Impacts of the Sowi Gunung Landfill in Masyepi Village, Manokwari Regency, West Papua, Indonesia

Demianus Medodga[1], Anton Sinery[2*], Bud Setiawan[3], Ice Anugrah Sari[3] and Amisah[4]

[1]Master's student, Environmental Science, Postgraduate Program, University of Papua, Jl. Gunung Salju, Manokwari 98314, West Papua, Indonesia

[2]Postgraduate Program, University of Papua, Jl. Gunung Salju, Manokwari 98314, West Papua, Indonesia

[3]Department of Forestry, Faculty of Forestry, Tadulako University, Jl. Soekarno Hatta Km 9, Tondo, Mantikulore, Palu 94148, Central Sulawesi, Indonesia

[4]Faculty of Forestry, Caritas Indonesia University, Jl. Lembah Hijau, Manokwari 98314, West Papua, Indonesia

***Corresponding Author**

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ABSTRACT

The Sowi Gunung landfill in Masyepi Village, South Manokwari District, is approximately 500 m from nearby settlements and 1–1.5 km from the West Papua Governor's office complex. Reports indicate that the site has exceeded its operational capacity and that smoke was observed between July and September 2026. This study examined environmental pressures and community perceptions using a mixed-methods design: a 20-resident Likert questionnaire, a separate survey of 70 residents, review of previously published water-quality results, field observations, vegetation suitability scores reported for three buffer-zone locations, and document and news review. The manuscript also reports a regional feasibility score of 210/320 (with a sensitivity range of 152–217) and an assessment against 12 SNI 03-3241-1994 criteria; however, the underlying pairwise matrix, criterion weights, expert records, regional-parameter weights, and sensitivity calculations were not available in the materials reviewed for this revision, so these scores cannot yet be independently reproduced. Among the 70 residents surveyed, 96% reported being disturbed by the landfill and all 70 supported relocation or rehabilitation. The 20-resident questionnaire indicated concern about odor, vectors, and possible water contamination, as well as limited information and low confidence in environmental management. Reports of coughing and shortness of breath occurred during the 2026 smoke episode, but ambient pollutant concentrations were not measured in this study. Previously published water data were collected in 2021 and were not re-measured against Government Regulation No. 22/2021. The findings support immediate improvements in waste handling, fire prevention, environmental monitoring, buffer-zone rehabilitation, public engagement, and comparative assessment of alternative sites, while the technical scores and environmental exposure pathways require further verification.

Keywords: landfill; open dumping; waste-fire smoke; community perception; environmental impacts; Sowi Gunung

INTRODUCTION

The Sowi Gunung landfill (*Tempat Pemrosesan Akhir*, TPA), located in Masyepi Village, South Manokwari District, is the final waste processing facility of Manokwari Regency. The site lies only about 500 m from the residential areas of Masyepi and Katebu villages and about 1–1.5 km from the West Papua Governor's office complex. This proximity creates tangible risks of nuisance odor, the spread of disease vectors, and water pollution from leachate. These conditions are inconsistent with the principle of landfill site selection, which requires final processing facilities to be located away from dense settlements and public service centers, as

regulated in SNI 03-3241-1994 on procedures for selecting landfill sites (National Standardization Agency, 1994) and Minister of Public Works Regulation No. 03/PRT/M/2013 (Ministry of Public Works, 2013).

The impacts of landfills that do not meet standards are complex. Biologically, open waste piles become breeding grounds for flies and rats whose range can reach 1–2 km. Atmospherically, anaerobic decomposition releases methane, carbon dioxide, and pungent sulfur compounds. Hydrologically, poorly decomposed waste generates *leachate* that carries dissolved and suspended substances and can pollute groundwater and surface water if it is not treated and the landfill base layer is not impermeable (Srikandi, 2014; Tchobanoglous et al., 1993). Socially, vehicle noise, traffic congestion, and poor aesthetics often lead to community resistance known as *Not In My Backyard* (NIMBY) (Wolsink, 2006).

The Manokwari Environment and Land Agency (*Dinas Lingkungan Hidup dan Pertanahan*, DLHP) reported that, of a 59-hectare landfill area, only about 12 hectares had been used and that waste generation had already exceeded the capacity of that area (JagatPapua, 2023). By September 2026 the landfill was reported to have exceeded its capacity and the disposal cell could no longer be excavated, because the incoming waste was mixed so that a cell planned for 70 years would last only 20–30 years (Tabura Pos, 2026b). Since 22 July 2026, residents of Sowi sub-district have complained of thick smoke from the landfill every morning (Tabura Pos, 2026a). In August 2026, the Regent of Manokwari targeted the smoke from the landfill fire to be resolved before 17 August, with waste generation of about 150 tons per day (ANTARA, 2026a), and the Manokwari District Military Command (Kodim 1801/Manokwari) deployed a fire truck provided by the Ministry of Defense (ANTARA, 2026b). On 7 September 2026, the Governor of West Papua stated that the landfill smoke had reached the governor's office, so that civil servants had to wear masks during the morning assembly (Jubi, 2026a). The Director of the West Papua Provincial General Hospital explained that smoke exposure can cause disorders ranging from mild irritation to serious respiratory problems and can worsen asthma and chronic lung disease (RRI, 2026a), and on 17 September 2026 smoke was reported to still blanket the provincial government complex, with residents complaining of shortness of breath and coughing (Kompas.com, 2026a).

Regional governments are required to close landfills operated as *open dumping* under Law No. 18 of 2008 (Government of Indonesia, 2008). In 2025 the Ministry of Environment imposed administrative sanctions of government coercion on 343 landfills still operating as open dumps, with the threat of further sanctions up to criminal penalties (Metro TV, 2025; ANTARA, 2025a). The government also issued Presidential Regulation No. 109 of 2025 on the handling of urban waste through processing waste into renewable energy, which replaced Presidential Regulation No. 35 of 2018 (ANTARA, 2025b; Government of Indonesia, 2025).

Previous research at the same site showed that leachate at the treatment unit and two springs around the landfill used by residents still met water quality standards at the time of sampling, but the study also noted impaired function of the landfill base layer due to fire and suboptimal operation of the treatment unit (Angrianto et al., 2021). Scientific information on how the community and technical stakeholders assess the feasibility of the landfill site comprehensively, including spatial planning aspects and social acceptance, is not yet available. This study therefore aimed to analyze the impacts of the Sowi Gunung landfill and its 2026 fire on the physical environment and on community comfort and health.

RESEARCH METHODS

Research Site and Period

This research was conducted at the Sowi Gunung landfill, Masyepi Village, South Manokwari District, Manokwari Regency, from July to September 2026. The study encompassed preparation, data collection, and data analysis.

Equipment and Materials

The equipment used in this study was a camera, writing tools, and a computer for data collection and analysis. The materials used were lists of questions (questionnaires and interview guides) and reports related to waste management from the relevant agencies.

Research Procedures

A mixed-methods design was used (Creswell & Creswell, 2018). The study included (i) a regional feasibility assessment using 10 parameters and a reported weighted score; (ii) an assessment of 12 criteria from SNI 03-3241-1994, reportedly using the Analytic Hierarchy Process (AHP) with three experts (Saaty, 2008); (iii) a five-point Likert questionnaire administered to 20 residents; (iv) a separate perception survey of 70 residents of Masyepi Village; (v) vegetation suitability scores (Key Performance Index, KPI) reported for three buffer-zone locations; and (vi) review of documents and news reports about the July–September 2026 smoke and fire events. The available manuscript and files do not contain the AHP pairwise-comparison matrix, consistency calculations, the experts' names and qualifications, the full weights and scoring sheets for the 10 regional parameters, the underlying vegetation indicators and sampling layout, or respondent-level data. Accordingly, the AHP, feasibility sensitivity analysis, and KPI calculations are reported as preliminary results and cannot be independently reproduced from the information currently available.

Preparation involved coordination with community and government stakeholders, followed by interviews and field observations. Observations addressed site conditions, facilities, infrastructure, disposal practices, and approximate distances to settlements and offices. Documentary review covered regulations, spatial-planning information, demographic and environmental-health profiles, and landfill operational reports. The village head reportedly gave a population of 230 residents. The sample counts therefore correspond to 20/230 (8.7%) and 70/230 (30.4%) of that reported population; these are sample-to-population ratios, not response rates, and the samples may overlap. The study record available for this revision does not specify the sampling frame or selection procedure for either resident sample, the number approached, whether the samples overlapped, the survey response rate, exact survey dates, or the language used to administer the questionnaires. These details must be confirmed from the original field records before publication; they should not be inferred from the sample sizes alone.

Data Analysis

Questionnaire responses were summarized using frequencies, percentages, and item means on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). The reported interpretation bands were 1.00–1.80 (strongly disagree), 1.81–2.60 (disagree), 2.61–3.40 (neutral), 3.41–4.20 (agree), and 4.21–5.00 (strongly agree) (Riduwan, 2002). The available data are aggregate frequency tables rather than respondent-level records. Cronbach's alpha, confidence intervals, and inferential tests comparing age, education, or proximity groups therefore could not be calculated for this revision. No statistical significance is claimed. The chronology and reported impacts of the 2026 fire were reconstructed from documents, official statements, and news reports; the cause of the fire was not independently verified. Water-quality values are secondary data from Angrianto et al. (2021), not new measurements, and were not reanalysed as if they were collected under PP 22/2021.

RESULTS AND DISCUSSION

Community Perceptions and Social Comfort

The distribution of responses is presented in Table 1 and the mean scores in Table 2. The results show three main patterns.

Table 1. Distribution of Responses of Community Respondents (n = 20)

No	SD (1)	D (2)	N (3)	A (4)	SA (5)
S1	0 (0%)	18 (90%)	2 (10%)	0 (0%)	0 (0%)
S2	2 (10%)	18 (90%)	0 (0%)	0 (0%)	0 (0%)
S3	0 (0%)	0 (0%)	0 (0%)	3 (15%)	17 (85%)

S4	0 (0%)	0 (0%)	0 (0%)	2 (10%)	18 (90%)
S5	0 (0%)	0 (0%)	17 (85%)	3 (15%)	0 (0%)
S6	15 (75%)	5 (25%)	0 (0%)	0 (0%)	0 (0%)
S7	0 (0%)	5 (25%)	0 (0%)	0 (0%)	15 (75%)

Source: primary data (2026). SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree. Statements S1–S7 are listed in Table 2.

Table 2. Mean Scores of Community Perception

No	**Statement**	**Mean**	**Category**
S1	I am aware of the plan for building/operating a landfill in this area.	2.10	Disagree
S2	The government or relevant agencies have conducted transparent public consultation on the landfill location.	1.90	Disagree
S3	I am worried that the landfill will degrade environmental quality (odor, flies, and disease vectors).	4.85	Strongly agree
S4	I am worried that landfill activities will contaminate clean water sources/residents' wells around the site.	4.90	Strongly agree
S5	I am worried that increased traffic of waste trucks will cause congestion and road damage.	3.15	Neutral
S6	I believe the landfill is equipped with good environmental management technology (leachate treatment and buffer zone).	1.25	Strongly disagree
S7	Overall, I support the selection of the landfill location in this area on condition of compensation and strict supervision.	4.25	Strongly agree

Source: primary data (2026),

First, the community's level of knowledge and access to information and public participation were limited. No respondent selected “agree” or “strongly agree” when asked whether they knew about the landfill operating plan (90% disagreed, 10% neutral; mean 2.10), and none agreed that the government had conducted transparent public consultation (mean 1.90). Second, environmental concern is very high: all respondents agreed or strongly agreed that they were worried about odor, flies, and disease vectors (85% strongly agreed; mean 4.85) and about contamination of clean water sources (90% strongly agreed; mean 4.90), whereas concern about truck traffic was neutral (85% neutral; mean 3.15). Third, trust in management technology was very low (mean 1.25; 75% strongly disagreed), although 75% of respondents strongly agreed to support the landfill location if compensation and strict supervision were provided (mean 4.25) and 25% disagreed.

Characteristics and Perceptions of Masyepi Village Residents

Masyepi Village is one of the villages in direct contact with the landfill, with a population of 230 people in 77 households (interview with the village head). The largest groups of respondents were aged 21–30 years (37%) and had a senior high school education (44%) (Tables 3 and 4).

Table 3. Characteristics of Respondents by Age

No	Age (years)	Number	Percentage (%)
1	< 20	7	10
2	21–30	26	37
3	31–40	14	20
4	41–50	12	17
5	51–60	6	9
6	61–90	5	7
Total		**70**	**100**

Source: Karubaba (2024), primary data.

Table 4. Characteristics of Respondents by Education

Education	Number	Percentage (%)
Elementary school	3	4
Junior high school	17	24
Senior high school	31	44
Vocational high school	6	9
Diploma	10	14
Bachelor's degree	3	4
Total	**70**	**100**

Source: Karubaba (2024), primary data.

The survey results are presented in Table 5, with mean scores recalculated from the frequencies and categorized according to the classes described in Section 2.4.

Table 5. Perception of Masyepi Village Residents toward the Presence of the Landfill (n = 70)

No	Statement	SD	D	N	A	SA	Mean	Category
S1	Disturbed by the presence of the landfill	0 (0%)	3 (4%)	0 (0%)	40 (57%)	27 (39%)	4.30	Strongly agree
S2	Garbage odor is smelled throughout the day	0 (0%)	5 (7%)	3 (4%)	35 (50%)	27 (39%)	4.20	Agree
S3	Flies and rats are encountered more often	0 (0%)	0 (0%)	0 (0%)	42 (60%)	28 (40%)	4.40	Strongly agree

S4	The landfill helps the local economy	4 (6%)	32 (46%)	22 (31%)	10 (14%)	2 (3%)	2.63	Neutral
S5	Well/spring water smells	33 (47%)	29 (41%)	8 (11%)	0 (0%)	0 (0%)	1.64	Strongly disagree
S6	Disturbed by landfill noise	27 (39%)	43 (61%)	0 (0%)	0 (0%)	0 (0%)	1.61	Strongly disagree
S7	The landfill site needs to be relocated or rehabilitated	0 (0%)	0 (0%)	0 (0%)	51 (73%)	19 (27%)	4.27	Strongly agree
S8	Landfill facilities and infrastructure need to be upgraded	0 (0%)	0 (0%)	62 (89%)	6 (9%)	2 (3%)	3.14	Neutral
S9	Disturbed by waste truck mobilization	0 (0%)	29 (41%)	13 (19%)	28 (40%)	0 (0%)	2.99	Neutral
S10	Disturbed by dust from truck mobilization	0 (0%)	28 (40%)	26 (37%)	16 (23%)	0 (0%)	2.83	Neutral

Source: primary data (2026), processed. SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree; percentages are rounded.

Among the 70 residents surveyed, 96% (67/70) reported being disturbed by the landfill (mean 4.30), 89% (62/70) reported that odor was noticeable throughout the day (mean 4.20), and all 70 reported encountering flies and rats more often (mean 4.40). All 70 agreed or strongly agreed that the landfill should be relocated or rehabilitated (mean 4.27). Conversely, 36 of 70 respondents (51%) disagreed or strongly disagreed that the landfill helps the local economy, and 62 of 70 (89%) disagreed or strongly disagreed that well or spring water smelled. These perceptions do not establish water safety; the available water measurements were collected in 2021 and were not repeated in this study. All 70 respondents disagreed that noise was a nuisance. Responses about truck traffic and dust were mixed: 40% reported disturbance from truck mobilization and 23% from dust. Most respondents (62/70; 89%) selected a neutral response about upgrading landfill facilities and infrastructure.

The two perception datasets address different questions: the 20-resident questionnaire covered knowledge, consultation, environmental concern, trust, and conditional acceptance, whereas the 70-resident survey covered daily nuisances and attitudes toward relocation. The available records do not establish whether participants overlapped between these samples; they should therefore be treated as two distinct reported sample sizes, not as 90 unique residents. Because sampling procedures, response rates, and respondent-level records were unavailable, results are descriptive and should not be generalized beyond the surveyed participants without qualification.

The dominance of odor and nuisance from disease vectors is in line with the summary by Axmalia and Mulasari (2020) of respiratory, skin, and eye irritation complaints among residents near landfills, and with the explanation by El-Fadel et al. (1997) that open anaerobic decomposition releases odorous gases and provides breeding media for vectors. A local study by Timang et al. (2019) of 60 respondents in six villages of West Manokwari District (May–June 2016) reported that 61.67% of respondents considered the implementation of the landfill to be going well even though waste was dumped without treatment, and 56.67% considered waste collection fairly good. The difference from the results of this study, in which 96% of Masyepi residents felt disturbed, indicates that perception depends on proximity to the landfill: residents in the service area assess the system in terms of waste collection, whereas residents in direct contact experience odor, flies, and smoke. This comparison is indicative because of differences in location, survey year, and instrument.

Impacts on the Physical Environment

Field observations and interviews with the community of Masyepi Village revealed two dominant forms of environmental pressure. First, pungent odor from open anaerobic decomposition is a daily nuisance; the distance of about 500 m from settlements and about 1.5 km from offices allows local winds to spread the odor, reduces the comfort of outdoor activities, and may trigger respiratory disorders in vulnerable groups such as children and the elderly. Second, residents reported massive fly populations extending into residential areas. Flies can disperse up to a radius of 1–2 km, and their presence increases the risk of mechanical transmission of pathogens causing diarrhea, dysentery, and skin infections through food and drink. This phenomenon indicates that the buffer zone does not function effectively in stopping the spread of vectors.

Angrianto et al. (2021) reported leachate and spring-water measurements collected in 2021. Their results included leachate pH 8.07, TSS 77 mg/L, BOD 4.3 mg/L, COD 16.5 mg/L, total nitrogen 0.701 mg/L, and TDS 2,733 mg/L, along with measurements from two nearby springs. No water samples were collected for the present study. The historical results should be interpreted as evidence only for the sampling period and locations reported by Angrianto et al. (2021); they do not establish current water quality or compliance with PP 22/2021. Current compliance must be assessed using a new sampling campaign, appropriate parameters and detection limits, and the applicable standards in PP 22/2021, Appendix VI.

Karubaba (2024) describes porous limestone in the landfill area and reports that the base membrane was damaged by an earlier fire; the springs are reported to be 421–1,230 m from the landfill. The current study did not measure leachate migration or spring-water quality. The manuscript also reports vegetation KPI values of 49–60% at three buffer-zone locations and classifies them as "less suitable." However, the KPI formula, indicators, indicator weights, quadrat or transect numbers and dimensions, buffer-zone definitions, and classification thresholds were not present in the materials available for this revision. The KPI result should therefore be regarded as a reported preliminary classification pending provision of the original vegetation assessment sheets. Vegetation alone should not be assumed to control landfill gas, smoke, or leachate.

The main reference for water quality data is Angrianto et al. (2021), who analyzed leachate from the wastewater treatment unit (IPAL) of the Sowi Gunung landfill and two springs nearby in September–November 2021 (Table 6).

Table 6. Quality of Leachate and Spring Water around the Sowi Gunung Landfill

Parameter (mg/L, except pH)	**Leachate (treatment unit)**	**Leachate standard (P.59/2016)**	**Spring 1**	**Spring 2**	**Class I standard (PP 82/2001)**
pH	8.07	6–9	7.22	6.92	6–9
TSS	77	100	4	3	50
TDS	2,733	none	241	382	1,000
BOD	4.3	150	1.6	1.4	2
COD	16.5	300	7.4	8.2	10
Total N	0.701	60	0.514	0.414	10.56
TOC	17.4	none	4.3	7.6	none

Source: Angrianto et al. (2021).

The 2021 data reported by Angrianto et al. (2021) cannot be used to certify present-day compliance. In particular, the spring COD values (7.4 and 8.2 mg/L) and BOD values (1.6 and 1.4 mg/L) were reported against the

standards used in that earlier study, including PP 82/2001. The current study did not collect samples, and the 2021 dataset does not include the full suite requested for a contemporary assessment, including nitrate and metals, or detection limits and current sampling metadata in the materials reviewed. Thus, residents' concern about water quality is a reason to conduct monitoring, not evidence that contamination has occurred or that water is safe. A new sampling campaign should document dates, locations, methods, detection limits, and the relevant PP 22/2021 criteria.

Impacts of the 2026 Landfill Fire

The 2026 smoke and fire episode was reconstructed from news reports and official statements; the exact start date cannot be established from these sources. The earliest report identified complaints on 22 July 2026, when residents said burning had already continued for almost a week, and reports of smoke continued through 17 September 2026. The chronology distinguishes reports specifically attributed to the landfill from concurrent forest and land fires where the sources permit, but no hotspot analysis, official burn-scar map, or independent fire investigation record was available for this revision. The source of ignition and the proportion of haze attributable to the landfill therefore remain unverified.

Table 7. Chronology of the Fire and Response to the Smoke at the Sowi Gunung Landfill, July–September 2026

Date	Event	Source
8 July 2026	A West Papua representative in the Regional Representative Council (DPD RI) considered the Arfai landfill no longer ideal because it is close to settlements and offices; residents were anxious about air pollution because waste is usually burned.	Link Papua (2026)
22 July 2026	Residents of Sowi sub-district complained of thick smoke from waste burning at the landfill, visible every morning; according to residents the burning had gone on for almost a week without follow-up by the agencies; journalists observed smoke rising from the inner part of the waste pile.	Tabura Pos (2026a)
13 August 2026	The Regent of Manokwari stated that the waste had overflowed and had to be disposed of by burning with the smoke controlled, targeted the smoke to be resolved before 17 August, deployed firefighting teams, and formed a survey team for two new landfill locations; waste generation about 150 tons per day.	ANTARA (2026a)
21 August 2026	Kodim 1801/Manokwari deployed one fire truck provided by the Ministry of Defense; spraying together with the Regency Fire Brigade to prevent the fire from spreading and to reduce smoke.	ANTARA (2026b)
1 September 2026	RRI Manokwari dialogue: smoke from the Sowi landfill is carried by wind to settlements and activity centers; the Director of the West Papua Provincial General Hospital explained the risks from irritation to serious respiratory disorders, especially in vulnerable groups.	RRI (2026a)
6–7 September 2026	DLHP stated that no burning was carried out on 6 September; the Governor of West Papua stated that smoke reached the governor's office, employees wore masks at the morning assembly, and suspected burning by irresponsible parties.	Tabura Pos (2026b); Jubi (2026a)
8–9 September 2026	Head of the Solid Waste Division of DLHP: the landfill is over capacity, the sanitary landfill system can no longer be applied, and fires may occur naturally because of methane gas. DLHP stated that Manokwari's general air quality was still good based on $PM_{2.5}$ predictions (not measurements around the landfill).	Tabura Pos (2026b); RRI (2026b)

17 September 2026	Smoke from waste burning still blanketed the West Papua provincial government complex and the Sowi–Arfai area in the morning, afternoon, and night; a member of the West Papua Regional House of Representatives reported families with shortness of breath and coughing and regretted the statement that the air was still good.	Kompas.com (2026a)

Source: news reports and officials' statements (see source column), processed.

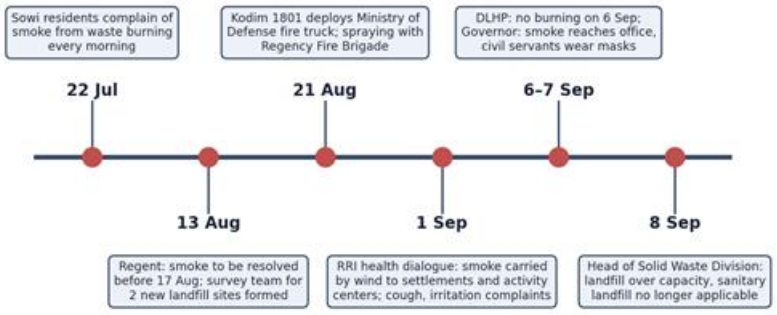

Figure 1. Chronology of the Fire and Response to the Smoke at the Sowi Gunung Landfill, July–September 2026

Reported effects of the fire included complaints of coughing and shortness of breath among residents, statements by a hospital official about possible respiratory risks, smoke observed moving toward settlements and the governor's office, disruption of government activities, and deployment of fire-suppression teams. These are reported symptoms and expert or official statements, not clinical diagnoses or measurements of exposure. PM2.5 and relevant gases were not measured at the landfill, nearby settlements, or the governor's office during burning and non-burning periods. Consequently, the study cannot quantify exposure, establish a dose–response relationship, or attribute individual symptoms exclusively to landfill smoke. General air-quality estimates for Manokwari should not be treated as site-specific monitoring data.

Table 8. Summary of the Impacts of the 2026 Sowi Gunung Landfill Fire

Aspect	**Findings**	**Source**
Public health	Complaints of shortness of breath and coughing among residents' family members; risk of irritation to serious respiratory disorders, higher in children, the elderly, pregnant women, and people with lung/heart disease	Kompas.com (2026a); RRI (2026a)
Air quality	Thick smoke visible every morning and carried by wind to settlements and the governor's office; $PM_{2.5}$ and gas concentrations not measured around the landfill; general air quality assessed as "good" based on predictions	Tabura Pos (2026a); Jubi (2026a); RRI (2026b)
Government and public activities	Civil servants' activities disrupted; employees wore masks at the morning assembly	Jubi (2026a)
Operations and safety	Fire suppression by regional teams, the fire brigade, and Kodim with Ministry of Defense assistance; risk of recurrence because of methane gas	ANTARA (2026a; 2026b); Tabura Pos (2026b)
Governance and policy	Differing accounts of the cause (burned to dispose of the pile, burned by other parties, naturally ignited); accelerated survey of a new landfill location	ANTARA (2026a); Jubi (2026a); Tabura Pos (2026b)

Source: 2026 news reports, processed.

Smoke during the 2026 dry season was not necessarily attributable only to the landfill. Forest and land fires near South Manokwari District, including Angresi Village and the Maripi Indah limestone hill, were reported in late August 2026 (RRI, 2026c; Kompas.com, 2026b), and Jubi (2026b) described haze from both forest/land fires and waste burning. Because the study did not analyse satellite hotspots, burn scars, wind trajectories, or pollutant fingerprints, it cannot quantitatively separate these sources. The manuscript therefore distinguishes documented landfill-fire reports from regional haze reports and avoids attributing all smoke exposure to the landfill.

There are three accounts of the cause of the fire that cannot be verified in this study. The Regent stated that overflowing waste needed to be disposed of by burning with the smoke controlled (ANTARA, 2026a); DLHP stated that it did not carry out burning on 6 September and that fires can occur naturally because mixed waste produces methane gas and high temperatures (Tabura Pos, 2026b); and the Governor suspected that parties had deliberately set fires (Jubi, 2026a). Regardless of the actual cause, all three converge on the same root problem: mixed waste piles exceeding capacity in an open disposal system. Open burning as a way to reduce waste piles contradicts the principles of waste management and adds to the emission burden and health risk; an investigation of the cause by the competent authorities remains necessary.

Landfill fires in the dry season occur in many regions: in the 2026 dry season, fires were reported at the Jatiwaringin (Tangerang), Galuga (Bogor), Putri Cempo (Surakarta), and Jatibarang (Semarang) landfills (Kompas.id, 2026). The similarity of this pattern suggests that the fire at the Sowi Gunung landfill is not a local anomaly but a structural symptom of open disposal systems facing the dry season. Internationally, Manjunatha et al. (2024) summarized that landfill fires release $PM_{2.5}$, O_3, NO_2, dioxins and furans, polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds, and noted that when the open Ghazipur landfill (New Delhi) burned in November 2020, $PM_{2.5}$ and PM_{10} at a point 3.5 km from the landfill were 420 and 600 $\mu g/m^3$, respectively (as cited from The Indian Express, 2021). These figures cannot be equated with the Sowi Gunung landfill because the scale of the waste pile and the meteorology differ, but they show that particulate impacts can be felt several kilometers away, in line with complaints at the provincial offices 1–1.5 km away and in the Sowi–Arfai area. The Manokwari case differs in its proximity to provincial offices and settlements, so the smoke is directly felt by decision-makers. In addition, the earlier fire damaged the base layer (Angrianto et al., 2021) and changed the treatment system into open disposal (Karubaba, 2024), so the 2026 fire is a repetition with cumulative consequences.

Synthesis of Impacts from Multiple Sources

Table 9 synthesizes observations, survey responses, secondary studies, official statements, and news reports. The most consistently reported nuisances were odor and disease vectors, while smoke-related complaints were reported during the 2026 fire episode. Water contamination remains a potential risk rather than a demonstrated current impact because this study did not collect water samples. Similarly, the health findings are based on reported symptoms and expert statements rather than clinical or exposure measurements. The feasibility and vegetation KPI scores also require the underlying calculation records before they can be independently verified.

Table 9. Synthesis of the Impacts of the Presence and Operation of the Sowi Gunung Landfill

Component	Evidence from multiple sources	Source type	Impact level
Odor and aesthetics	Odor smelled throughout the day (89% of 70 residents); pungent odor and combustion gases reaching offices (experts, observation)	Survey; experts; observation	High
Disease vectors	Flies and rats encountered more often (100% of 70 residents; concern about odor, flies, and disease vectors, mean 4.85 in the survey of 20 residents)	Survey	High

Air and smoke	Smoke from the 2026 fire reached Sowi settlements and the governor's office; respiratory complaints	News reports; officials' statements	High (episodic)
Health	Complaints of shortness of breath and coughing; hospital statement on risks to vulnerable groups; data on acute respiratory infection (ISPA) cases not available	News reports; medical statements	Medium–high
Water and soil	Leachate and spring water met quality standards in a single 2021 sample; however, porous limestone, damaged base membrane, high leachate TDS, springs at 421–1,230 m; complaints of water and land pollution	Previous research; DLHP	High potential
Noise and traffic	Noise not perceived as a nuisance; truck and dust disturbances divided (23–40%)	Survey of 70 residents	Low–medium
Social and trust	Low public consultation and trust in technology; all residents agree on relocation or rehabilitation; conditional support 75%	Surveys of 20 and 70 residents	High
Capacity and governance	Over capacity; 70-year cell full within 20–30 years; differing accounts of the cause of the fire	DLHP; news reports	High

Source: primary data (2026) and various sources.

Impacts on the Environment and Social Comfort

The descriptive survey results indicate concern about odor, vectors, and possible water contamination. These perceptions are consistent with reported operating conditions, but they do not by themselves prove environmental contamination or a causal health effect. Law No. 18 of 2008 prohibits open dumping (Government of Indonesia, 2008), while the observations and reports indicate that waste handling at the site requires operational review. The regional feasibility score and SNI/AHP assessment are preliminary as presented because their matrices, weights, expert records, and sensitivity assumptions were not available for verification.

The 70-resident survey showed that nuisance from odor and vectors was commonly reported, whereas traffic disturbance was less consistent. Concern about water quality (mean 4.90 in the separate 20-resident questionnaire) contrasts with the historical water results reported by Angrianto et al. (2021), but the comparison is limited by the difference in time and the absence of new samples. The historical data should not be interpreted as proof of current safety. Periodic monitoring of leachate, groundwater, and springs should include parameters required by the applicable standards, with sampling dates, methods, and detection limits reported.

In the 20-resident questionnaire, low reported awareness, limited consultation, and low confidence in environmental management were prominent descriptive findings. In the 70-resident survey, 75% supported relocation or rehabilitation only insofar as the underlying item and response coding indicate conditional support; this result should not be interpreted as a statistically tested population estimate. Because the samples' selection procedures and possible overlap are undocumented, the two surveys should not be pooled and no age-, education-, or proximity-based differences can be inferred from the aggregate tables.

The 2026 fire episode added an acute smoke-related concern to the chronic nuisances reported by residents. Smoke was reported near settlements and government offices, but PM2.5 and gas concentrations were not measured, and regional forest and land fires occurred during the same period. The study therefore documents reported smoke events and symptoms but cannot quantify exposure or determine the proportion attributable to the landfill.

Overall, these findings extend previous local studies. Angrianto et al. (2021) focused on water quality, Karubaba (2024) on the site and vegetation, and Timang et al. (2019) on perceptions of waste services; this study adds the social-health impact dimension and the 2026 fire within one framework. The most consistent impacts across all sources are odor, vectors, and smoke, whereas the impact on water remains a potential that has been neither proven nor refuted.

Limitations

Several limitations constrain interpretation. First, the two community samples were small and their sampling frames, selection procedures, response rates, administration dates and language, and possible overlap were not documented in the materials available for this revision. The 20- and 70-person datasets were reported in aggregate, so internal consistency (Cronbach's alpha), confidence intervals, and inferential comparisons by age, education, or proximity could not be calculated. Second, the reported AHP/SNI assessment, regional feasibility score and sensitivity range cannot be reproduced without the original pairwise-comparison matrix, criterion and parameter weights, expert identities and qualifications, consistency calculations, and sensitivity assumptions. Third, the vegetation KPI classification lacks a documented formula, indicator definitions, weights, sampling effort, and classification threshold. Fourth, water-quality information comes from secondary measurements collected in 2021; this study did not collect new samples, and current compliance with PP 22/2021 has not been established. Fifth, no ambient PM2.5 or gas concentrations were measured during burning and non-burning periods, so health impacts are based on reported symptoms and expert or official statements rather than exposure measurements or clinical data. Finally, the cause of the landfill fire and the relative contribution of landfill smoke versus concurrent forest and land fires remain unverified because no independent fire investigation, hotspot analysis, or burn-scar assessment was conducted. These gaps should be addressed before drawing definitive conclusions about technical feasibility, current pollution, or causally attributable health effects.

CONCLUSION

The study documents substantial reported nuisance associated with the Sowi Gunung landfill, particularly odor and vectors, and an additional smoke-related concern during the July–September 2026 fire episode. Among the 70 residents surveyed, 96% reported disturbance from the landfill and all 70 supported relocation or rehabilitation. In the separate questionnaire of 20 residents, mean concern scores were 4.85 for odor and vectors and 4.90 for possible water contamination; these are descriptive results from that subsample. Historical water-quality results are available only from 2021, and no ambient air measurements or new water samples were collected for this study. The reported regional feasibility score (210/320; sensitivity range 152–217), SNI/AHP assessment, and vegetation KPI classification cannot be independently verified without the original matrices, weights, field sheets, and calculation records. Accordingly, the results support precautionary operational improvements and updated monitoring, but do not by themselves establish current water contamination, quantify health risks, or verify the cause and source contribution of the 2026 smoke.

RECOMMENDATIONS

The following actions are recommended: (1) reduce and sort waste upstream to slow landfill filling; (2) prevent open burning and strengthen fire prevention, early detection, emergency response, and safe extinguishing procedures; (3) inspect and repair leachate collection and treatment infrastructure and assess the integrity of the landfill base liner; (4) conduct new leachate and spring/groundwater sampling against PP 22/2021, including relevant physical-chemical parameters, nitrate, and metals, with sampling dates, locations, methods, and detection limits reported; (5) monitor PM2.5 and relevant gases at the landfill, nearby settlements, and the governor's office during both burning and non-burning periods; (6) document fire events using official incident records, hotspot data, and burn-scar mapping where available; (7) rehabilitate the buffer zone based on a documented vegetation survey and transparent KPI method; (8) conduct documented public consultation and disclose monitoring results; and (9) complete and publish the underlying SNI/AHP matrix, expert qualifications, consistency ratio, weights, regional-parameter scoring sheets, sensitivity calculations, and alternative-site assessment before relying on the feasibility score for policy decisions.

Author Contributions

Conceptualisation, D.M. and A.S.; Methodology, D.M; Formal analysis, D.M.; Investigation, R.Y.; Resources, D.M.; Data curation, D.M.; Writing-original draft preparation, D.M.; Writing-review and editing, A.S.; Supervision, A.S. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

This study involved interviews and questionnaires about community perceptions and an assessment of landfill conditions. No experimental procedures involving humans or animals were conducted. The authors should ensure that this statement complies with the target journal's ethics policy and any applicable institutional requirements.

Informed Consent Statement

Informed consent was obtained from the local government and community members who provided data for this study.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Conflicts of Interest

The authors declare no conflict of interest regarding the publication of this paper.

AI Use Statement

AI tools were used for language editing and figure preparation. Data processing and analysis were conducted separately by the authors using the field data.

Appendix A. Reproducibility information required for the technical assessments

The technical scores reported in this manuscript should be considered provisional until the original records are supplied and checked. The following information was not present in the manuscript and files available for this revision and must not be reconstructed by assumption: (A1) the exact 12 SNI criteria and their operational definitions; (A2) the 12 × 12 AHP pairwise-comparison matrix, aggregation method for the three experts, normalized criterion weights, λmax, consistency index (CI), random index (RI), and consistency ratio (CR); (A3) the names, roles, and qualifications of the three experts, subject to their consent; (A4) the list of 10 regional parameters, scale and direction of each measure, raw parameter scores, weights, data sources, and weighted-score formula; (A5) the scenarios or weight variations that generated the reported sensitivity range of 152–217; and (A6) the vegetation KPI formula, indicator-level observations and weights, buffer-zone definitions, number and dimensions of quadrats/transects, and the threshold for "less suitable." These records should be added as a supplementary workbook or tables. The AHP consistency ratio should be calculated from the actual matrix and reported as CR = CI/RI; a value below 0.10 should be demonstrated rather than asserted.

Appendix B. Community survey documentation required

The original questionnaire forms and respondent-level, de-identified dataset should be supplied as supplementary materials. The documentation should state the sampling frame and selection method for each sample, whether any participants took part in both surveys, the village population denominator used to calculate coverage, the number approached and number responding, exact dates, language of administration, and handling of missing responses. Cronbach's alpha can be calculated only from item-level responses for the relevant multi-item scale; it cannot be calculated from the aggregate frequency tables reproduced in this manuscript. Inferential tests and confidence intervals likewise require respondent-level data and appropriate grouping variables. Until those records are available, the findings are presented descriptively and no statistical significance is claimed.

Appendix C. Environmental monitoring data status

No new leachate, spring-water, ambient PM2.5, or gas measurements were collected for this study. The water-quality table is reproduced from Angrianto et al. (2021), and the smoke/health findings are based on reports, observations, and public or expert statements. The manuscript therefore does not claim that contemporary water or air quality has been verified against PP 22/2021 or ambient-air standards. New monitoring results, if collected, should report sampling dates, coordinates or site descriptions, methods, analytical laboratories, detection and quantification limits, quality-control procedures, and the relevant standards.

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