Districts of Banjarmasin city

No	District	3	Banjarmasin Barat
1	Banjarmasin Utara	4	Banjarmasin Timur
2	Banjarmasin Selatan	5	Banjarmasin Tengah

3.4.8 Banjar regency

- Consist of 19 (nineteen) districts, and just 10 (ten) districts are served by the local government for waste collection and transported to local TPA Cahaya Kencana in Karang Intan district. Because of the regional TPA Banjarbakula request the service receiver to separate the waste first and put all waste in bag before entering the landfill, the local government of Banjar until now (April 2020) decided not to transport their waste to regional TPA. The local government do not ready for waste separation and also the bag need more budget allocation.
- The other districts that still do not get any waste collection from the local government, should manage their own waste at TPS 3R (4 constructions from PUPR) or other way. The other districts, some still living on remote area, very far from the city, some are very small populated.
- Districts of Banjar regency served/not served by local government for waste collection are shown below.

Table 39 Districts of Banjar regency served/not served by Waste Collection

Served		Not Served	
1	Martapura Timur	11	Aluh aluh
2	Martapura Barat	12	Beruntung Baru
3	Gambut	13	Martapura
4	Sungai Tabuk	14	Paramasan
5	Aranio	15	Pengaron
6	Karang Intan	16	Sambung Makmur
7	Astambul	17	Sungai Pinang
8	Mataraman	18	Tatah Makmur
9	Simpang Empat	19	Telaga Bauntung
10	Kertak Hanyar		

3.4.9 Barito Kuala regency

- Consist of 17 (seventeen) districts, and just 12 (twelve) districts are served by the local government for waste collection. Waste collected are separated by the waste collection employee. The residue about 16-18 ton are transported to regional TPA and then the rest about 9-12 tons are transported to local TPA Tabing Rimbah in Mandastama district. This local TPA was utilized since by the end of 2014.
- Districts of Barito Kuala regency served/not served by local government for waste collection are as below.

Table 40 Districts of Barito Kuala regency served/not served by Waste Collection

Served		Not Served	
1	Marabahan	13	Belawang
2	Barambai	14	Kuripan
3	Bakumpai	15	Tabukan
4	Cerbon	16	Tabinganen
5	Rantau Badauh	17	Wanaraya
6	Jejangkit		
7	Mandastana		
8	Alalak		
9	Anjir Pasir		
10	Anjir Muara		
11	Tamban (only one village served)		
12	Mekarsari (only one village served)		

3.4.10 Tanah Laut Regency

- Consist of 11 (eleven) districts, and and just 4 (four) districts are served by the local government for waste collection and transported to local TPA Bakunci and to regional TPA Banjarbakula.
- Districts of Tanah Laut regency served/not served by local government for waste collection are as below:

Table 41 Districts of Tanah Laut regency served/not served by Waste Collection

Served		Not Served	
1	Tambang Ulang	6	Bajuin
2	Bati Bati	7	Batuampar
3	Kurau	8	Jorong
4	Bumi Makmur	9	Kintap
5	Pelaihari	10	Panyipatan
		11	Takisung

4 Webinar "Sharing Experience about Regional Waste Management"

4.1 Objective

The webinar was held on December 1st 2020 by at the Public Housing Settlement Area and Human Settlement Office (PRKPCK) of East Java Province supported by JICA virtually. It is aimed to share the general concept of Regional Waste Management among the officials of East Java Province, Regencies/Cities in Gerbankertosusila and other agencies. Highlighting lessons learned from implemented practices and experiences. The webinar offered the opinion exchange with the local governments and encourage the municipalities in Gerbankertosusila to consider the participation in phase 2 of the JICA project.

4.2 Program

Presentation from Central Government lectures share the national waste management target, guideline and policies of cooperation, implementation, financing, of regional SWM between regions within province.

And the presentation by the provincial lecturers share the information regarding chronologies, concept, purpose of regional system, system mechanism, process of consensus building with local communities and land acquisition, and also lessons and advices useful to start the regional system

Date, venue and program of the webinar are as follows.

- Date : December 1st, 2020
- Venue : Online Seminar (webinar)

Time (Indonesia)	Agenda	Resource Person
08:30 – 09:00	Registration	All participants
08:30 – 09:10	Opening remarks	Head of Department of Housing Service, Settlement Areas and Living Environment, East Java Provincial Government Ms. Dahlia Erawati
09:10– 09:20	Keynote speech	Keynote speech by representative of JICA Indonesia Ms. Satsuki KANDA
09:20– 09:40	Presentation : General policy of promotion on regional waste management in Indonesia	Ministry of Public Work and Housing, Directorate General of Human Settlement, Presented by Head of sub-Directorate of Technical Planning, Directorate of Sanitation Ms. Marsaulina Pasaribu
09:40 – 10:00	Presentation : Funding and Sharing Funding on waste management	Ministry of Home Affairs, Directorate General of Regional Financial Development Presented by Head of Regional Section IV/A, Directorate of Regional Revenue Ms. Ni Putu Myari Artha
10:00 – 10:30	Q&A	
10:30 – 11:00	Presentation : Review of Regional Waste Management Implemented in Indonesia	JICA Expert Team
11:00 – 12:30	Presentation : Regional Waste Management in South Kalimantan, Q&A	Environmental Agency of South Kalimantan Province Presented by Head of Environmental Agency of South Kalimantan Province, Ms. Hanifah Dwi Nirwana

12:30 – 13:20	Lunch Break	
13:20 – 14:50	Presentation : Regional Waste Management in West Java	Environmental Agency of West Java Province Presented by Head of Section, UPTD Planning and Evaluation of SWM of Regional TPA/TPST Mr. Arief Perdana
14:50 – 15:00	Conclusion/Closing speech	Department of Housing Service, Settlement Areas and Living Environment, East Java Provincial Government

4.3 Presentations

4.3.1 Presentation by Ministry of Public Works and Housing

Funding and sharing of funding in the context of handling solid waste, seen from a legal basis are as follows;

First, related to Law 23/2014 on Regional Government, part 3 (three) that Funding for the implementation of Regional Government Affairs. In article 282, it is explained that the administration of government affairs which becomes the regional authority is funded by the APBD.

Second, in Government Regulations 12/2019 concerning Regional Financial Management, the sources of income that can be used by the Regional Government in order to fund Regional Government affairs are described, one of which is related to solid waste. Starting from regional-generated revenue (PAD), Transfer Revenue and other legal regional revenue.

PAD consists of regional taxes, regional retribution, then the revenue from legalized regional wealth management and other legal regional revenues. As for Transfer Revenue, it is broken down into Central Government Transfers and Inter-regional Transfers.

In Central Government Transfers, there is a balance fund, namely General Allocation Funds (DAU), Special Allocation Funds (DAK). And in inter-regional transfers, there is Sharing Revenue and Financial Support. And for other legal regional revenue, there are grant funds, emergency funds and other revenue according to Law.

This needs to be mentioned at the beginning because it is a source of revenue that can be used to fund Regional Government affairs, in this case one of which is related to solid waste. In principle, for waste management, it can be taken from any funding source. Later we will see which one can be a source of funding.

From PAD, the first is non-aermark PAD, which is sourced from local taxes whose designation is not regulated by Law. After the tax is received in the local treasury, there is no brand for what it is used for, it can be used for anything, one of which is for waste matters. The second from PAD is for DAK-non-physical BPLS (*Waste Service Management Assistance*) which comes from Transfer Revenue. The *third* from PAD is revenue from financial support from transfer revenue from other local Governments.

Then retribution which is also part of PAD, namely retribution for solid waste or cleaning services, where this is actually intended for solid waste services.

If we look at Law 28/2009 on the Object of Retribution;

In article 112 paragraphs a, b and c, namely solid waste/cleaning services administered by the Regional Government, there are components of the object of retribution that can be imposed on the community when the Regional Government conduct cleaning services.

In Article 152, it is explained that there are principles and targets in determining the tariff for public service collection, and in Article 153 regulates the principles and targets in determining the tariff for business services. And Article 154 explains the principles and targets of collection in certain permits.

The three articles above have their respective arrangements, in article 152 for public services, that charges can only replace part of the service fee, in contrast to Article 153 where this collection is intended to obtain a proper profit.

If later the waste management will be subject to retribution, it will be included in the public service collection, therefore the tariff must pay attention to the cost of providing solid waste services. However, because public service charges only cover part of the cost, it needs to be covered by other costs.

However, we first understand about Solid Waste Management Standards, in order to break down the infrastructure that will be needed, sources of funding and determine the collection rates that will be imposed on the community by first defining clusters in the community's capacity.

And keep in mind that retribution will affect services, the better service will affect the results of retribution.

Because we are talking about public service retribution, we will focus on article 152, because it only covers part of the costs, so expenses will be greater than income, so we cannot expect retribution for financing solid waste management, it will not be 100%.

The costs referred to here are operating and maintenance costs, there are interest and capital costs, which can be covered by the cost of retribution, so when calculating the cost of retribution, the components must be considered. Therefore, before the value of the retribution is set for the mandatory retribution, in this case, the community that will be served,

The use of retribution is related to service providers, which needs to be understood how regional solid waste management standards are, so that the infrastructure and human resources needed is calculated to describe the management costs. And when the nominal has been obtained, it must be understood that retribution is a source of financing in addition to other sources, for example taxes collected from the public, which can be DAU if available to cover shortages.

We also need to understand and calculate retribution rates. The first principle is to determine the community clusters that will be served, this is depend on the community capability. If it is entered into mandatory affairs, it should be free and should not be charged to the public. In the home class, you can cluster into the poor, middle and rich clusters. Also business clusters such as small enterprises (UMKM), large shops, supermarkets and others. After finding the total number, then divide it into each cluster.

This presentation focuses on retribution because in Law 28/2009 Article 161, it is stated that the utilization of the revenue from this type of retribution is prioritized for matters directly related to the delivery of the services concerned. So, if the retribution for solid waste, then prioritize financing for solid waste matters.

Then in Government Regulations 81/2012 Article 29, the utilization of retribution is used for solid waste service activities, in order to make the service becomes optimal.

In Government Regulations 28/2018 Article 4, mentioned that Regional cooperation with other regions, related to waste management.

For funding related to cooperation, Article 12, paragraph 2 states that local governments can provide financial assistance to other regions.

In terms of budgeting, in the Ministry of Home Affairs regulation no. 050-3708/2020 concerning General and Special Financial Assistance Expenditures for regional cooperation has prepared a slot, which is used to record financial assistance provided to other regions in the framework of regional cooperation.

In Presidential Regulation 38/2015, it can also be cooperated with business entities, specifically in the provision of infrastructure, there are 19 types of infrastructure regulated in article 5, one of which is in letter g, namely Waste Management System Infrastructure.

From the funding side, in the Ministry of Home Affairs regulation no. 96/2016 concerning Regional Government Cooperation with Business Entities, a payment method slot has also been provided if waste management is carried out by a business entity. The slot is expenditure on availability payment for solid waste management system infrastructure, which is quoted from the nomenclature of Presidential Regulation no.38/2015.

The conclusion that can be given is, in terms of funding sources, there are retribution, non-physical DAK BLPS, legal financial assistance revenue, taxes, DAU, etc. And in terms of administration, it can be done alone or together with other regions or with business entities.

4.3.2 Presentation by Ministry of Home Affairs

In regional solid waste management, there are several basic policies;

First, Law 18/2018, which states the need to prioritize waste reduction. It is not the same as before, that the waste that will be sent to the TPA, there has been a handling effort, so that what enters the TPA is residue. And it was also stated that one of the tasks of the Province is to facilitate cooperation between regions. And after the landfill is closed, it is necessary to monitor up to 20 years of environmental quality in the landfill.

The second Law 23/2014 concerning Regional Government, in the attachment describes the authority regarding who is in charge of waste management, both on a cross-provincial scale, national strategic interests as well as the development of regional solid waste management systems, as well as for the management of regional TPA and TPST.

Third, Presidential Regulation 97/2017 regarding the target of reducing waste by 2025, 30% for waste reducing and 70% for waste handling.

Fourth, Ministerial Regulation PUPR 3/2017, concerning Technical Guidelines for Waste Management Facilities and Infrastructure.

Related to the distribution of Governmental affairs regarding Solid Waste in Law 23/2014 concerning on Regional Government, the authority of the Central Government, Provincial Governments and District / City Governments is described in detail.

The target of waste management according to Presidential Regulation 97/2017 until 2025, explained that the waste management target is 100%, where 30% for waste reduction and 70% for waste handling including collection, transportation and processing as well as final processing (3R and WTE). Meanwhile, the management at the TPA can be done with a sanitary landfill system or a minimum control landfill.

For the scope of waste management from source to processing site, the authorities and those who contribute to carry out waste management are regulated in;

Presidential Regulation 97/2017, there are so many stakeholders involved in waste management, authority is distributed starting from waste generation handling, container, collection, infrastructure development, transportation and disposal / processing facilities. For reduction, a lot of involvement from the Ministry of Environment and Forestry (KLHK), the community, the Ministry of Health, the Ministry of Education, Ministry of Communication and Information (Kemenkominfo) and the private sector. In the container stage, the authority from the community and local government and the private sector, as well as in the collection. The PUPR Ministry in coordination with the Local Government is involved in the construction of TPST / TPS3R. Maintenance of TPST / TPS3R is managed by the community when it has been handed over to the community, but institutionally it is the responsibility of the Regional Government.

For the construction of waste reduction facilities such as a Waste Bank or Recycle Center there is a lot of involvement from the KLHK and the Regional Government. For transportation is carried out by the Regional Government or the private sector. For the means of disposal or processing is the Ministry of PUPR, by construction of the TPA and in coordination with the Regional Government. Meanwhile, the issuance of permits for incinerators and waste processing by private parties is the authority of KLHK. And for operation and maintenance, it is the responsibility of the local government and the private sector.

To monitor the outcome of this waste is the authority of KLHK. Specific waste is the responsibility of the waste producer and the KLHK, Ministry of Health and Ministry of Industry.

Limited land encourages the regional TPA development. Especially in urban areas and cause protests from residents. It is hoped that with the cooperation between districts/cities, the problem of land limitations can be resolved. In regencies they still have land, while cities with high waste generation have difficulty getting land.

The second is related to operational and maintenance costs. For the regional TPA is hoped that no longer use the open dumping system, but sanitary landfill or at least the control landfill. Therefore, it costs money, and by implementing a regional TPA, the operational and maintenance costs will be shared.

Third, we need technological innovations in waste management, because there are several technologies that require a very large amount of waste input, with the presence of regional landfills, they can take advantage of WTE or RDF technology. Due to the increasing management burden and waste generation, we are facing limited transportation and human resources problem.

When facilitating cooperation, there were several challenges and problems related to regional TPA development, including the difficulty of reaching a cooperation agreement due to considerations from each district/city, so before move forward for cooperation, this needs to be explored first.

And especially when a district/city is selected as the point of construction for a regional TPA, objections arise and also the difficulty of establishing an institution that will manages regional cooperation. From PUPR hope that provinces will manage by forming UPTD at Provincial level.

The objectives and benefits of regional waste management are accommodating land difficulties for the city, increasing synergy between regions, to increase the range, quality and efficiency of waste management services, improve management and institutional capacity in regional waste management and are expected to mobilize funds from various sources for system development regional waste management.

There are 5 (five) aspects that need to be considered in regional waste management, which is regulatory, institutional, community participation, technical and financial aspects. This time we will discuss 3 (three) aspects: regulation, institutions and community participation.

For regulation, the Provincial Government should prepare regional waste management regulations, that manage service fees and Negative Impact Compensation (KDN). Provincial Government related to provincial waste management policies and strategies, and also related to waste management permits, and Regional Head Regulations deemed necessary.

For institutions, many facilities have been built by the Ministry of PUPR, but their management is not in accordance with the Ministerial Regulation. For example, there are still many TPAs that implement an open dumping system, there are also various institutional forms, it could be UPTD, where the source of funds is from the APBD, operational activities and financial management are in line with Departmental policies and internal audits, it could also be BLUD, where the source of funds is from the APBD and services fee and must make a business strategy plan and have flexibility in financial management or can be BUMD where the source of funds is from the APBD, equity and company profits, and have a business strategy plan and financial management like a company.

So the management system is depend on the local government choice, adjusted to their respective conditions. Based on the Ministry of PUPR, there have been 9 UPTD regional waste management formed and the regulator is handed over to the respective Local Government.

Regarding the distribution of authority, there are boundaries between the Provincial Government and the districts/cities. Where the district/city is responsible from waste separation, transportation, processing to transportation of residues to the regional landfill. Meanwhile, processing at regional landfills is the responsibility of the Provincial Government.

Regarding the financing aspect, regional waste management requires operational and maintenance costs, as well as KDN costs. Operational and maintenance costs include employee wages, office supplies, materials, work utilities and laboratory checks. This is a cost component to be considered when calculating operating costs. To calculate maintenance costs, the components include maintenance of heavy equipment, generators, Leachate Treatment Plant (IPL), weigh bridges, offices expenses, operational roads and drainage.

So, from the components of operating and maintenance costs, we can calculate the service cost (Tipping Fee), by dividing the operational and maintenance costs with the total waste that enters the landfill. For KDN, we can calculate that is 10% to 15% of the service cost. This is what must be agreed upon during the cooperation agreement in regional waste management.

From the aspect of the role of the community, where the community has a role in handling waste either independently or in partnership with the district/city government, besides that it is also expected that the community will pay waste retribution and also be involved in planning, providing suggestions and considerations to the Government.

The stages for implementing regional infrastructure are divided into 4 (four) stages, the first is preparation, second is development, the third is operation and maintenance and the fourth stage is post-development, the last stage that is often forgotten so that there is no sustainability of the TPA that has been built.

In the preparation stage it takes a relatively long time, between the Provincial Government and the District/ City deliver a KSB first, to jointly manage regional TPA.

Then determine the location of the regional TPA, which must be registered in the provincial Spatial Planning (RTRW), then proceed with the preparation of the DED. And before progressing to the development stage, the Cooperation Agreement (PKS) needs to be prepared. In the PKS it is necessary to emphasize the duties and authorities of each province and district/city and also include the amount of the Tipping Fee, the total waste input that will enter the regional TPA. The amount of this Tipping Fee will greatly affect the amount of operational and maintenance costs at the regional TPA. In some areas, the provincial government provides subsidies for operational and maintenance costs, because the tipping fee is insufficient.

Then to the development stage. Usually construct by the Ministry of PUPR, unless the regional APBD is capable of building. Apart from physical development, supporting regulations and institutional structures were also prepared.

Points for the preparation of regional landfills, starting with technical assistance from the Central Government, then there is a KSB between Provincial and District/City Governments.

Among the criteria for determining the location of a regional TPA, because this is often a problem related to the feasibility of the location. Referring to Ministerial Regulation PU 3/2013, one of which requires that they

be far from residential areas, which is more than 1 km, registered in the RTRW, have Environmental Impact Analysis (AMDAL) / Environmental Management and Monitoring Efforts (UKL-UPL) documents to avoid reprimands, have been disseminated to the public to ensure there are no objections in the surrounding community, have approval by the competent authority and the location determination is carried out by the Governor.

And for regional TPA planning criteria, it is contained in SNI 03-3241-1994 concerning the procedures for selecting a landfill location, starting from the criteria for infrastructure and facilities to operational criteria.

To date, a total of 12 regional TPAs have been built. And currently 2 (two) regional TPAs are being built in the North Sulawesi region which were built since 2020 and continued in 2021, then an improvement development in the Talumelito regional TPA in Gorontalo which was completed in early November 2020.

Those are some policies from the Ministry of PUPR related to the development of regional TPA and to support regional waste management.

4.3.3 Presentation by South Kalimantan Province

The construction of the Barjarbakula Regional TPA has a fairly long journey, which started in 1996. Initiation to become a Metropolitan city, with the name Banjarmaskuala which is an urban area from 1999 to 2019. And in 2006, a RTR has published the Banjarbakula Metropolitan Area, then legalized in 2015, and is currently discussing related to the Presidential Decree 3/2012.

At the time of the construction of the TPA in 2017, the KSB was also made concurrently and it was officially issued on 7 February 2020. And in 2020 it has received approval for the retribution rate from the Regional Representative Assembly (DPR) and entered the evaluation phase from the Ministry of Home Affairs.

The construction of the TPA was initiated by the Ministry of PUPR, with a land area of 15 ha and spent 150 billion funds. Service life is 7 (seven) years, with a capacity of 250 tons per day covering 1300 people and with a system to sanitary landfill.

In the cooperation, it was also agreed that the amount of waste from each party that could be transported to the regional TPA according to the KSB. This amount is adjusted to the distance and availability of waste processing services, as well as transportation costs in each Regency/City.

For institutions, as operations, an UPTD was formed under Environmental Agency (DLH) South Kalimantan Province. And continued with the establishment of SOPs, training, counseling and partnership development.

At the beginning of the TPA construction, there was resistance from the community and then an approach was made with socialization. In this phase the community asks to be involved in the construction phase and has been involved proportionally. To compensate the local community, the TPA provides the composting results and liquid fertilizer. And there is still a pending promise from regional TPA to distribute methane gas and organic fertilizers to the community.

For land, there is a part of a grant from Banjarbaru City and the distance from the TPA to the community settlement area is 1.5 KM, the surrounding areas are oil palm and rubber plantations.

All construction from the Ministry of PUPR and the Province provide the access road and office construction. The maintenance cost is covered by Regional Expenditure Budget (APBD) of 6.2 billion from South Kalimantan Province. And the tipping fee is agreed between regencies/cities.

There is a special increase in waste generation in every March every year related to community event (Haul) which increases to 314 tons.

Until this webinar is held, it's still free of charge because there is no legal protection yet. The tipping fee will be charged is 65,000 rupiah as plan, and the revenue is expected to reach 6.4 billion.

4.3.4 Presentation by West Java Province

The role of the West Java Provincial Government began since the waste tragedy in Leuwigajah. This TPA Leuwigajah is unique because it is located in the city of Cimahi, however, the biggest contributor of waste is from the city of Bandung, and when a disaster occurs, the victims are residents of Bandung Regency. At that time, there was a confusion, who is in charge? Then the initiation was carried out by bearing 30% for the victims and the rest divided according to the amount of waste in each region. Since then, the West Java Provincial Government has been involved in waste management in the District/City. Then it is stated in the 2018-2023 Regional Medium Term Development Plan (RPJMD) for regional waste management in the area of the National Activity Center.

West Java Province has the largest population of around 50 million people. With the number of TPAs reaching 57 points, it can be seen that there is a potential for environmental pollution. With this basis and the legal protection of Law 18/2008, an idea emerged for the establishment of a regional TPA.

To avoid overlapping responsibilities, then starting to share roles according to the mandate of Law 23/2014, each District / City transports its own waste and if it has entered the cross districts / cities, the Provincial Government plays a role. In particular, the role of the province emerged in areas with high waste generation with limited land.

Investment financing for large infrastructure such as TPA, operational roads, is assisted by the Ministry of PUPR, so that the Provincial Government builds one that does not require very large costs. For maintenance, use the PPP system by appointing experienced partners, because the Provincial Government itself does not have sufficient human resources.

The waste that enters the Sarimukti TPA is up to 2000 tons per day. There are a lot of scavengers in this TPA, but after being studied, they have a role in reducing waste up to 10 tons per day for plastic bag waste and plastic bottles. This is a dilemma, because with the activity of scavengers, the surrounding area becomes slum. Because it is neither prohibited nor requested, the scavengers work at their own risk.

For Legok Nangka regional TPA;

By using the PPP scheme, an auction process is currently being prepared. In the future, this TPA will receive waste from the previous area Sarimukti plus Garut and Sumedang District. Waste that can be handled reaches 1800-2000 tons per day. The construction is carried out by the Ministry of PUPR, including landfills, roads, and IPAL, while the West Java Province builds fences, gates and other small-scale works.

For Lulut Nambo regional TPA;

Will serving Bogor District, Bogor City and Depok City. For development, the auction has been completed, but there are a few problems on the auction winners side, where progress in the field is very small (around 2.4%), so that the West Java Province takes initiative steps to take over the construction work to Regional Owned Enterprises (BUMD) rather than being cut off, and it is hoped that the work will be finished by the end of this year.

For the Ciayumajakuning regional TPA;

Will serving the Cirebon Regency, Cirebon City and Indramayu Regency. Due to the experience of the Legok Nangka regional TPA development under the PPP scheme, the Ciayumajakuning TPA development will be pursued with the BUMD scheme with a target of completion in 2023.

For the legal basis for the development of regional TPA also refers to:

1. Law 18/2008 concerning Waste Management
2. PP 81/2012 concerning Management of Household Waste and Household-like Waste
3. Law 23/2014 on Regional Government
4. Law 28/2018 concerning Regional Cooperation
5. West Java Provincial Regulation No. 1/2016 concerning Amendments to Regional Regulation no. 12/2010 concerning Waste Management in West Java

So that in its implementation, the development of regional TPAs has complied with the points in the relevant regulations as a legal basis. As with the following matters, there are institutional PKS documents, development financing to operations and maintenance.

For operational and maintenance costs (in rupiah):

1. Sarimukti regional TPA: 74,500 with a subsidy from the provincial government of 24,000 rupiah
2. Legok Nangka regional landfill: 386,000, with subsidies 30% from the provincial government
3. Lulut Nambo regional landfill: 125,000, without subsidies

For the Technology:

1. Sarimukti regional TPA,: sanitary landfill,
2. Legok Nangka regional landfill: WTE, incenerator (4T)

4.4 Q&A

Q&A for Ministry of Home Affairs

(Q) : How is the licensing mechanism if the private sector conducts waste to energy activities?
(A) : It is handled by another division. There are several steps when associated with the private sector. In compliance with Presidential Decree No 38 of 2015, if waste management generates electricity, it uses

the PPP (Public-Private Partnership) concept, which has the concept of waste reduction to generate electricity.

(Q) : How is the licensing mechanism of waste management between districts/cities and the private sector?

(A) : If the cooperation only to transport waste from the source to the TPS or TPA, the concept is not PPP because it is only an operational activity. In this case, what is purchased from the private sector is the "service", for example, government spending on contract labor services. the concept is the procurement of goods and services. Because waste management produces electricity, the payment method is "Service Availability Payment". This can be a factor that reduces the investment return of the business company if it can generate electricity.

Q&A for Ministry of Public Works and Public Housing

(Q) : What is the sustainability of the implementation of the prepared regional landfill plan if the Municipalities RTRW does not include a regional landfill yet? In contrast, it takes quite a long time to revise the Municipalities RTRW.

(A) Regarding the location, we have explained that the location of the regional landfill must be within the Provincial RTRW. The expectation is, if it is not already in the Municipalities RTRW, then the Municipalities RTRW must confirm what is stated in the Provincial RTRW. This is our foundation when the Ministry of Public Works and Public Housing is involved in developing a regional landfill. Building a regional landfill takes a long time because it requires special efforts related to land acquisition, etc. What is certain is that the location plan must be in the Provincial RTRW.

Q&A for South Kalimantan Province

(Q) When was the Banjarbakula regional landfill site initiated?

(A) Banjarbakula began in 1996. The location was determined in 2014 and 2015, which was later determined in the RTRW. Based on the agreement from the regents and mayors, the location was decided in Banjarbaru due to technical considerations. With swampy land conditions, it is not possible to build a sanitary landfill.

(Q) Is there any transfer station for the furthest distance from the service area to the landfill?

(A) The farthest distance is Barito Kuala, with more than 50 KM. When determining the quota (waste), we give the smallest allocation to Barito Kuala in terms of efficiency. There is no transfer station, but there is a special road where the dump trucks must be closed not to get protests from the public due to the smell and spills when they pass the road.

(Q) How was the process to reach the tipping fee agreement?

(A) It is never easy to reach agreements on financing and efficiency with cross-regulations/municipalities. The soil conditions, which are not suitable for constructing a landfill site, require a regional landfill site to meet the needs of the waste services in the area. We also have meetings with the Provincial Public Works Office to discuss these needs, since it is the common aim between regional heads that an agreement can be reached.

(Q) Is the Gunung Kupang landfill different from Banjarbakula landfill, or are they integrated landfill?

(Q) What is the surrounding area like? Is it agriculture area?

(Q) Does the leachate treatment affect the surrounding area? Then, what is the solution? Because Surabaya is very prone to polluting the surrounding area, namely the ponds.

(Q) Is there a leachate collection pond?

(A) They are the same landfill. The Banjarbakula landfill is at Gunung Kupang Street, Banjar Baru, thus they also call it Gunung Kupang Landfill.

(A) The surrounding area has oil palm and rubber plantations.

(A) We have planned the leachate water treatment not to pollute the surrounding environment, such as the leachate management schedule (suctioning of pre-sedimentation tanks, etc.), and we apply it according to the SOP. Therefore, the water that comes out of the leachate pond is guaranteed not to affect the surrounding plantations' soundness. The distance between the landfill and the settlement is about 1.5 km.

(A) There must be a leachate pool. It is mandatory. We have made a very complete set built by the Ministry of Public Works and Public Housing.

(Q) When the tipping fee was agreed, does it mean that there is no Cooperation Agreement, right? What are the stages?

(Q) Does the cooperation-related discussion take a long time?

(A) In the beginning, it started with a collective aspiration to create a regional landfill as manifested in the Mutual Agreement. There is a legal basis, after which the Ministry of Public Works and Public Housing intervened by building a regional landfill. The Ministry of Public Works and Public Housing will respond to this if there is a Collective Agreement. Then, we discussed the quotas. After many discussions, we decided to give the most quotas in Banjarbaru because the landfill location is in that area. These stages were carried out in parallel to make it easier.

(A) The costs are not cheap. It is impossible to be borne entirely by the province. After a long discussion and calculation of the ideal, the figure was obtained (IDR 65,000/ton). Before the agreement with the regions, we negotiated with the provinces. There is a need for a governor regulation as a complementary instrument. We also agreed to provide compensation to the area so that the sharing from the province is not too big.

(A) Yes, that's right, because the cooperation agreement concerns quotas, etc.

Q&A for West Java Province

(Q) Negative impact compensation with a rate of Rp. 15,000, is it regulated in a Governor Regulation or other regulations?

(Q) Is there an appraisal process first in determining the rate, or is it just an agreement as stated in the minutes?

(Q) After compensation, if there is road damage etc., is it the responsibility of the district or provincial government?

(A) The amount of compensation is regulated in the Cooperation Agreement. The distribution for affected villages, the amount for each village, the use of the money are all regulated in the West Bandung Regent Regulation.

(A) In the Cooperation Agreement process, we (the province) give time for the West Bandung Regency Government to mitigate what costs are needed. We also use our AMDAL. After that, the mitigation results were brought to the forum for discussion, with the initial rate being around IDR20,000 - IDR25,000. However, after discussion, it was agreed that the rate was IDR15,000.

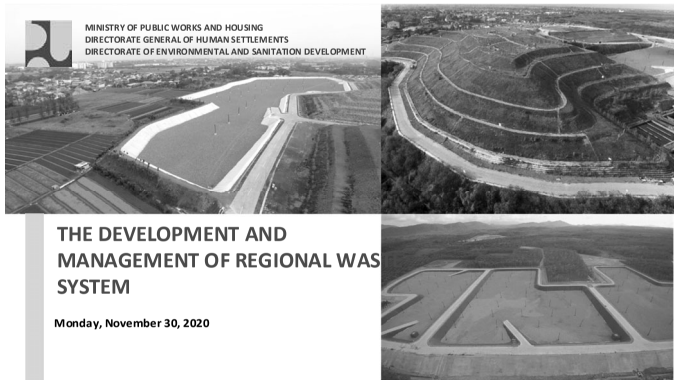
(A) Road maintenance is carried out by the West Bandung Regency Government. Since the beginning, road/access construction has been assisted by the provincial APBD. For road maintenance costs, the province provides financial assistance.

(Q) Has all of the 1,800 tonnes of waste been collected in the regional landfills? Or is it shared with local and regional landfills?
(Q) In which aspect is the KBPU complicated, sir?
(A) Bandung City, Cimahi City, West Bandung Regency, and Bandung Regency do not have any landfills at all, so all the waste goes to Sarimukti. But not all of them go to the Sarimukti landfill because there's still a low level of solid waste operation. In general, those not absorbed into services are discharged into rivers, etc. Indeed, not all of the garbage can be disposed of at the Sarimukti landfill. In the case of the Legok Nangka landfill, we will limit the management since it is already a Joint Arrangement, the rest of which must find their own efforts to manage their waste in order to reduce the generation of waste.
(A) You need to be patient because it takes a long time, such as document preparation and review, for around two years. At the time, the implementation was not as smooth as we had expected, such as financial constraints, the collection of supporting documents such as the OBC-FDC, all this took a long time.

4.5 Presentation Materials

Presentation materials by the four speakers are shown from the next page.

Presentation by PUPR



MINISTRY OF PUBLIC WORKS AND HOUSING
DIRECTORATE GENERAL OF HUMAN SETTLEMENTS
DIRECTORATE OF ENVIRONMENTAL AND SANITATION DEVELOPMENT

THE DEVELOPMENT AND MANAGEMENT OF REGIONAL WAS SYSTEM

Monday, November 30, 2020

1

GOVERNMENT POLICY FOUNDATION

01 Law Number 18 of 2008

- Prioritize waste reduction.
- Assign the Provincial Government, among other things to facilitate the cooperation between regions within a province in a waste management.
- Monitor the environtmental quality after the closure of the landfills up to 20 years.

02 Law Number 23 of 2014 on Local Government

- The development of a trans-provincial waste management system and a waste management system for the national strategic interest.
- Give the authority to the Provincial Government in the regional waste system development & management, as well as the waste handling in regional landfill and integrated waste processing site (TPA/TPST)

03 Presidential Regulation Number 97 of 2017

- Waste reduction and handling target: 30%-70% (2025)

04 Regulation of Minister of Public Works Number 3 of 2013

Technical Guidelines for Solid-waste Management Facilities and Infrastructure

2

Waste Management Government Affairs Division Law Number 23 of 2014 about Local Government

Central Government

- The development of management system nationally, trans-provincially or of national strategic interest
- The permit issuance for Incinerator of the waste processor into electrical energy
- The permit issuance for methane gas (landfill gas) utilization for the electrical energy at the regional landfill by the private parties
- The guidance and supervision of waste handling in the regional landfill and integrated waste processing site
- The establishment and supervision of the producer responsibility in waste reduction
- The guidance and supervision of the producer responsibility in waste reduction

Regional Government

- The Development of Regional Management System
  The waste handling in the regional landfill and integrated waste processing site *(TPA/TPST).*

Local Government

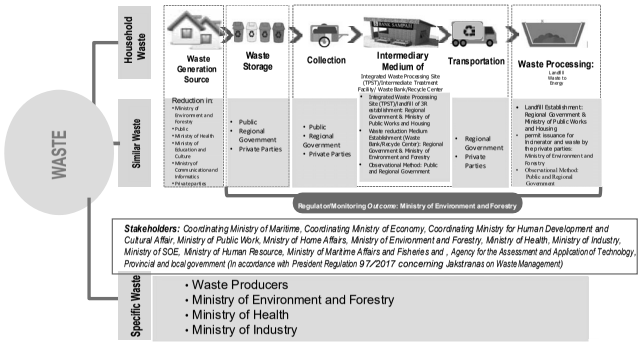
- The establishment of Management System in Regencies/Cities
- The Waste Management
- The permit issuance of waste recycling/processing, waste transportation, and waste final processing organized by the private parties
- The guidance and supervision of waste management that is organized by private parties.

3

Waste Management Target in 2025
Presidential Regulation Number 97 of 2017

4

Household and Similar Waste Management Scope



5

Basic Implementation of Regional Waste Management

6

Challenges & Problems

Regional Landfill Development

01 The difficulties of the collaboration between cities/regencies, especially in the landfill management regionalization

02 Cities/regencies objections of the regional landfill placements

03 The difficulties of institution establishment to manage the regional collaboration professionally

04
- The difficulties in obtaining the landfill site in urban areas, especially in metropolitan/big cities that worsen the waste management condition

05 The public objections on the landfill placement which is placed nearby the residence due to NIMBY *(Not in My Backyard) Syndrome*
drome

Purposes & Benefits

Regional Waste Management

01 Accommodate the cities/regencies (primarily metropolitan and big cities) which have problems in discovering the landfill area following the requirements in their administrative area

02 Improve the synergy between regions in the waste management

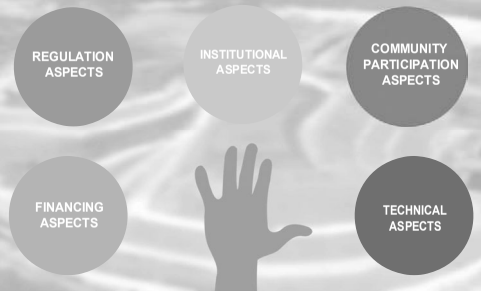
03 Improve the range, quality, and efficiency of the waste management system services

04 Improve the management and institutional capacity in regional waste management

05 Mobilize the funds from various sources for the development of a waste management system

Basic Aspects

Regional Management of Sanitation



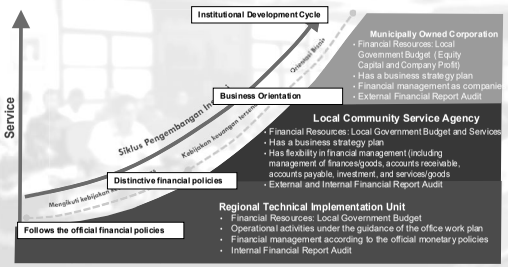
Regulation Aspects

Provincial Government

- Regional Regulations regarding the Regional Waste Management
- Governor Regulations regarding the Service Fees and Negative Impact Compensation
- Governor Regulations regarding the Provincial Waste Management Policy and Strategy
- Governor Regulations regarding the Waste Management Permit
- Other necessary Local Leaders Regulations
  Regulations regarding the Waste Management Permit

Institutional Aspects

Institutional Forms for Sanitation Infrastructure Management



Institutional Aspects *(Follow-through)*

Institutional Forms for Sanitation Infrastructure Management

Aspect	Regional Technical Implementation Unit	Regional Technical Implementation Unit of Local Community Service Agency-Financial Management Pattern *(UPTD PPK-BLUD)*	Municipally Owned Corporation
Legal Basis	Head of District Regulation	Decree of Head of District (after pre-requirements fulfillment: substantive, technical, administrative)	Regional Regulation
Constructor	Main Office of Regional Technical Implementation Unit	Main Office of Regional Technical Implementation Unit	supervisory Board
Financial Management	Follows the official policies and regional financial management regulations	Has flexibility in financial management (including management of finances/goods, accounts receivable, accounts payable, investment, and services/goods	Financial management a company
Human Resources	Civil servant structural and functional officers	BLUD management officers and employees can come from civil servants and non-civil servants who are professional as needed	Professional staff as needed
Employee Recruitment Policy	The appointment and dismissal of managing officers and employees are under the provisions of laws and regulations	Management officers and non-civil servant of BLUD employees can be employed permanently or on a contract basis. The appointment and dismissal of managing officers and civil servant BLUD employees are under the provisions of the laws and regulations	Independent recruitment according to company needs and capabilities

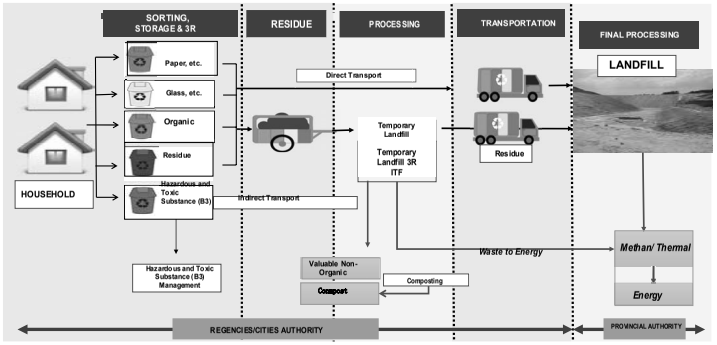
Institutional Aspects

Regional Technical Implementation Unit of Regional Waste Management already established

No	Provinsi	Operator	Peraturan Gubernur Pembentukan UPTD	Regulator
1.	Aceh	Regional Technical Implementation Unit of Integrated Landfill of Aceh Region	Regent Regulation of Aceh No. 16 of 2013 about Organizational Structure & Work Procedure at Regional Technical Implementation Unit of Aceh Human Settlement Office	Housing and Residential Area Office
2.	West Sumatra	Technical Implementation Unit of Regional Landfill	Governor Regulation of West Sumatra No. 113 of 2017	Environmental Office *(Dinas Lingkungan Hidup)*
3.	Gorontalo	Regional Technical Implementation Unit of Talumelito Landfill of Public Works Office	Governor Regulation of Gorontalo No. 55 of 2013 about Organizational Establishment and Work Procedure at Regional Technical Implementation Unit of Talumelito Final Processing Site, Gorontalo Province	Public Works and Spatial Planning Office *(Dinas Pekerjaan Umum dan Tata Ruang)*
4.	Yogyakarta Special Region	Urban Water and Sanitation Infrastructure Management Center *(BALAI PISAMP)*	Governor Regulation of Yogyakarta Special Region No. 84 of 2014 about the amendment of Governor Regulation of Yogyakarta Special Region No. 41 of 2008 about the duties and functions details of the office and Technical Implementation Unit at the Public Works and Mineral Energy Resources Office	Public Works and Mineral Energy Resources
5.	West Java	Regional Waste Management Center *(BPSR)*	Governor Regulation of West Java No. 113 of 2009 of Regional Waste Management Center	Environmental Office *(Dinas Lingkungan Hidup)*
6.	Bali	Technical Implementation Unit of Waste Management	Governor Regulation of Bali No. 128 of 2016 about the Organizational Formation and Main Duties Details of Technical ImplementionUnit in the Public Works and Spatial Planning Office of Bali Province	Public Works and Spatial Planning Office *(Dinas Pekerjaan Umum dan Tata Ruang)*
7.	South Kalimantan	Regional Technical Implementation Unit of BANJARBAKULA Landfill	Governor Regulation of South Kalimantan No. 156 of 2017 about the Organizational Formation and Working Procedure of Regional Technical Implementation Unit of BANJARBAKULA Landfill at the Environmental Office	Environmental Office *(Dinas Lingkungan Hidup)*
8.	North Sulawesi	Regional Technical Implementation Unit of Waste Management	Governor Regulation of North Sulawesi No. 60 of 2017 about the formation of the Regional Technical Implementation Unit at the Provincial Public Works and Spatial Planning Office - Type A	Public Works and Spatial Planning Office
9.	West Nusa Tenggara	Regional Technical Implementation Unit of Regional Landfill	Governor Regulation of West Nusa Tenggara No. 29 of 2018 about Formation, Position, Organizational Structure, Duties and Functions, and Regional Technical Implementation Unit of Work Procedures	Environmental Office *(Dinas Lingkungan Hidup)*

13

Authority Division in Regional Waste Management Between Regencies/Cities and Province



14

Financing Aspects

15

添付資料 3-58

Community Particiation Aspect

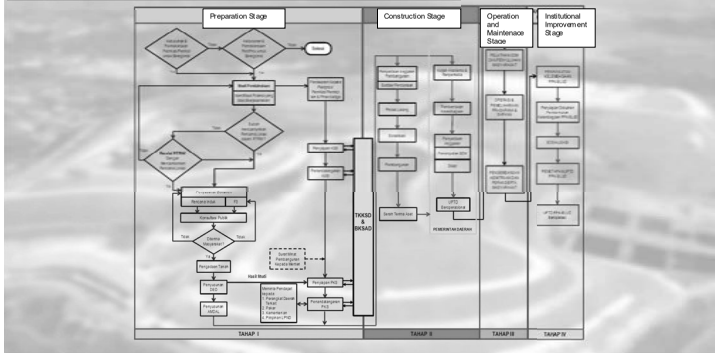
a. Conducting waste handling activities independently and/or in partnership with the regency/city government

b. Paying the garbage retribution

c. Get involved in the planning process and provide suggestions, consideration, and/or recommendation to the Government and/or Local Government regarding the garbage management

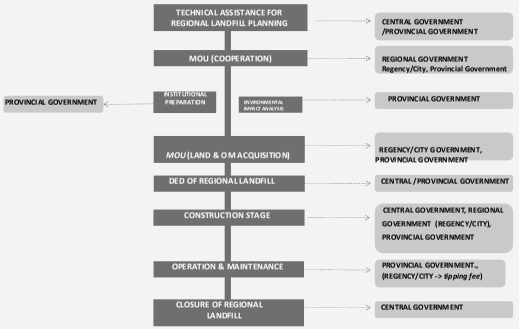
16

The Stages of Regional Infrastructure Implementation



17

Setup Steps of Regional Landfill



18

Criteria and Location Determination of Regional Landfill

- The location meets the feasibility of landfill
- By the Regional Spatial Plan
- An AMDAL/UKL-UPL study has been conducted
- Has been socialized to the public
- The location approval by the authorized
- Location of Regional Waste Management by the Governor

19

The Planning Criteria of Regional Landfill

LOCATION CRITERIA

SNI 03-3241-1994 regarding **Procedure for Landfill Location Selection**

OPERATION CRITERIA

Sanitary Landfill

INFRASTRUCTURE CRITERIA & SUGGESTION

- Basic facility (driveway, operational road, electricity/generator, drainage, clean water, fence, office)
- Environmental protection facility (waterproof lining, leachate collection channels, leachate processing installation, buffer zone, monitoring wells, gas handling)
- Operational facility (heavy equipment, ground truck, ground cover)
- Supporting facility (workshop, garage, washing area for vehicles and heavy equipment, weigh station, laboratory)

20

Regional landfills in Indonesia

1. **Blang Bintang Regional Landfill, Aceh Besar Regency, NAD (Banda Aceh Cityand Aceh Besar Regency)**
2. Solok Regional Landfill, Solok City, West Sumatera (City and Regency of Solok)
3. **Payakumbuh Regional Landfill, West Sumatera (City and Regency of Payakumbuh)**
4. Sarimukti Regional Landfill, West Java (City and Regency of Bandung)
5. **Piyungan Landfill, Bantul Regency, DIY (Yogyakarta City, Sleman Regency, Bantul Regency)**
6. Bangli Regional Landfill, Bali (Bangli Regency, Gianyar Regency, Klungkung Regency, Karang Asem Regency)
7. **Regional Landfill Gapuk Regional Landfill, Mataram City, NTB (Mataram City and West Lombok Regency)**
8. Talumelito Regional Landfill, Gorontalo (City and Regency of Gorontalo, Kab Bone Bolango)
9. **Regional Landfill Banjar Bakula Regional Landfill (Banjarmasin City, Banjarbaru City, Banjar Regency, Barito Kuala Regency, Tanah Laut Regency)**
10. Legok Nangka Regional Landfill, West Java (Bandung City, Bandung Regency, Cimahi City, South Bandung Regency, Sumedang Regency, Garut Regency)
11. **Nambo Regional Landfill, West Java (Bogor City, Bogor Regency, Depok City)**
12. Sarbagita Regional Landfill, Bali (Denpasar City, Badung Regency, Gianyar Regency, Tabanan Regency)

21

Construction Activity Plan of Regional Landfills

No.	Activity	Budget Year	Province
1.	Regional Landfill Mammitarang Construction	2020-2021	North Sulawesi
2.	Regional Landfill Talumelito	2020	Gorontalo

22

23

Presentation by MoHA

FUNDING AND SHARING OF FUNDING FOR WASTE MANAGEMENT

By:
Ni Putu Myari Artha, MSi

Head of Local Revenue Office
Directorate General of Local Financial Development
Ministry of Home Affairs

Jakarta, December 1, 2020

1

Law No. 23 of 2014 concerning Local Government

Part Three

Implementation Funding

Local Government Affairs

Article 282

1) The administration of Government Affairs that falls under the Local Government's authority shall be funded from and at the expense of the provincial budget (APBD).
2) Administration of Government Affairs that falls under the Central Government's authority in the Regions shall be funded from and at the expense of the state budget (APBN).
3) Administration of funding for the administration of Government Affairs that fall under the authority of the Local Government as referred to in paragraph (1) shall be implemented separately from the administration of funding for the administration of Government Affairs that fall under the authority of the Central Government as referred to in paragraph (2).

2

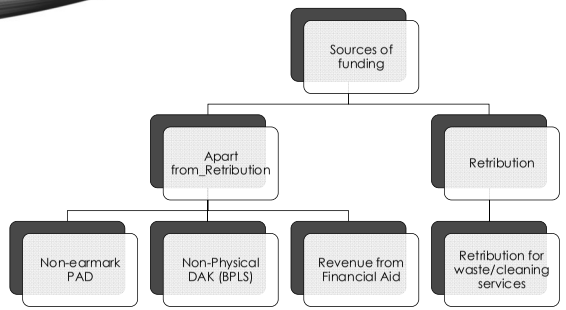
Local Own-Source Revenue
- Local tax;
- Local Retribution;
- Separated Proceeds from the management of Local Assets;
- Other Legitimate Local Own-Source Revenue

Transfer Revenue
- Central Government Transfers
- Balancing Fund
- Local Incentive Funds;
- Special Autonomy Fund;
- Privileges Fund;
- Village Fund
- Inter-Regional Transfer
- Revenue Sharing;
- Financial Aid

Other Legitimate Local Revenue
- Grant;
- Emergency Fund;
- Other revenue according to PUU

3

添付資料 3-60



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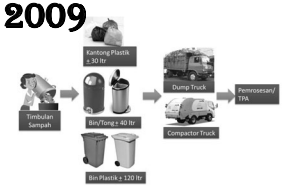
THE OBJECT OF RETRIBUTION

LAW NO. 28 OF 2009



Article 112 of Law No. 28 of 2009

Objects of Retribution for Waste/Cleaning Services are solid waste/cleaning services organized by the Local Government, including:

a. collection of waste from the source to the temporary landfill site;
b. transporting waste from its source and or temporary landfill site to landfill site; and
c. provision of landfill/waste disposal site.

5

Article 152

1) The principles and targets in determining the tariff for Public Service Retribution are determined by taking into account the provision cost of the services concerned, the capacity of the community, aspects of justice, and the effectiveness of control over the services.
2) Costs, as referred to in paragraph (1), include operation and maintenance costs, interest costs, and capital costs.
3) In the event that the determination of the tariff takes full account of the provision cost of the services, the stipulation of the tariff is only to cover part of the cost.
4) Retribution for Reimbursement of Printing Resident Identity Card (KTP) and Retribution for Reimbursement of Map Printing Costs only take into account printing and administration costs.

Article 153

1) The principles and targets in determining the tariff for business service Retribution shall be based on the objective of obtaining an adequate profit.
2) Adequate profit, as referred to in paragraph (1), is the profit earned if the business services are performed efficiently and oriented towards market prices.

Article 154

1) The principles and targets in determining the tariff for certain permit Retribution are based on the objective of covering part or all of the costs of administering the issuance of permits concerned.
2) The costs of administering the issuance of permits as referred to in paragraph (1) include the issuance of permit documents, field supervision, law enforcement, administration, and costs of the negative impact of the issuance of permits.

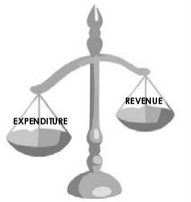
PRINCIPLES OF LOCAL RETRIBUTION

RETRIBUTION ⇄ **SERVICES**

- THE RESULTS OF RETRIBUTION ACCEPTANCE AFFECT THE SERVICES
- THE SERVICES AFFECT THE RESULTS OF RETRIBUTION

6

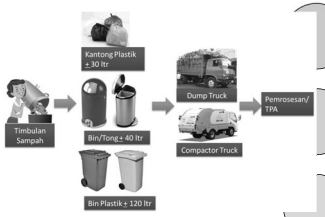
Article 152 paragraph (3) of Law No. 28 of 2009.
In the event that the determination of the tariff takes full account of the provision cost of the services, the stipulation of the tariff is only to cover part of the cost.



The Retribution is only to cover the **costs of some solid waste/cleaning services**

THE UTILIZATION OF RETRIBUTION TO COVER THE COSTS OF WASTE MANAGEMENT

Article 152 of Law No. 28 of 2009
The principles and targets in determining the tariff for Retribution are determined by taking into account the **provision cost of the services** concerned, the community's capacity, aspects of justice, and the effectiveness of control over the services. The provision cost of the services includes **operation and maintenance costs, interest costs, and capital costs.**



- Understanding solid waste management/cleaning standards;
- Understanding RETRIBUTION as a source of financing in solid waste management/cleaning;
- Understanding how to calculate and determine RETRIBUTION tariff as a source of financing for solid waste management/cleaning

UTILIZATION OF RETRIBUTION

Article 161 of Law No. 28 of 2009

- The utilization of the acquisition of each type of Retribution is prioritized for funding activities that are directly related to the operation of the service concerned.

Article 29 Government Regulation No. 81 of 2012

3) The Retribution proceeds as referred to in paragraph (1) are utilized for:
   a. waste management service activities;
   b. provision of waste collection facilities;
   c. preventing of state of emergency;
   d. environmental restoration due to waste management activities; and/or
   e. increasing the competence of waste managers

PP 28/2018

COPY

GOVERNMENT REGULATION NUMBER 28 OF 2018

PRESIDENT OF THE REPUBLIC OF INDONESIA

GOVERNMENT REGULATION OF THE REPUBLIC OF INDONESIA NUMBER 28 OF 2018 CONCERNING LOCAL COOPERATION

BY THE GRACE OF GOD ALMIGHTY

PRESIDENT OF THE REPUBLIC OF INDONESIA

Considering: that in order to implement the provisions of Article 369 of Law Number 23 of 2014 concerning Local Government, it is necessary to stipulate a Government Regulation on Local Cooperation;

Part Three

Cooperation Object

Article 4

1) The object of KSDD is a government affair that falls under the local government's authority to realize public welfare and the acceleration of fulfilment of public services.

COOPERATION BETWEEN REGIONS

Part Ten

Assistance for Cooperation between Regions

Article 12

1. The Central Government may provide financial assistance to the local governments through the state budget (APBN) to implement compulsory cooperation in accordance with the state's financial capacity.
2. The Local Governments may provide financial assistance to other regions through the provincial budget (APBD) to carry out compulsory cooperation on local apparatus in accordance with the sectors of the cooperation.

COPY

GOVERNMENT REGULATION NUMBER 28 OF 2018

PRESIDENT OF THE REPUBLIC OF INDONESIA

GOVERNMENT REGULATION OF THE REPUBLIC OF INDONESIA NUMBER 28 OF 2018 CONCERNING LOCAL COOPERATION

BY THE GRACE OF GOD ALMIGHTY

PRESIDENT OF THE REPUBLIC OF INDONESIA

Considering: that in order to implement the provisions of Article 369 of Law Number 23 of 2014 concerning Local Government, it is necessary to stipulate a Government Regulation on Local Cooperation;

5	4	02				Expenditure for Financial Aid It is utilized to record expenditures in the form of financial assistance provided to other regions in the framework of local cooperation, equitable increase in financial capacity, and/or other specific objectives.

DECREE OF THE MINISTER OF HOME AFFAIRS O50-3708 OF 2020

CHAPTER III

TYPES OF INFRASTRUCTURE AND FORMS OF COOPERATION

Article 5

1) Applicable infrastructures for cooperation under this Presidential Regulation are economic infrastructure and social infrastructure
2) Types of economic infrastructure and social infrastructure as referred to in paragraph (1) include:

a. Transportation infrastructure;
b. Road infrastructure;
c. Water resources and irrigation infrastructure;
d. Drinking water infrastructure;
e. Centralized wastewater management system infrastructure;
f. Local wastewater management system infrastructure;
g. Solid waste management system infrastructure;
h. Telecommunication and information infrastructure;
i. Electricity infrastructure;
j. Oil and gas and renewable energy infrastructure;
k. Energy conservation infrastructure;
l. Urban facility infrastructure;
m. Educational facility infrastructure;
n. Sports infrastructure facilities and infrastructure;
o. Local infrastructure;
p. Tourism infrastructure;
q. Health Services infrastructure;
r. Correctional infrastructure; and
s. Public housing infrastructure.

PRESIDENT OF THE REPUBLIC OF INDONESIA

REGULATION OF THE PRESIDENT OF THE REPUBLIC OF INDONESIA NUMBER 38 OF 2015 CONCERNING GOVERNMENT COOPERATION WITH BUSINESS ENTITIES IN THE PROVISION OF INFRASTRUCTURE

BY THE GRACE OF GOD ALMIGHTY

PRESIDENT OF THE REPUBLIC OF INDONESIA

Considering:

a. that the availability of adequate and sustainable infrastructure is an urgent need to support the implementation of national development in the context of improving the national economy, enhancing the social welfare, and increasing Indonesia's competitiveness in global competition;
b. that in order to accelerate infrastructure development, it is necessary to take comprehensive steps in order to create an investment climate to encourage the participation of business entities in the provision of infrastructure and services based on sound business principles;
c. that in order to encourage and enhance cooperation between the government and business entities in the provision of infrastructure and social services, it is necessary to regulate and protect consumers, public, and business entities interests in a fair manner;

PRESIDENTIAL REGULATION NO. 38 OF 2015

13

THE MINISTER OF HOME AFFAIRS OF THE REPUBLIC OF INDONESIA

REGULATION OF THE MINISTER OF HOME AFFAIRS OF THE REPUBLIC OF INDONESIA NUMBER 96 OF 2016 CONCERNING PAYMENTS OF SERVICE AVAILABILITY IN THE FRAMEWORK OF LOCAL GOVERNMENT COOPERATION WITH BUSINESS ENTITIES IN THE PROVISION OF LOCAL INFRASTRUCTURE

BY THE GRACE OF GOD ALMIGHTY

THE MINISTER OF HOME AFFAIRS OF THE REPUBLIC OF INDONESIA,

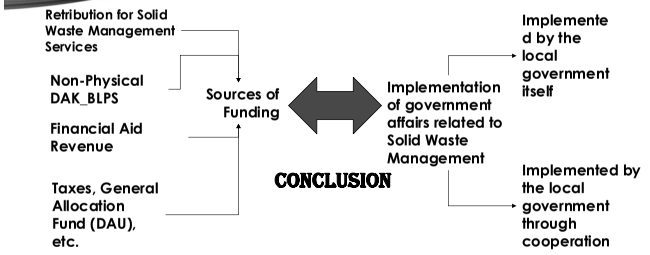
Considering:

that in order to implement the provisions of Article 13 paragraph (5) and Article 47 paragraph (2) of Presidential Regulation Number 38 of 2015 concerning Government Cooperation with Business Entities in the Provision of Infrastructure, it is necessary to stipulate a Regulation of the Minister of Home Affairs regarding Payment for Service Availability in the Framework of Local Government Cooperation with Business Entities in Provision of Local Infrastructure;

5	1	02	02	10		Availability Payment of Service Expenditures
5	1	02	02	10	0007	Availability Payment of Service Expenditures for Waste Management System Infrastructure

Used to record the Availability Payment of Service Expenditures for regular payments by the regional head to implementing business entities for the infrastructure availability of solid waste management system services that are in accordance with the quality and/or criteria as specified in the agreement KPDBU.

14



15

MINISTRY OF INTERNAL AFFAIRS

NI PUTU MYARI ARTHA MSI.
HEAD OF LOCAL REVENUE OFFICE

Directorate General of Local Financial Development
MINISTRY OF HOME AFFAIRS

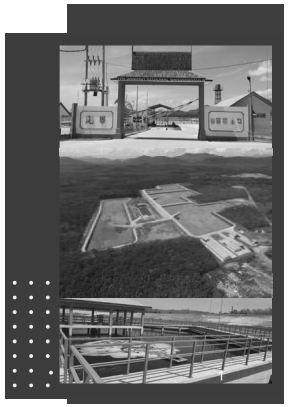
16

Presentation by South Kalimantan Province

BANJARBAKULA REGIONAL TPA
SOUTH KALIMANTAN PROVINCE

Presented by :
Hanifah Dwi Nirwana, ST., MT
Head of Office

ENVIRONMENTAL OFFICE OF SOUTH KALIMANTAN PROVINCE
BANJARBARU, DECEMBER 1ST,2020



OUTLINE

01 COOPERATION INITITATIVES
02 BUILDING COOPERATION
03 INSTITUTION FORMED
04 PUBLIC ACCEPTANCE
05 FUNDING MECHANISMS
06 OPERATIONAL MECHANISMS
07 TIPPING FEE

2

01
COOPERATION INITIATIVES

3

COOPERATION INITIATIVES

LEGAL BASIS OF URBAN AREA SPATIAL PLAN FOR BANJARBAKULA METROPOLITAN AREA

National Spatial Planning (Gov. Reg. 13 of 2017)

- Urban Area **Banjarbakula → Banjarmasin National Activity Center**
- **Martapura, Marabahan → Regional Activity Center**
- Stipulation of National Strategic Area: **Banjarmasin-Banjarbaru-Banjar-Barito Kuala-Tanah Laut →URBAN**

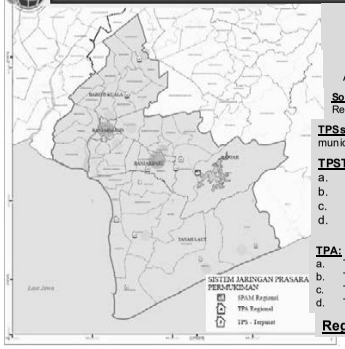
In Review Process

Presidential Decree No. 3 of 2012 – Kalimantan Island Spatial Planning

- Control of urban sprawl development
- Control of physical development for the preservation of sustainable food agricultural land, industrial development centers, development centers for ecotourism and cultural tourism→**Banjarmasin National Activity Center**

4

COOPERATION INITIATIVES



CHAPTER IV
Banjarbakula Metropolitan Area Spatial Structure Plan
Article 15 – 50

Urban Infrastructure Network System

Article 49 – Solid Waste Management System

Solid waste management system consisted of TPS, TPST, TPA, and Regional TPA

TPSs are planned at the neighborhood unit and activity centers stipulated in municipalities spatial plan.

TPST:
a. TPST Bati Bati in Kecamatan Bati Bati;
b. TPST Panyipatan in Kecamatan Panyipatan;
c. TPST Jorong in Kecamatan Jorong; and
d. TPST Kintap in Kecamatan Kintap, Tanah Laut Regency

TPA:
a. TPA Cahaya Kencana in Kecamatan Karang Intan, Banjar Regency;
b. TPA Cerbon & TPA Mandastana in Barito kuala Regency;
c. TPA Basirih in Banjarmasin City; and
d. TPA Bakunci/Pelaihari & TPA Maluka Baulin in Tanah Laut Regency.

Regional TPA is located in Banjarbaru City.

5

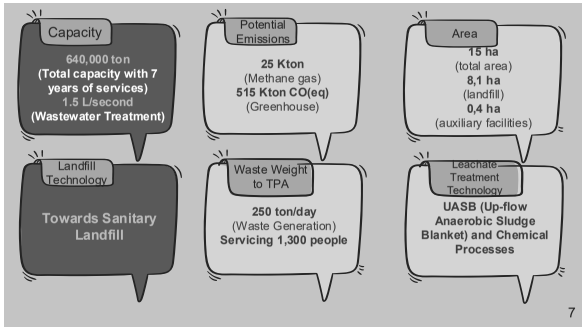
COOPERATION INITIATIVES

Governor's Decree No.: 188.44/0512/KUM/2018 concerning Stipulation of Land Acquisition Location for the Construction of the Banjarbakula Regional TPA.

- **Located in Kecamatan Cempaka, Banjarbaru City.**
- **Total area is 17 Ha.**
- **Constructed on May 12th,2017 and finished on November 30th, 2018.**
- **Construction budget is Rp. 150 billion.**

6

COOPERATION INITIATIVES



COOPERATION INITIATIVES

OFFER OF REGIONAL COOPERATION

The Regents/Majors form Regional Cooperation Coordination Team (TKKSD) which is tasked with preparing a cooperation plan that includes:

1. Develop a regional TPA cooperation plan that will be cooperated with other municipalities;
2. Prepare complete information and data about regional TPA;
3. Analyzing the costs and benefits of the cooperation.

PREPARATION OF COLLECTIVE AGREEMENTS

After receiving the answers to the agreement, each TKKSD immediately discuss the Regional Cooperation (KSAD) and prepare the Collective Agreement which contained:

1. Identity of the particular parties;
2. Purposes and objectives;
3. Object and scope of the cooperation;
4. Form of cooperation;
5. Fund sources;
6. Fiscal Year commencement of the implementation of the cooperation;
7. Validity period of the Collective Agreement, no longer than 12 months;
8. Work plan.

02

BUILDING COOPERATION

BUILDING COOPERATION

SIGNING THE COLLECTIVE AGREEMENT

TKKSD assists municipalities government in coordinating with the Governor and Minister of Public Works to support KSAD

COOPERATION AGREEMENT
ABOUT
REGIONAL SOLID WASTE MANAGEMENT IN METROPOLITAN AREAS OF BANJARMASIN CITY, BANJARBARU CITY, BANJAR REGENCY, BARITO KUALA REGENCY, AND TANAH LAUT REGENCY
BETWEEN
DIRECTORATE OF ENVIRONTMENT SANITATION DEVELOPMENT
DIRECTORATE GENERAL OF HUMAN SETTLEMENTS
MINISTRY OF PUBLIC WORKS AND HOUSING,
SOUTH KALIMANTAN PROVINCE GOVERNMENT,
BANJARMASIN CITY GOVERNMENT,
BANJARBARU CITY GOVERNMENT,
BANJAR REGENCY GOVERNMENT,
BARITO KUALA REGENCY GOVERNMENT, AND
TANAH LAUT REGENCY GOVERNMENT

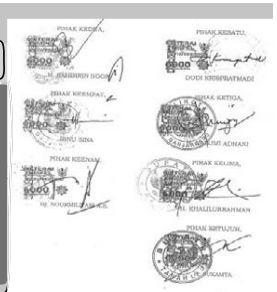
NOMOR: 10/KUM/2017
NOMOR: 181.2/09/KUM/2017
NOMOR: 4/PKS/Banjar/2017
NOMOR: 180/28/PK-KUM/2017

BUILDING COOPERATION

SIGNING THE COOPERATION AGREEMENT

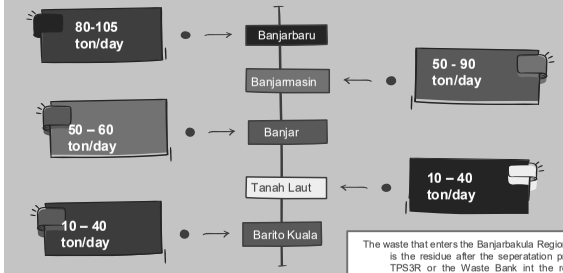
Prior to the signing of the Cooperation Agreement, TKKSD assisted the municipalities in coordinating with the Governor, Minister of Home Affairs, and Minister of Public Works to attend to witness the signing of the KSAD Agreement.

The Regional Cooperation Agreement is then signed by the Municipalities Heads, in which the place and time for the signing of the Cooperation Agreement is determined according to the agreement of all of the parties.



BUILDING COOPERATION

QUOTA DISTRIBUTION AGREEMENT

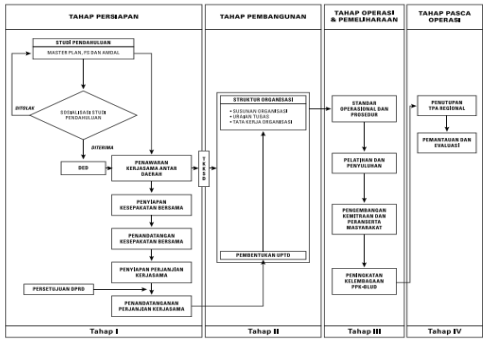


The waste that enters the Banjarbakula Regional TPAS is the residue after the seperatation process at TPS3R or the Waste Bank int the respective municipalities.

03

INSTITUTION FORMED

Tahapan Pembentukkan Kelembagaan TPA Regional



ORGANIZATIONAL STRUCTURE

The UPTD Banjarbakula Regional Garbage TPA was formed based on the Regulation of the Governor of South Kalimantan Number 0156 of 2017 dated 27 December 2017

04

PUBLIC ACCEPTANCE

PUBLIC ACCEPTANCE

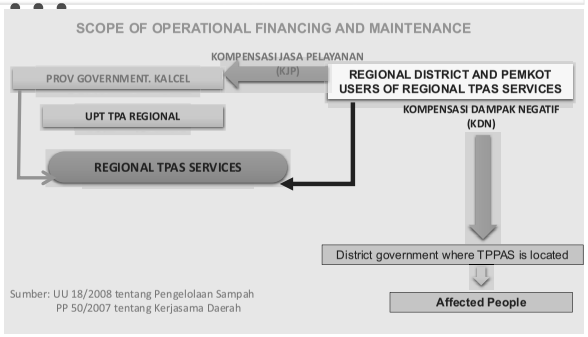
- **Affected communities, receive compensation for the environmental impact of the Regional Waste TPA from a second party (Kota Banjarbaru) which is regulated in an agreement (Addendum)**
- **The community gets the use of methane gas and organic fertilizer from the Regional Garbage TPA**

05

FINANCING MECHANISM

FINANCING MECHANISM

SCOPE OF OPERATIONAL FINANCING AND MAINTENANCE



Sumber: UU 18/2008 tentang Pengelolaan Sampah
PP 50/2007 tentang Kerjasama Daerah

FINANCING MECHANISM

LA ND

Part of the grant from the City of Banjarbaru and Procurement from the Provincial Government of South Kalimantan

CONSTRUCTION

Built by the Ministry of Public Works and Housing through the Directorate General of Human Settlements - Strategic Settlement Environmental Health Development Work Unit

Operations and Maintenance

South Kalimantan Provincial Government APBD

Tipping Fee Determination

Regional TPAS Service Users Banjarbakula

FINANCING MECHANISMS

2020 Fiscal Year, the Banjarbakula Regional TPA UPTD received a budget allocation of 6,261,867,500 (Six billion two hundred sixty-one million eight hundred sixty-seven thousand five hundred rupiah).

The funds are used for routine budget needs, capital expenditures and operational costs for waste management.

06

OPERASIONAL MECHANISM

OPERASIONAL MECHANISM

BANJARBAKULA REGIONAL TPA SYSTEM AND CAPACITY

2019 — Starting with Tonnage 200 tons / day or 73,000 tons / year

2021 — Tonnage 275 tons / day or 100,375 tons / year

2030 — Tonnage 225 tons / day or 82,129 tons / year

Sistem operasional : Sanitary Landfill
Kapasitas (max) : 275 ton/hari

OPERASIONAL MECHANISM

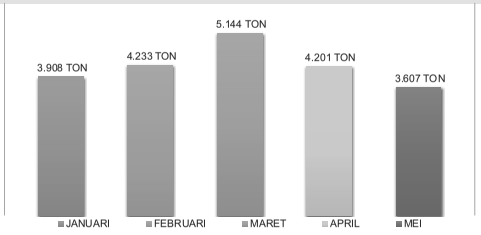
Total data on waste acceptance in 2019

BULAN	KETERANGAN	BERAT BERSIH (TON)
MARET	SAMPAH - PASCA HAUL	314

APRIL	SAMPAH	4.274
MEI		446
	TOTAL	4.720

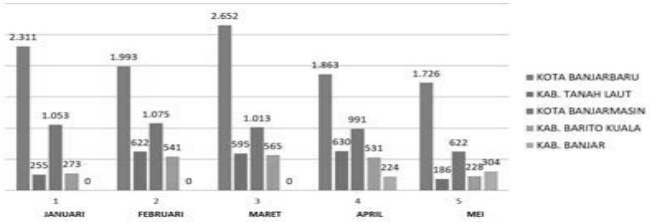
OPERASIONAL MECHANISM

Total Data of Waste Receipts from 5 Regency / Cities January - May 2020



OPERASIONAL MECHANISM

Total data on waste revenue per regency / city in January - May 2020



07

TIPPING FEE

TIPPING FEE

The results of the agreement 5 regencies / cities of incoming waste :
Banjarbaru : 80-105 ton/hari
Banjarmasin : 50-90 ton/hari
Banjar : 50-60 ton/hari
Tanah Laut : 10-40 ton/hari
Barito Kuala : 10-40 ton/hari

Decree of the People's Representative Council of South Kalimantan Province Number 17 of 2020 concerning the Approval of the South Kalimantan Provincial House of Representatives on the Draft Regional Regulation of the Province of South Kalimantan concerning the Third Amendment Number 14 of 2011 concerning General Retribution

Reperda Evaluation Proposal to the Minister of Home Affairs at the Director General of Regional Finance Development of the Ministry of Home Affairs Number: 188.341 / 01228 / KUM dated 19 October 2020

TIPPING FEE

Tipping Fee Amount Determination Based on Distribution of Quota in 5 Districts / Cities

No	Regency/city	Year (Ton)			The amount of waste retributio n(Rp)	Total Receipts(Rp)
		2019	2020	2021		
1	Banjarbaru	108	108	108x360h= 38.880	65.000	2.527.200.000
2	Banjarmasin	51	76	126x360h= 27.360	65.000	1.778.400.000
3	Banjar	32	32	32x360hr= 11.520	65.000	748.800.000
4	Tanah Laut	2	2	2x360hr= 720	65.000	46.800.000
5	Barito Kuala	7	7	7x360hr= 2.520	65.000	163.800.000
Total		200	225	275x360hr= 99.000	65.000	6.435.000.000

Note: This figure is the result of mutual agreement with 5 districts / cities that dispose of their waste to the Reg. Banjarbakula without retribution (Free) in 2019-2020

TIPPING FEE

Total Acceptance of TYPING FEE ALTERNATIVES PAID 5 REGENCIES / CITIES IN 2020

TONASE : 225 ton/day
or : 82.129 ton/year

No	Prosentase Besar Tf (0%)	Amount of Waste Disposal / Year	Amount of Retribution for 5 Regencies (City) / Year (Rp)	Amount of Provincial Government Subsidy / Year (Rp)
1.	40	82.129	2.135.354.000	3.203.031.000
2.	50	82.129	2.669.192.500	2.669.192.500
3.	60	82.129	3.203.031.000	2.135.354.000
4.	70	82.129	3.736.869.500	1.601.515.500
5.	80	82.129	4.270.708.000	1.067.677.000
Total		-	-	-

*TF = Rp. 65.000/ton

TIPPING FEE

ALTERNATIVES OF TIPPING FEE PAYED IN 5 KABS / CITIES IN 2021

TONASE : 275 TON/HARI
ATAU : 100.375 TON/TAHUN

No	Prosentase Besar Tf (0%)	Amount of Waste Disposal / Year	Amount of Retribution for 5 Regencies (City) / Year (Rp)	Amount of Provincial Government Subsidy / Year (Rp)
1.	60	100.375	3.914.625.000	2.609.750.000
2.	70	100.375	4.567.062.500	1.957.312.500
3.	80	100.375	5.219.500.000	1.304.875.000
4.	90	100.375	5.871.937.500	652.437.500
5.	100	100.375	6.524.375.000	0
Total		-	-	-

*TF = Rp. 65.000/ton

THANK YOU

DINAS LINGKUNGAN HIDUP PROVINSI KALSEL

/dlhkalselprov

@dlhkalselprov

@dlhkalselprov

DINASLINGKUNGAN HIDUP PROV. KALSEL

Prensetation by West Java Province

Development and Management of Regional TPPAS Progress in West Java

Pemerintah Provinsi Jawa Barat
Dinas Lingkungan Hidup
UPTD Pengelolaan Sampah TPA/TPST Regional

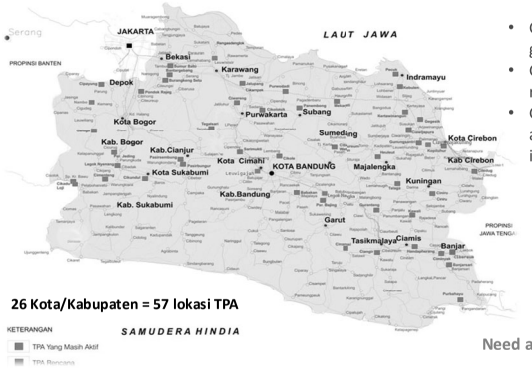
BACKGROUND: Regionalization and The Role of West Java Province Government

1) Disaster experience in waste management and thread of waste management emergency
2) Limited land availability for TPA especially in urban area
3) Provision in Undang-Undang 18 Year 2008 about Waste Management which is prohibit the *open dumping*
4) Regional SWM in Central of National Activity Area (Metropolitan Bandung and Bogor considered as effective, efficient and strategic area, **RTRWP, RPJPD 2025 dan RPJMD 2018-2023**)
5) Limited resources availability in Government, so that we need to encourage municipals to make interzonal cooperation including professional public company involved in SWM
6) Affirmation of the role of Provincial Government in Perda No.1 year 2016 about Waste Management in West Java

METROPOLITAN BANDUNG	METROPOLITAN BOGOR	METROPOLITAN CIREBON
1. Kota Bandung	1. Kota Bogor	1. Kota Cirebon
2. Kota Cimahi	2. Kota Depok	2. Kab. Cirebon
3. Kabupaten Bandung	3. Kabupaten Bogor	3. Kab. Indramayu
4. Kabupaten Bandung Barat		4. Kab. Majalengka
5. Kabupaten Sumedang		5. Kab. Kuningan
6. Kabupaten Garut		

BEKARPUR AREA
Kota Bekasi, Kab. Bekasi, Kab. Karawang dan Kab. Purwakarta

BACKGROUND: Regionalization and The Role of West Java Province Government

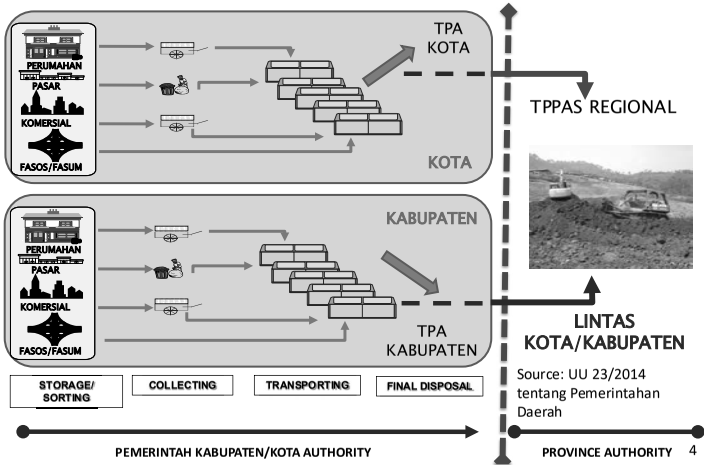


26 Kota/Kabupaten = 57 lokasi TPA

- Growth of Waste generation
- Growth of land requirement for TPA
- Growth of amount and potential area of impact from TPA

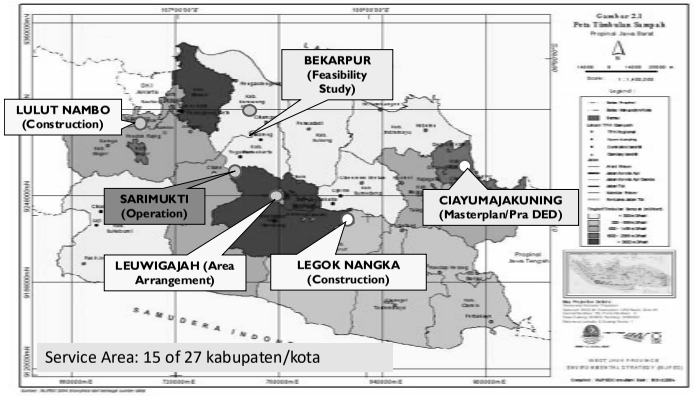
Need a Strategic Control

LOCAL- REGIONAL SCOPE



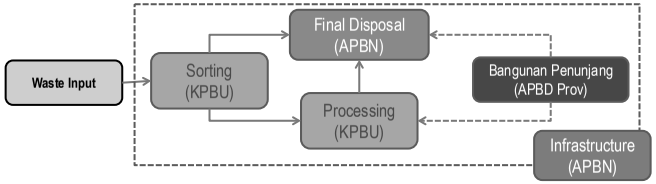
Source: UU 23/2014 tentang Pemerintahan Daerah

RENCANA LOKASI TPPAS REGIONAL



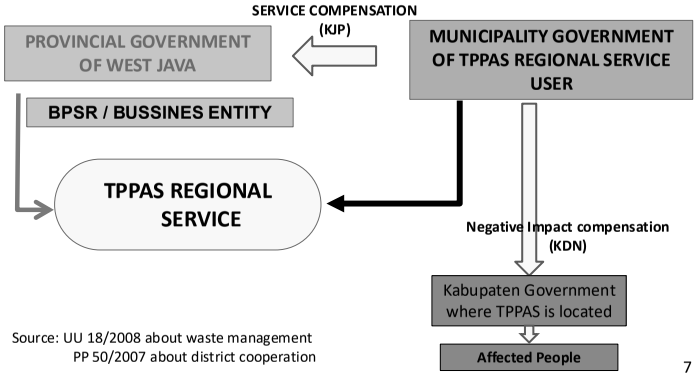
Service Area: 15 of 27 kabupaten/kota

THE SCOPE OF INVESTMENT FINANCING



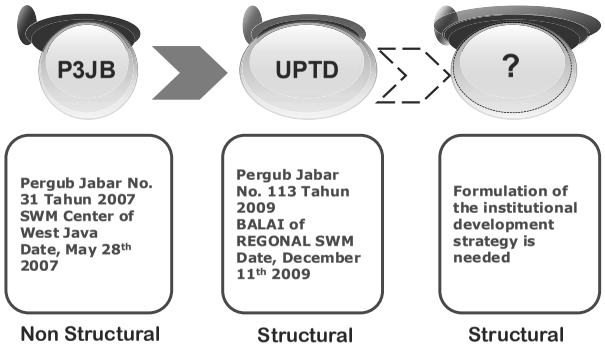
Infrastructur	Sorting	Support Building	Processing	Final Disposal
1. Street Operational 2. Drainage 3. Leachate Processing Facility	Hangar and sorting tools	1. Workshop and heavy equipment garage 2. Fencing 3. Office 4. Weighbridge 5. Street lighting 6. Worker Place 7. Clean water 8. Perking area 9. Hazardous storage	1. Sorting machine 2. Composting facility 3. Recycling facility 4. Waste to renewable energy processing	1. Sanitary Landfill development 2. Base layering

OPERATIONAL AND MAINTENANCE FINANCING SCOPE



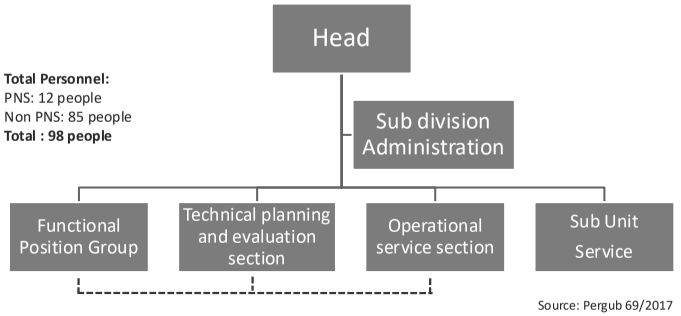
Source: UU 18/2008 about waste management
PP 50/2007 about district cooperation

Institutional Existing Development



Dasar Hukum:
1. UU 18 Tahun 2008 about SWM: Pasal 7, 8 and 9
2. UU 23 Tahun 2014 about District Government: Public works division

Institutional Structure

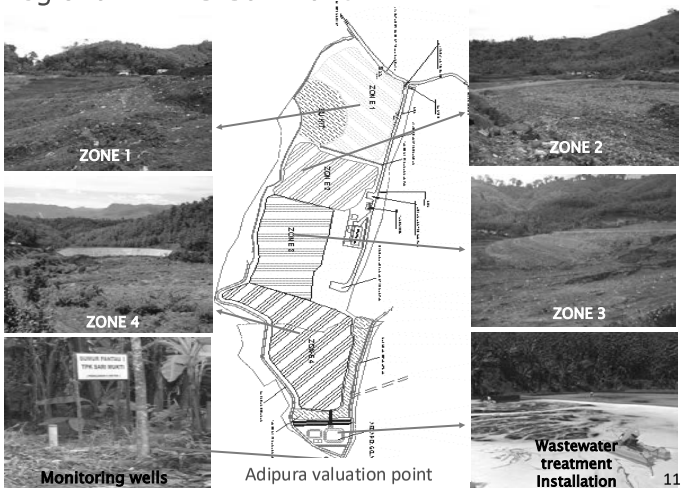


Source: Pergub 69/2017

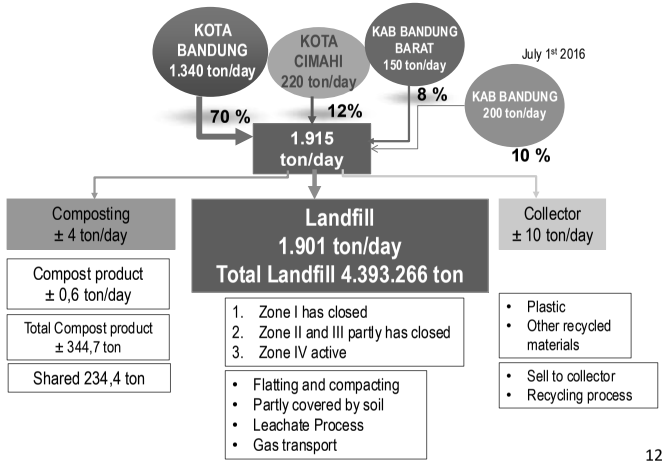
Main Task:
Functional duty of Dinas in Regional SWM
Function:
1. Carrying out the study of technical guidance material in regional SWM
2. Carrying out the regional SWM in West Java

GENERAL INFORMATION OF REGIONAL TPPAS IN WEST JAVA

Regional TPPAS Sarimukti



Processing and utilization flow



REGIONAL TPPAS LEGOK NANGKA

Operational Capacity: 1.800 ton/day

Service Area:
1. Kabupaten Bandung
2. Kabupaten Sumedang
3. Kabupaten Garut
4. Kabupaten Bandung Barat
5. Kota Bandung
6. Kota Cimahi

Cost Estimation:

APBN	APBD Prov	Investment	Total
162.349.205.000	108.791.849.000	TBD	**TBD**

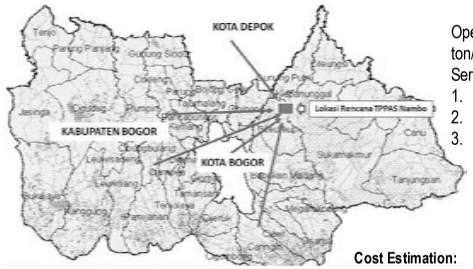
Implementation Schedule Plan:

ACTIVITY DETAIL	2018	2019	2020	2021	2023	Remarks
Auction Document Drafting	⟷					
Auction Preparation		⟷	⟷			
Auction Process KPBU				⟷		
MoU Drafting				⟷		
Financial Closing				⟷		
Technical details planning				⟷		Partner
Building	⟷	⟷	⟷	⟷		
Operational					⟷	

Target 2020:
1. Pre-Qualification phase and KPBU auction must be done
2. Handover of asset management from PUPR Ministry

FIELD PROGRESS

REGIONAL TPPAS LULUT NAMBO



Operational Capacity: 1.500 ton/day

Service Area:
1. Kabupaten Bogor
2. Kota Bogor
3. Kota Depok

Cost Estimation:

APBN	APBD Prov	Investment	Total
133.400.147.000	81.160.264.000	600.204.271.000	**814.764.682.000**

Implementation Schedule Plan:

ACTIVITY DETAILS	2015	2016	2017	2018	2020	Remarks
Auction Process KPS	⟷	⟷				
Cooperation agreement Drafting			⟷			
Financial Closing			⟷			
Technical Details Planning			⟷			Investor
Building		⟷	⟷	⟷		
Operational					⟷	

Target 2020:
1. Share acquisition process PT. Jabar Bersih Lestari (JBL)
2. Handover of asset management from PUPR Ministry

FIELD PROGRESS

REGIONAL TPPAS CIAYUMAJAKUNING

Service Area:
1. Kabupaten Cirebon
2. Kota Cirebon
3. Kabupaten Indramayu

Location plan is in Desa Ciwaringin Kecamatan Ciwaringin Kabupaten Cirebon (according to the Study of Location Determination by Diskimrum Prov Jabar TA 2015)

Implementation Schedule Plan :

ACTIVITY DETAILS	2016	2017	2018	2019	Remarks
Masterplan (Pre DED) drafting					
Environmental studies drafting					
Location determination permit					
Land acquisition					
Regional AMDAL drafting					
Investment auction preparation					
Investment auction					

Target 2020:
1. Location determination permit by The Mayor of Cirebon
2. Borrow-to-use permit in forestry area (IPPKH) from Forestry Ministry

LEGAL BASIS AND COOPERATION AGREEMENT

Legal Fondation

1. **Undang-Undang Nomor 18 Year 2008 about SWM,**
   1) Waste reduction
   2) Waste processing
   3) Open dumping prohibit
   4) Environment impact compensation
   5) Criminal sanctions

   Related to Regional SWM
2. **Peraturan Pemerintah Nomor 81 Year 2012 about HH and HHL SWM**
   1) Sorting, 5 types
   2) Collecting, TPS 3 R
   3) Transportation, SPA
   4) Processing, in source, TPST
   5) Final disposal

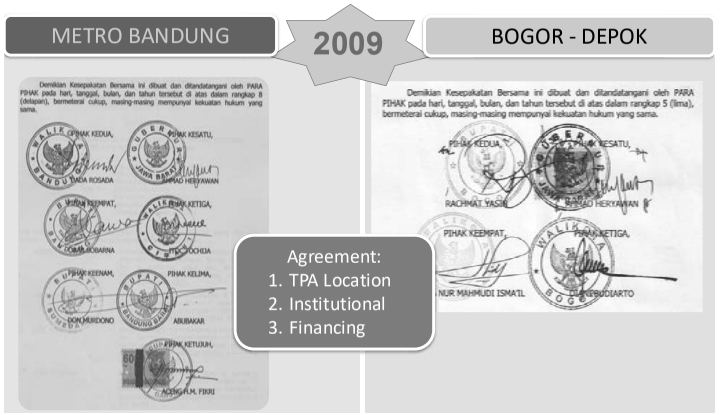
   Related to Regional SWM
3. **Undang-Undang Nomor 23 Year 2014 about District Government**
4. **Peraturan Pemerintah Nomor 28 Year 2018 District Cooperation**
5. **Peraturan Daerah Provinsi Jawa Barat Nomor 1 Year 2016 about revision of Peraturan Daerah Nomor 12 Year 2010 about SWM in West Java**

Legal Fondation

Regulated things in Perda Provinsi Jawa Barat Nomor 1 Year 2016 such as:

- Regional TPPAS Management through Cooperation agreement
- **Provincial Government as Manager (service provider) Regional**
- **TPPAS**
- Kabupaten/Kota Government as service user of Regional
- TPPAS
- **Development cost by APBN dan APBD Provinsi**
- Operational and maintenance cost is on users
- **Service Compensation (KJP) implementation and Negative Impact Compensation (KDN)**
- Probability of implementation pattern of financial management of Badan Layanan Umum Daerah (PPK BLUD)
- **Implementation guarantee of cooperation between Government and business entity (KPBU)**

Mutual Agreement (MoU)



COOPERATION AGREEMENT OF TPA SARIMUKTI

COOPERATION AGREEMENT
BETWEEN
WEST JAVA PROVINCE GOVERNMENT,
KOTA BANDUNG GOVERNMENT,
KOTA CIMAHI GOVERNMENT
AND
KABUPATEN BANDUNG BARAT GOVERNMENT

ABOUT

PROCESSING AND FINAL DISPOSAL OF REGIONAL WASTE INTERIM IN DESA SARIMUKTI, KECAMATAN CIPATAT, KABUPATEN BANDUNG BARAT

Nomor :	658.1/06/Diskimrum
	658.1/379-PD.KBR
	180/61-Perj./2011
	119/Perj.22-DCKTR/2011

Date February 18th Year 2011

Addendum

Date February 18th Year 2016

Date January 25th Year 2018

JULY 1st 2016
KABUPATEN BANDUNG USE TPPAS REGIONAL SARIMUKTI

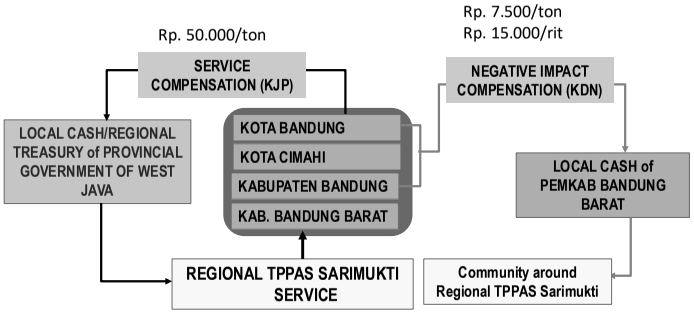
PERJANJIAN KERJASAMA
ANTARA
PEMERINTAH DAERAH PROVINSI JAWA BARAT,
PEMERINTAH DAERAH KOTA BANDUNG,
PEMERINTAH DAERAH KOTA CIMAHI,
PEMERINTAH DAERAH KABUPATEN BANDUNG BARAT,
DAN
PEMERINTAH DAERAH KABUPATEN BANDUNG

TENTANG
PENANGANAN PERSAMPAHAN KABUPATEN BANDUNG DI TEMPAT PENGOLAHAN DAN PEMROSESAN AKHIR SAMPAH (TPPAS) REGIONAL SEMENTARA SARIMUKTI

119/14/Kimrum
NOMOR : 658.1/1890-PDKBR
180/64-PERJ/2016
658.1/813/DCKTR
658.1/14-DISPERTASIH/2016

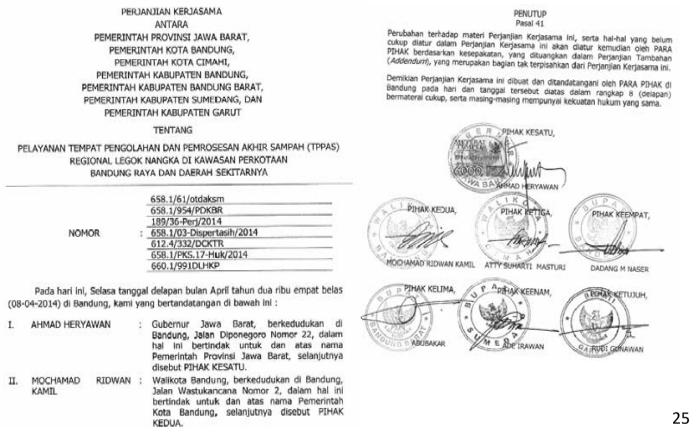
Pada hari ini, Jum'at, tanggal satu bulan Juli tahun dua ribu enam belas (01-07-2016), bertempat di Bandung, kami yang bertandatangan di bawah ini :

Operational and Maintenance cost of Regional TPPAS Sarimukti



Note: Operational and maintenance cost in APBD Prov. Jabar TA 2020 is worth Rp. 74.500/ton

COOPERATION AGREEMENT OF REGIONAL TPPAS LEGOK NANGKA



PERJANJIAN KERJASAMA
ANTARA
PEMERINTAH PROVINSI JAWA BARAT,
PEMERINTAH KOTA BANDUNG,
PEMERINTAH KOTA CIMAHI,
PEMERINTAH KABUPATEN BANDUNG,
PEMERINTAH KABUPATEN BANDUNG BARAT,
PEMERINTAH KABUPATEN SUMEDANG, DAN
PEMERINTAH KABUPATEN GARUT

TENTANG

PELAYANAN TEMPAT PENGOLAHAN DAN PEMROSESAN AKHIR SAMPAH (TPPAS)
REGIONAL LEGOK NANGKA DI KAWASAN PERKOTAAN
BANDUNG RAYA DAN DAERAH SEKITARNYA

NOMOR : 658.1/61/otdaksm; 658.1/954/PDKBR; 189/36-Perj/2014; 658.1/03-Dispertasih/2014; 612.4/332/DCKTR; 658.1/PKS.17-Huk/2014; 660.1/991DLHKP

Pada hari ini, Selasa tanggal delapan bulan April tahun dua ribu empat belas (08-04-2014) di Bandung, kami yang bertandatangan di bawah ini :

I. AHMAD HERYAWAN : Gubernur Jawa Barat, berkedudukan di Bandung, Jalan Diponegoro Nomor 22, dalam hal ini bertindak untuk dan atas nama Pemerintah Provinsi Jawa Barat, selanjutnya disebut PIHAK KESATU.

II. MOCHAMAD RIDWAN KAMIL : Walikota Bandung, berkedudukan di Bandung, Jalan Wastukancana Nomor 2, dalam hal ini bertindak untuk dan atas nama Pemerintah Kota Bandung, selanjutnya disebut PIHAK KEDUA.

PENUTUP
Pasal 41

Perubahan terhadap materi Perjanjian Kerjasama ini, serta hal-hal yang belum cukup diatur dalam Perjanjian Kerjasama ini akan diatur kemudian oleh PARA PIHAK berdasarkan kesepakatan, yang dituangkan dalam Perjanjian Tambahan (*Addendum*), yang merupakan bagian tak terpisahkan dari Perjanjian Kerjasama ini.

Demikian Perjanjian Kerjasama ini dibuat dan ditandatangani oleh PARA PIHAK di Bandung pada hari dan tanggal tersebut diatas dalam rangkap 8 (delapan) bermaterai cukup, serta masing-masing mempunyai kekuatan hukum yang sama.

PIHAK KESATU, AHMAD HERYAWAN
PIHAK KEDUA, MOCHAMAD RIDWAN KAMIL
PIHAK KETIGA, ATTY SUHARTI MASTURI
PIHAK KEEMPAT, DADANG M NASER
PIHAK KELIMA, ABUBAKAR
PIHAK KEENAM, ISMAIL IRAWAN
PIHAK KETUJUH, SITI RUDI GUNAWAN

25

AGREEMENT OF PROCESSING CAPACITY OF REGIONAL TPPAS LEGOK NANGKA

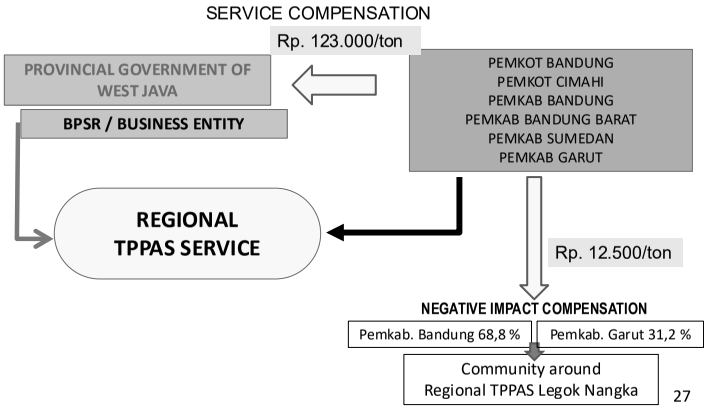
KAPASITAS PENGOLAHAN
Pasal 5

(1) Kuantitas sampah yang diterima di TPPAS Regional paling banyak 2.180 ton/hari, dengan proporsi sebagai berikut:

No	Penerima Layanan TPPAS Regional	Kuota Kuantitas minimal - maksimal (ton/hari)
1	PIHAK KEDUA	500 - 1.200
2	PIHAK KETIGA	150 - 250
3	PIHAK KEEMPAT	100 -300
4	PIHAK KELIMA	50–200
5	PIHAK KEENAM	20 – 30
6	PIHAK KETUJUH	100 - 200
	JUMLAH	920–2.180

26

Operational and Maintenance cost of Regional TPPAS Legok Nangka



27

COOPERATION AGREEMENT OF REGIONAL TPPAS LULUT NAMBO

PERJANJIAN KERJASAMA
ANTARA
PEMERINTAH PROVINSI JAWA BARAT,
PEMERINTAH KABUPATEN BOGOR,
PEMERINTAH KOTA BOGOR, DAN
PEMERINTAH KOTA DEPOK

TENTANG

PELAYANAN TEMPAT PENGOLAHAN DAN PEMROSESAN AKHIR SAMPAH (TPPAS)
REGIONAL NAMBO UNTUK WILAYAH KABUPATEN BOGOR,
KOTA BOGOR DAN KOTA DEPOK

NOMOR : 658.1/71/Otdaksm; 119/6/VIII/PRJN/KS/2014; 658.1/Perj.519-DKP/2014; 050/104/PKS/Huk/2014

PENUTUP
Pasal 37

Perubahan terhadap materi Perjanjian Kerjasama ini, serta hal-hal yang belum cukup diatur dalam Perjanjian Kerjasama ini akan diatur kemudian oleh PARA PIHAK berdasarkan kesepakatan, yang dituangkan dalam Perjanjian Tambahan (*Addendum*), yang merupakan bagian tak terpisahkan dari Perjanjian Kerjasama ini.

Demikian Perjanjian Kerjasama ini dibuat dan ditandatangani oleh PARA PIHAK di Bandung pada hari dan tanggal tersebut diatas dalam rangkap 5 (lima) bermaterai cukup, masing-masing mempunyai kekuatan hukum yang sama.

PIHAK KEDUA, RACHMAT YASIN
PIHAK KESATU, AHMAD HERYAWAN
PIHAK KEEMPAT, H. NUR MAHMUDI ISMAIL
PIHAK KETIGA, DR. BIMA ARYA

18

28

AGREEMENT OF PROCESSING CAPACITY OF REGIONAL TPPAS LULUT NAMBO

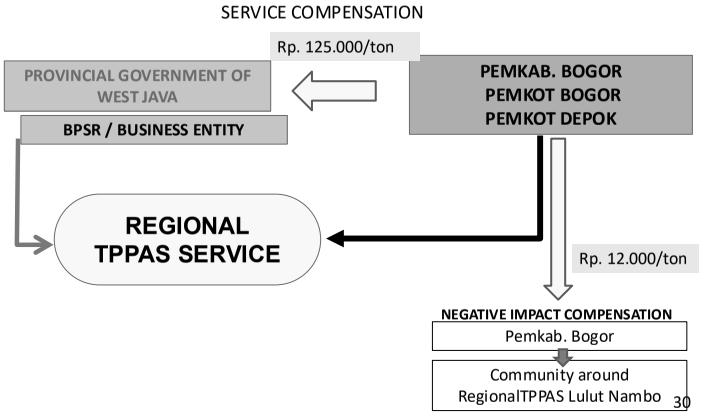
Pasal 11

(1) Kuantitas sampah yang diterima di TPPAS Regional paling banyak 1700 (seribu tujuh ratus) ton/hari, dengan perincian sebagai berikut:

No	Penerima Layanan TPPAS Regional	Kuota Kuantitas (ton/hari)	
		minimal	maksimal
1	PIHAK KEDUA	400	600
2	PIHAK KETIGA	450	600
3	PIHAK KEEMPAT	300	500
	JUMLAH	1150	1700

29

Operational and Maintenance cost of Regional TPPAS Lulut Nambo



30

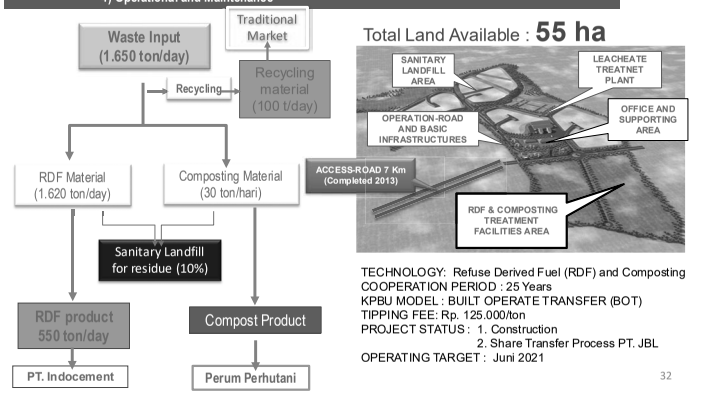
COOPERATION BETWEEN GOVERNMENT AND BUSINESS ENTITY IN INFRASTRUKTUR PROVISION

31

Profile of KPBU Nambo

Capacity: 1.650,-1.800 ton/day
KPBU Scope : 1) Sorting and recycling equipment construction
2) **RDF and Composting Facility** Construction
3) Planning and EPC Supervision Consultant Provision
4) **Operational and Maintenance**

Output:
1. RDF
2. Compost

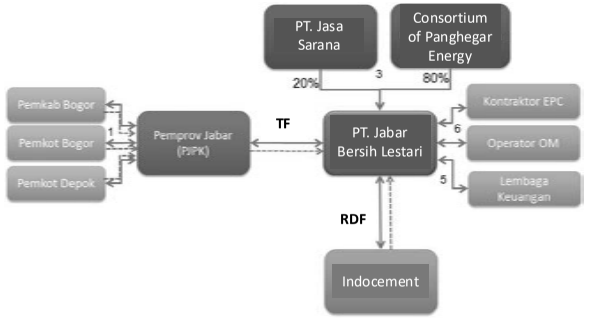


Total Land Available : **55 ha**

TECHNOLOGY: Refuse Derived Fuel (RDF) and Composting
COOPERATION PERIOD : 25 Years
KPBU MODEL : BUILT OPERATE TRANSFER (BOT)
TIPPING FEE: Rp. 125.000/ton
PROJECT STATUS : 1. Construction
2. Share Transfer Process PT. JBL
OPERATING TARGET : Juni 2021

32

PROJECT STRUCTURE OF KPBU REGIONAL TPPAS NAMBO

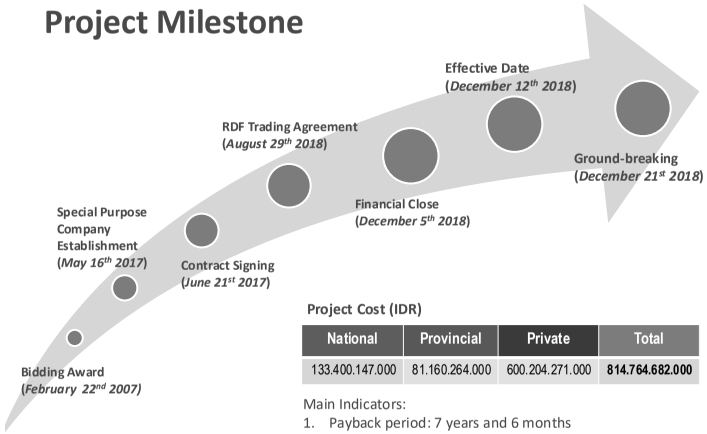


- Auction process has been started after announcement on **February 5th 2015** until a winner has been selected on **March 16th 2016** .
- Contract signing has been done by West Java Governor on **June 21st 2017**.
- PT. Jasa Sarana as the *standing partner* (was not participating in auction process, directly joined in consortium of the winner of auction)

33

添付資料 3-74

Project Milestone



Project Cost (IDR)

National	Provincial	Private	Total
133.400.147.000	81.160.264.000	600.204.271.000	**814.764.682.000**

Main Indicators:
1. Payback period: 7 years and 6 months
2. Economic IRR: 295.36%
3. Financial IRR: 18%
4. Social Cost Benefit Analysis: IDR 460,45 Billion

34

Profile of KPBU Legok Nangka

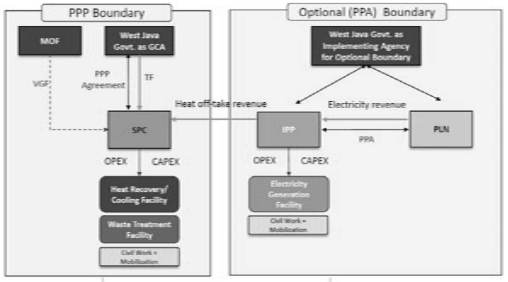
This project is implemented by Provincial Government of West Java in accordance with **Peraturan Presiden No. 38/2015** tentang Kerja Sama Pemerintah dengan Badan Usaha (KBPU) and **Peraturan Presiden No. 35/2018** tentang Pengolah Sampah menjadi Energi Listrik (Waste to Energy (electricity)), (if the auction participants are choosing thermal technology)

Purposes of this project are:
- ✓ HH SMW facility building;
- ✓ Improve the sanitation and healthy condition;
- ✓ Support the circular economic concept

Capacity	1.853 – 2.131 ton/day
Waste Input	From 6 Kabupaten/Kota; (*Kota Bandung, Kota Cimahi, Kab. Bandung, Kab. Sumedang, Kab. Bandung Barat, Kab. Garut*)
Financial Scheme	KPBU (*Build-Operate-Transfer* with concession period 20 years after *COD*)
Financial Input/source	SWM Service cost (Rp/ton) from Pemprov Jabar and 6 Kabupaten/Kota
Provision/ Procurement	KPBU Auction with *Open Technology*
Investment Cost	Rp. 4 Trillion or USD 250 million

35

PROJECT STRUCTURE OF KPBU REGIONAL TPPAS LEGOK NANGKA



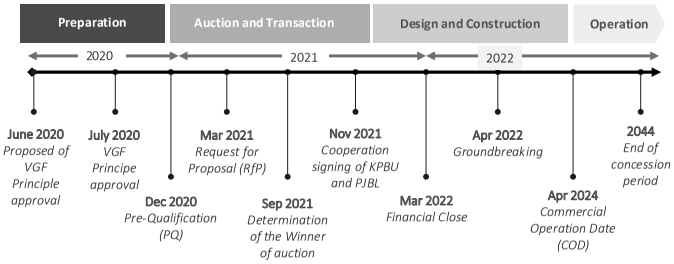
Sumber: Dokumen Final Business Case (FBC)

PPP Boundary:
KPBU Scope in auction in order to find a cooperation partner (*special purpose company* –SPC) for waste processing only

Optional (PPA) Boundary:
If the auction participants using thermal technology which is producing electricity, the electricity will be sold to PLN and implemented by (*independent power producer* – IPP)

36

Tentative Schedule



Note: If the auction goes as planned

THANK YOU