



Health-service capacity and environmental health risks in a peri-urban housing development area

Sulaiman¹, Jufri¹, Muti Sahida^{2,*}, Rusli³, Syahrudin⁴

¹ Public Health Study Program, Sekolah Tinggi Ilmu Kesehatan Makassar, Makassar, South Sulawesi 90241, Indonesia;

² Nursing Study Program, Sekolah Tinggi Ilmu Kesehatan Makassar, Makassar, South Sulawesi 90241, Indonesia;

³ Department of Social and Political Sciences, Universitas Indonesia Timur, Makassar, South Sulawesi 90221, Indonesia;

⁴ Department of Social and Political Sciences, Universitas Nahdlatul Ulama Sulawesi Tenggara, Kendari, Southeast Sulawesi 93116, Indonesia.

*Correspondence: mutisahida1991@gmail.com

Received Date: May 19, 2026

Revised Date: August 18, 2026

Accepted Date: August 24, 2026

ABSTRACT

Background: This study examines the waste management crisis at Klotok Landfill/*Tempat Pengelolaan Akhir* (TPA) in Pojok Village, Mojoroto Sub-district, Kediri City, as a representation of socio-ecological problems arising from uncontrolled urbanization. **Methods:** Employing a qualitative case study approach within Ulrich Beck's Risk Society theoretical framework, this research analyzes the impact of the landfill's overload condition, which has persisted for more than three decades, on the buffer community of Kelurahan Pojok. Data were obtained through field observation and in-depth interviews with affected residents, supplemented by academic document reviews and government archives. **Findings:** The results indicate that the systemic transition from controlled landfill to open dumping has transformed Kelurahan Pojok into a sacrifice zone bearing a disproportionate share of the city's ecological burden. Residents face chronic exposure to respiratory disorders, groundwater contamination, odor pollution, and social space degradation, constituting a form of slow violence that erodes community well-being across generations. Government responses have remained ad hoc and technocratic, failing to address structural roots, while public participation was ignored from the landfill's inception. **Conclusion:** This study affirms that the TPA Klotok crisis is a manifestation of organized irresponsibility, demanding a paradigmatic shift toward ecological justice-based governance and meaningful community participation. **Novelty/Originality of this article:** This study offers a novel application of Beck's Risk Society framework to an underexplored peri-urban landfill context in Indonesia, revealing how manufactured uncertainty and organized irresponsibility operate at the intersection of local governance failure and ecological injustice.

KEYWORDS: environmental-health monitoring; environmental health risks; health-service capacity; peri-urban housing development; primary health care readiness.

1. Introduction

Primary health care (PHC) functions as the first-contact level of care, integrating promotive, preventive, diagnostic, curative, rehabilitative, and referral services with population-oriented public-health functions (Jimenez et al., 2021a, 2021b; Khatri et al., 2023). Its effectiveness depends not only on the availability of health facilities but also on

Cite This Article:

Sulaiman, Jufri, Sahida, M., Rusli, & Syahrudin. (2026). Health-service capacity and environmental health risks in a peri-urban housing development area. *EcoVision: Journal of Environmental Solutions*, 3(2), 252–268. <https://doi.org/10.61511/evojes.v3i2.2026.3935>

Copyright: © 2026 by the authors. This article is distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).



accessibility, comprehensiveness, continuity, coordination, workforce capacity, and referral mechanisms (Ayanore et al., 2022; Khatri et al., 2023). Workforce composition and multidisciplinary capacity are particularly important for responding to diverse population needs and coordinating care across different levels of the health system (Kapoor et al., 2022). Therefore, in growing residential areas, PHC readiness should be assessed using a multidimensional approach that incorporates workforce availability, referral capacity, surveillance, and population-oriented public-health functions rather than facility numbers alone (Ayanore et al., 2022; World Health Organization, 2021).

Peri-urban housing growth can expand access to shelter and urban opportunities, but rapid settlement expansion may also increase pressure on water supply, sanitation, solid-waste management, drainage, mobility, vector control, and health services (Hutchings et al., 2022). Peri-urban areas are particularly vulnerable to service gaps because population growth and land-use transformation can occur faster than the extension and integration of essential infrastructure, producing uneven levels of service provision across newly developed settlements (Hutchings et al., 2022). Evidence from Southeast Asia and the Western Pacific also indicates that peri-urban communities may continue to rely on inadequately managed sanitation systems, with sanitation deficiencies associated with adverse health outcomes and substantial infrastructure inequalities (Nasim et al., 2022). In Indonesia, inadequate water and sanitation infrastructure remains a concern in peri-urban settings and has been linked to potential exposure to waterborne contaminants and related health risks (Nasim et al., 2022; Poague et al., 2022). Urban-health research further emphasizes that health risks are produced through interactions among demographic change, infrastructure, environmental conditions, and governance, rather than through population growth alone (Connolly et al., 2020). Therefore, assessment of peri-urban residential development should consider not only housing provision but also the adequacy, accessibility, and spatial distribution of essential infrastructure and health-related services (Caruso et al., 2015; Hutton & Chase, 2017; Odagiri et al., 2021).

In the study area, the available baseline combines district-level health-facility data, service-area workforce and disease records, and a rapid household environmental-health assessment, thereby providing complementary information on healthcare availability, service capacity, population health needs, and environmental conditions (Agustina et al., 2019; Mahendradhata & Hort, 2017). The facility data indicate the presence of hospitals, clinics, inpatient of Public Health Centers/*Pusat Kesehatan Masyarakat* (Puskesmas), and pharmacies, while the disease records show a mixed burden of respiratory infection, tuberculosis, typhoid, dermatitis, acute gastroenteritis, hypertension, and diabetes mellitus; this combination of communicable and non-communicable conditions highlights the need to consider both primary-care capacity and continuity of care when assessing local health-service readiness (Arsyad et al., 2022; Haemmerli et al., 2021a; Khatri et al., 2023). The household data additionally indicate potential environmental-health exposure pathways related to wells, septic systems, residential density, flooding, and standing water, which may increase opportunities for exposure to fecal contamination and water- and vector-related hazards in densely populated settlements (French et al., 2021; Mills et al., 2025; Odagiri et al., 2021). In this context, combining facility-based health information with household-level environmental indicators provides a broader basis for identifying spatial overlaps between service needs and environmental-health risks (Anvari et al., 2025; Aprilia et al., 2025; Singh, Sharma et al., 2018; Smith et al., 2023). Such an integrated baseline is particularly relevant in rapidly developing residential areas, where expansion of the population and built environment may occur alongside persistent gaps in sanitation, water infrastructure, and access to adequate health services (French et al., 2021; Mills et al., 2025).

These data are useful for planning, but physical facility availability should be distinguished from functional service capacity because the presence of a health facility does not necessarily indicate that it has adequate staffing, equipment, medicines, diagnostics, infrastructure, or operational capacity to deliver the required services (Haemmerli et al., 2021a; World Health Organization, 2021). This distinction is particularly relevant in primary-care assessment, where service availability refers primarily to the physical

presence of services and resources, whereas service readiness reflects the capacity of facilities to provide services according to defined standards (Haemmerli et al., 2021b). The interpretation of the present baseline therefore also requires careful treatment of incomplete or inconsistent source tables, particularly when data originate from different administrative, facility, and household sources with different reporting structures and denominators (Chaudhuri & Roy, 2017; Husin et al., 2024). The rapid household assessment was relatively small and several variables had different valid denominators; consequently, the resulting estimates should be interpreted as descriptive evidence of local conditions rather than population-representative epidemiological estimates. This approach is consistent with health-system measurement frameworks that emphasize context-specific indicators and appropriate interpretation of data for subnational planning and resource allocation (Arsyad et al., 2022; Mahendradhata & Hort, 2017). Rather than treating the baseline as a representative epidemiological survey, this study uses the available evidence as planning-level information to identify service-readiness gaps, characterize environmental-health risks, and support prioritization of further assessment and intervention. Such an approach is particularly appropriate for preliminary health-system and environmental-health planning, where facility-level readiness information can be integrated with contextual population and environmental data to identify areas requiring more detailed investigation (Ayanore et al., 2022).

This study therefore aims to; (1) describe the availability, distribution, and basic characteristics of health facilities and workforce composition relevant to the planned residential area, including their potential capacity to support the anticipated population; (2) summarize recorded priority-disease patterns within the relevant service area to identify major communicable and non-communicable health concerns that may require consideration in service planning; (3) identify household-level environmental-health risk pathways, including those associated with water sources, sanitation systems, residential density, flooding, drainage, and standing water; and (4) integrate the health-service and environmental-health findings into an implementation framework that translates identified needs and risks into practical actions, with clearly defined responsibilities for the residential developer, local government, and Puskesmas. The framework is intended to support coordinated planning before and during residential development, strengthen the alignment between population growth and essential health services, and provide a practical basis for monitoring service readiness and environmental-health conditions as the residential area expands.

2. Methods

2.1 Study design, setting, data sources and variables

This study used a descriptive case-study design based on pre-existing secondary and rapid-assessment data compiled for the health baseline of the proposed Sunville Residence development area in Paccinongang, Gowa Regency, South Sulawesi, Indonesia. A case-study approach is appropriate for examining a clearly bounded real-world setting using multiple complementary data sources, including documentary and descriptive quantitative information (Greenhalgh, 2025). The analysis was designed for baseline interpretation and planning, not causal inference, because the study describes the characteristics and context of a specific development area rather than testing causal relationships (Greenhalgh, 2025). No new field data were collected by the manuscript authors; therefore, the findings are interpreted as a contextual planning baseline rather than as population-representative epidemiological estimates.

Four data components were analyzed. First, health-facility availability in Somba Opu District for 2021–2023 covered hospitals, maternity hospitals, clinics/treatment halls, inpatient Puskesmas, non-inpatient Puskesmas, and pharmacies; the published district source was Somba Opu District in Figure 2024. Second, 2024 workforce records for the Puskesmas Samata service area included general practitioners, dentists, midwives, nurses,

nutrition personnel, public-health personnel, environmental-health personnel, pharmacy personnel, and laboratory analysts. Third, routine disease records covered selected leading conditions during 2022–2024. Fourth, the project baseline contained 21 household environmental-health records.

2.2 Rapid household assessment: Provenance and instrument

The 21-household rapid assessment was part of a pre-existing project baseline database supplied to the authors by Limited Liability Company/*Perseroan Terbatas* (PT) Enviro Celebes Konsultan. The manuscript authors did not conduct the original household visits. The source material available for this revision did not identify the individual enumerators or specify their organizational affiliation; this limitation is now stated explicitly rather than inferring personnel not documented in the source.

The complete original questionnaire or observation checklist was not included in the available source material. The structured dataset nevertheless shows that the assessment captured dwelling type and ownership, clean-water source, wastewater disposal, solid-waste management, local density, nearby environmental exposures, ventilation, flood vulnerability, and standing-water or mosquito-breeding potential. The study therefore treats these variables as items from a rapid environmental-health screening instrument. Because the original instrument, validation procedure, interviewer instructions, and sampling frame were unavailable, no claim is made regarding psychometric validity or population representativeness.

2.3 Data analysis, missing data, denominator handling, and quality control

Facility counts were summarized by year and interpreted by service role. Workforce counts were converted to proportions of the 52-person workforce. Disease records were summarized descriptively by year; blanks were retained as missing rather than interpreted as zero. The analysis emphasized recorded service demand and planning implications rather than incidence trends because denominator populations and case definitions were not consistently available.

Environmental-health variables were summarized as counts and proportions using the valid denominator available for each item. Water, sanitation, waste, density, flooding, ventilation, and standing-water indicators were interpreted as potential exposure or service-pressure pathways. The interpretation was guided by established links between housing conditions, stormwater, waste management, vector ecology, and health (Bonnetfof, 2007; Gaffield et al., 2003; Hopp & Foley, 2001; Kaza et al., 2018; Rentschler et al., 2022).

The rapid assessment contained 21 household records overall, but some source-table categories summed to 20. For variables with totals of 20, one of the 21 records was not represented in the tabulated categories; the source did not document whether this reflected a missing response, an unclassified observation, or a transcription omission. Those variables were therefore analyzed using $n = 20$ valid tabulated observations, whereas variables with complete category totals used $n = 21$. No missing value was recoded as a negative response, and no value was imputed. Facility and workforce totals were cross-checked against row-level values, disease blanks were retained as missing, and inconsistent solid-waste labels were flagged rather than merged. These rules preserve the audit trail of the source data and limit overinterpretation.

3. Results and Discussion

3.1 Health facilities and primary-care access

Health-facility availability changed modestly from 2021 to 2023. Hospitals increased from two to three, clinics/treatment halls from 15 to 19, and inpatient Puskesmas remained at two. No maternity hospital or non-inpatient Puskesmas was listed in the district category,

while pharmacies remained at 62 (Table 1; Figure 1). The pattern indicates growth in selected service points without a parallel increase in public primary-care units.

Table 1. Health-facility availability in Somba Opu District, 2021-2023

Health facility	2021	2022	2023	Main service interpretation
Hospital	2	2	3	Integrated referral, outpatient, inpatient, and emergency care
Maternity hospital	0	0	0	Maternal, delivery, neonatal, and reproductive-health service
Clinic/treatment hall	15	18	19	Outpatient diagnosis and basic treatment
Inpatient Puskesmas	2	2	2	Public first-level service with inpatient capacity
Non-inpatient Puskesmas	0	0	0	Public first-level outpatient, preventive, and promotive service
Pharmacy	62	62	62	Pharmaceutical service and drug-use counselling

Facility counts should not be interpreted as equivalent service capacity. hospitals, clinics, pharmacies, and Puskesmas perform different functions, and a large number of pharmacies does not substitute for prevention, surveillance, maternal-child health, environmental-health inspection, or coordinated referral. For the planned housing development, service readiness is therefore better judged by functional coverage and coordination than by proximity to any single facility type.

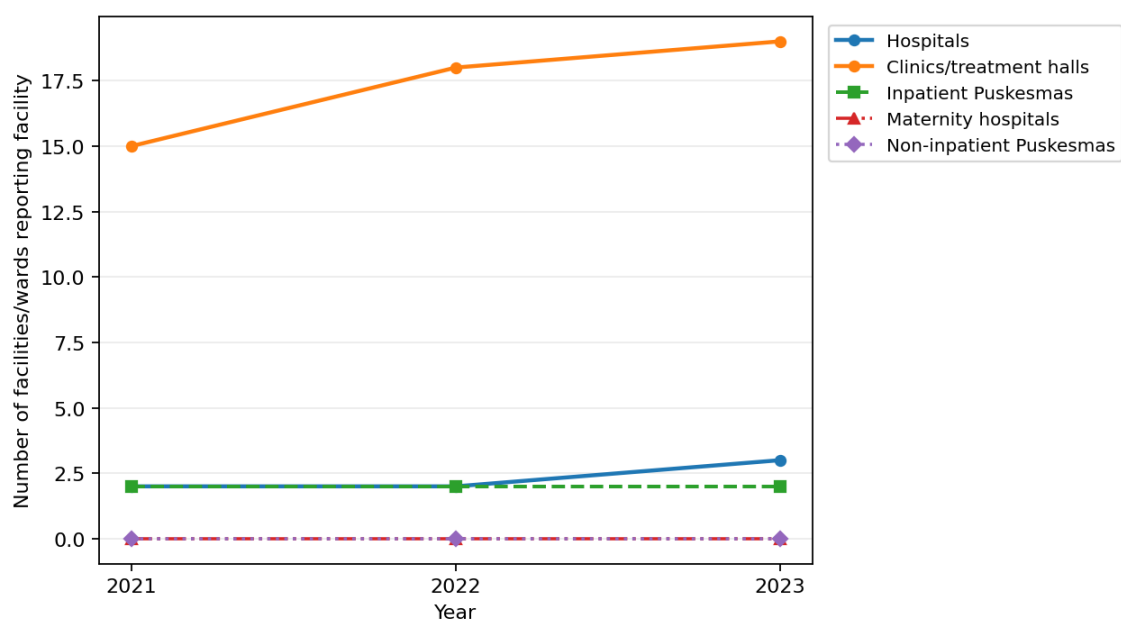


Fig. 1. Health-facility availability in Somba Opu, 2021-2023, excluding pharmacies to improve visual comparison of primary-care and referral categories

The Samata service area recorded 52 health workers in 2024 (Table 2). Midwives represented 38.5% of the workforce and nurses 25.0%, followed by public-health personnel (15.4%) and general practitioners (9.6%). Environmental-health personnel accounted for 5.8%, pharmacy personnel 3.8%, and laboratory analysts 1.9%. The workforce profile supports routine clinical, nursing, and maternal-child services, but the smaller environmental-health, pharmacy, and laboratory categories may become operational bottlenecks if residential population and service demand increase. This finding supports targeted readiness planning rather than relying on the total workforce count alone.

Table 2. Health workforce profile of the Puskesmas Samata service area, 2024

Category	Number	Share (%)	Main service relevance
General practitioners	5	9.6	General medical care, diagnosis, emergency triage, referral
Dentists	2	3.8	Oral-health care and prevention
Midwives	20	38.5	Maternal, neonatal, child-health, and family-planning services
Nurses	13	25.0	Outpatient nursing, procedures, wound care, patient support
Nutrition personnel	3	5.8	Nutrition assessment, counselling, stunting and anaemia prevention
Public-health personnel	8	15.4	Surveillance, health promotion, community empowerment
Environmental-health personnel	3	5.8	Water, sanitation, waste, vector, and environmental risk control
Pharmacy personnel	2	3.8	Drug management and rational-use counselling
Laboratory analysts	1	1.9	Basic diagnostic and surveillance support
Total	52	100.0	

3.2 Disease burden and service implications

Routine records show a mixed communicable, environmental, and chronic disease burden (Table 3). Acute respiratory infection remained the largest recorded category, decreasing from 2,686 cases in 2022 to 1,630 in 2024. In 2024, other high recorded categories included hypertension (845), tuberculosis (439), diabetes mellitus (368), dermatitis allergy (343), typhoid (316), gastritis (294), acute pharyngitis (231), febrile illness (201), and acute gastroenteritis (162) (Figure 2).

Table 3. Selected priority-disease records in the Samata service area, 2022–2024

Disease	2022	2023	2024	Planning implication
Acute respiratory infection	2,686	2,348	1,630	Ventilation, density, outpatient triage, health education
Dermatitis allergy	1,488	1,231	343	Water, hygiene, allergen, and environmental-contact control
Hypertension	1,398	975	845	Long-term screening, counselling, and medication continuity
Diabetes mellitus	707	677	368	Chronic care, diet, activity, medicine access
Tuberculosis	-	932	439	Case finding, diagnosis, adherence, household ventilation
Typhoid	-	-	316	Water and food safety, sanitation, outbreak vigilance
Gastritis	-	702	294	Outpatient care and health education
Acute pharyngitis	-	-	231	Respiratory transmission and outpatient care
Acute gastroenteritis	-	-	162	Water, sanitation, hygiene, and rehydration readiness

Note: A dash indicates that the category was not reported in the available annual table and should not be interpreted as zero cases.

Changes across years must be interpreted cautiously because several disease categories were blank in 2023 or 2024. A blank was treated as missing, not zero, because the source did not clarify whether it reflected non-reporting, a change in coding, or exclusion from the annual leading-disease list. The available data therefore support description of recorded burden but not formal estimation of year-to-year incidence change.

The pattern implies simultaneous service needs: respiratory and tuberculosis case finding, continuity of care for hypertension and diabetes, and water- and sanitation-related prevention for typhoid and acute gastroenteritis. Source-reported incidence indicators are summarized separately in Table 4 to distinguish rates from raw case counts.

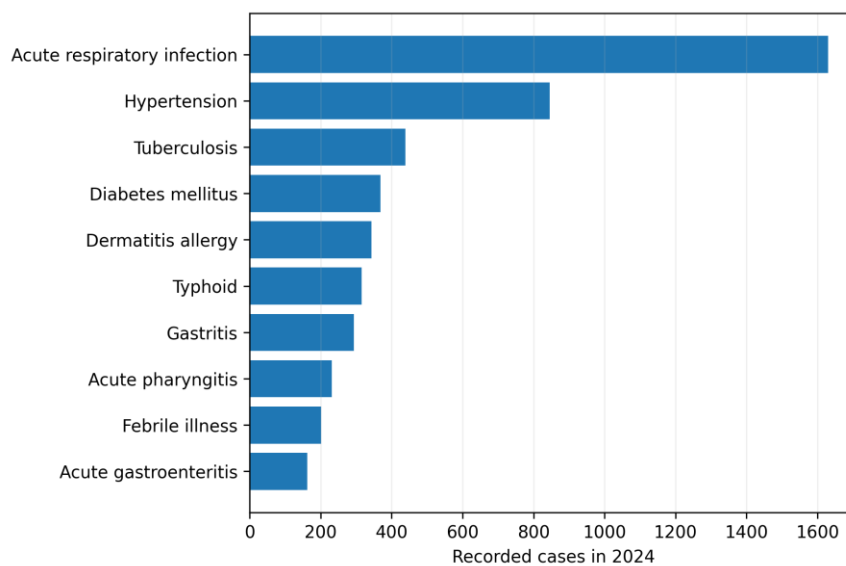


Fig. 2. Selected priority-disease records in the Samata service area, 2024. Values are recorded case counts, not population incidence rates

Figure 2 shows that acute respiratory infection (ARI) was the most frequently recorded condition in the Samata service area in 2024, with 1,630 cases, substantially exceeding hypertension (845 cases) and tuberculosis (439 cases). Other recorded conditions included diabetes mellitus (368), dermatitis allergy (343), typhoid (316), gastritis (294), acute pharyngitis (231), febrile illness (201), and acute gastroenteritis (162). The distribution therefore indicates a mixed disease burden involving respiratory, communicable, environmental-related, and chronic conditions, suggesting that health-service planning for the proposed residential area should integrate communicable-disease surveillance with chronic-disease prevention and management rather than focus on a single disease category. This multidimensional approach is consistent with the role of primary health care in addressing both infectious and non-communicable diseases through prevention, early detection, treatment, continuity of care, and population-oriented interventions (Hone et al., 2021). The relatively high number of respiratory infections also indicates the importance of maintaining appropriate respiratory-disease surveillance and health-promotion measures as population density and service demand increase.

The occurrence of dermatitis, typhoid, and acute gastroenteritis further supports the incorporation of water, sanitation, hygiene (WASH), food safety, drainage, and environmental-health measures into residential health planning, particularly where environmental conditions may influence exposure pathways (Prüss-Ustün et al., 2019; Wolf et al., 2023). At the same time, the recorded hypertension and diabetes cases indicate the need for continued screening, treatment, follow-up, and referral capacity for chronic diseases as part of an integrated primary-care system (Geldsetzer et al., 2019). Importantly, the values presented in Figure 2 represent recorded case counts rather than population-based incidence or prevalence rates; therefore, they should be interpreted as an indication of service-recorded disease burden rather than direct comparisons of disease risk across the population. Differences in population size, healthcare-seeking behaviour, diagnostic practices, reporting completeness, and service utilization may influence recorded case numbers. Accordingly, Figure 2 should primarily be used as a planning-level indicator of health-service demand, supporting decisions on surveillance priorities, workforce

preparedness, health promotion, chronic-disease management, and environmental-health interventions for the proposed residential development.

Table 4. Source-reported annual incidence indicators for selected priority diseases

Condition	Reported rate	Unit	Planning relevance
Acute respiratory infection	10.44	Per 1,000 population	Respiratory prevention, triage, ventilation
Tuberculosis	2.81	Per 1,000 population	Case finding, diagnosis, adherence, contact follow-up
Dermatitis allergy	2.20	Per 1,000 population	Water, hygiene, and environmental exposure
Typhoid	2.02	Per 1,000 population	Water and food safety, sanitation
Gastritis	1.88	Per 1,000 population	Outpatient management and health education
Acute pharyngitis	1.48	Per 1,000 population	Respiratory transmission and outpatient care
Febrile illness	1.29	Per 1,000 population	Early assessment and differential diagnosis
Acute gastroenteritis	1.04	Per 1,000 population	WASH safeguards and rehydration readiness

Note: Source-reported vulnerability/priority-disease indicators in the project baseline. Hypertension (0.54) and diabetes mellitus (0.24) were reported as prevalence indicators, but their denominator/unit was not specified; they are therefore not combined with the incidence rates above.

This study provides a context-specific health baseline for the proposed Sunville Residence development in Paccinongang, Gowa Regency, using a descriptive case-study design that integrates pre-existing secondary records with rapid household environmental-health assessment. As summarized in Table 4, the baseline brings together information on health-facility availability, workforce composition, recorded disease patterns, and household environmental-health conditions, allowing different dimensions of the local health context to be examined simultaneously. This type of case-study approach is appropriate for investigating complex, context-dependent health-service conditions using multiple complementary sources of evidence (Sibbald et al., 2021). The integration of these data also provides a more comprehensive basis for interpreting the relationship between existing service capacity and the health and environmental conditions relevant to the planned residential area (Mahendradhata & Hort, 2017; Mills et al., 2025)

The analysis was designed for baseline interpretation and planning rather than causal inference. The findings presented in Table 4 should therefore be interpreted as descriptive evidence of the existing planning context rather than as estimates of population-representative disease prevalence or causal relationships. This distinction is important because the underlying datasets were collected for different purposes and may vary in completeness, coverage, and denominator structure. Case-study research can provide valuable understanding of complex real-world contexts, but conclusions should remain proportionate to the design and evidence available (French et al., 2021; Greenhalgh, 2025). Accordingly, the baseline presented in Table 4 is used to identify potential service-readiness gaps, priority health conditions, and environmental-health pathways that warrant attention during residential development (Greenhalgh, 2025). The findings can subsequently serve as a planning reference for more systematic field assessment, routine monitoring, and implementation of health and environmental safeguards.

3.3 Household environmental-health risks

The rapid household assessment identified several environmental-health pathways relevant to a new residential development. Because item denominators varied, the results

are presented as screening indicators rather than population prevalence estimates (Table 5; Figure 3). Water-source records were complete for 21 households: 12 used Local Water Company/ Perusahaan Daerah Air Minum (PDAM) water (57.1%), seven used dug wells (33.3%), and two used boreholes (9.5%). Ten households (47.6%) reported private septic tanks. The combination of wells and on-site sanitation warrants attention to source protection, septic placement, desludging, drainage, and periodic water-quality monitoring, especially where flooding can mobilize contamination.

The source table also reported 11 households using city drainage or disposal channels for wastewater. This mixed wastewater arrangement suggests that project-level sanitation design should consider both internal infrastructure and downstream effects on surrounding drainage networks. Stormwater and wastewater controls are important because inadequately managed runoff can transfer contaminants beyond individual property boundaries (Gaffield et al., 2003).

Solid-waste entries were internally inconsistent: two similarly worded collection categories contained 14 and seven records. These values were not combined because the source did not explain whether they represented different collection systems or duplicated labels. The revised analysis therefore treats solid-waste service regularity as a monitoring priority rather than reporting a single percentage. Reliable collection remains important for drainage performance and vector control (Kaza et al., 2018).

Table 5. Selected environmental-health risk indicators from the rapid household assessment

Indicator	Count	Approx. share	Public-health interpretation
PDAM water	12/21	57.1%	Piped-water access exists but does not cover all assessed households
Dug well	7/21	33.3%	Potential shallow-groundwater vulnerability if sanitation is weak
Borehole	2/21	9.5%	Alternative source requiring quality and abstraction monitoring
Private septic tank	10/21	47.6%	Requires safe design, distance from wells, and desludging
Very dense or dense environment	15/20	75.0%	Potential pressure on ventilation, waste, drainage, and disease transmission
Flood-prone houses	11/20	55.0%	Risk pathway for waterborne, skin, and vector-related diseases
Standing-water potential	16/20	80.0%	Mosquito-breeding and dengue-risk pathway
Adequate ventilation	19/20	95.0%	Protective factor for respiratory risk if maintained

Note: Source from project rapid household environmental-health assessment in 2024. Percentages use the valid denominator available for each item; n = 21 for complete categories and n = 20 where the source table contained only 20 classified observations.

Among variables with 20 valid tabulated observations, 15 locations (75.0%) were categorized as very dense or dense, 11 (55.0%) as flood-prone, 16 (80.0%) as having standing-water potential, and 19 (95.0%) as having adequate ventilation. Flooding and standing water are the clearest warning signals because they can interact with sanitation, waste, and mosquito habitat (Hopp & Foley, 2001; Rentschler et al., 2022). These findings should be read as spatially uneven risks rather than area-wide averages. Future monitoring should map drains, flood-prone points, wells, septic systems, waste collection points, and standing-water locations so that corrective actions can be targeted to specific hotspots.

The source-reported priority-disease rates reinforce the same planning priorities. Acute respiratory infection had the highest reported annual incidence at 10.44 per 1,000 population, followed by tuberculosis (2.81), dermatitis allergy (2.20), typhoid (2.02), gastritis (1.88), acute pharyngitis (1.48), febrile illness (1.29), and acute gastroenteritis (1.04) (Table 4). Hypertension and diabetes were reported separately as prevalence

indicators (0.54 and 0.24), but the source did not specify their denominator or unit; they are therefore not presented as incidence rates.

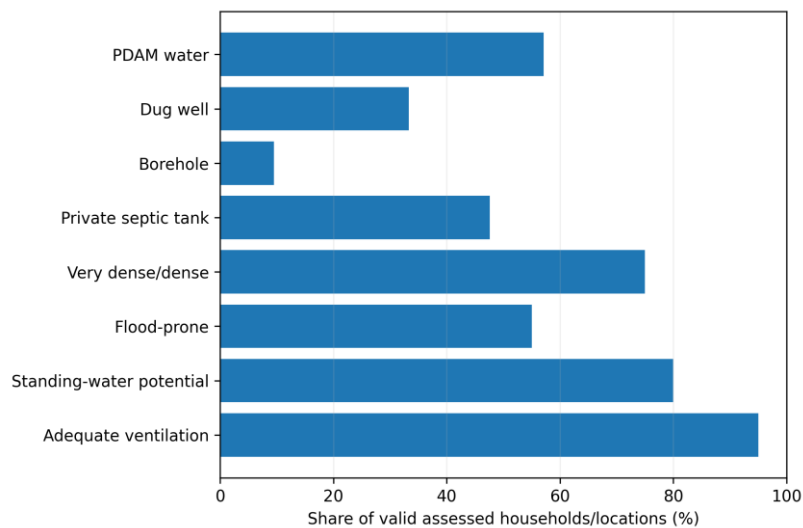


Fig. 3. Selected environmental-health indicators from the rapid household assessment. Percentages use item-specific valid denominators (n = 20–21)

3.4 Integrated readiness, management implications, limitations, and monitoring priorities

The combined findings indicate three linked readiness domains: service availability, workforce mix, and environmental safeguards (Arsyad et al., 2022; Setiaasih et al., 2025). These domains should be considered together because population growth can increase demand for primary healthcare while simultaneously requiring adequate infrastructure, human resources, and organizational capacity to maintain accessible and integrated services (Arsyad et al., 2022; Setiaasih et al., 2025). A pre-occupancy coordination mechanism should therefore link projected household growth with Puskesmas registration, referral pathways, maternal and child health services, tuberculosis surveillance, chronic-disease follow-up, water and sanitation management, drainage, and vector control, so that health-service capacity and environmental-health protection can develop alongside population growth (Khatri et al., 2023; Setiaasih et al., 2025). Such integration is consistent with evidence that effective primary healthcare requires continuity and coordination across providers and levels of care, supported by multidisciplinary teams, information systems, community collaboration, and multisectoral coordination (Khatri et al., 2023).

The developer should lead project-level infrastructure and environmental controls during construction and handover, including reliable water supply, appropriate wastewater and septic-system design, adequate drainage capacity, construction-waste management, dust control, and systematic removal of water-holding containers (Nasim et al., 2022; Odagiri et al., 2021). These measures fall largely within the development footprint and can therefore be incorporated into construction specifications, contractor requirements, inspection procedures, and handover criteria, particularly because deficiencies in water, sanitation, drainage, and waste infrastructure can create environmental-health risks beyond individual properties (French et al., 2021; Rahmasary et al., 2021). Construction-phase dust also warrants explicit management because construction activities can substantially increase particulate concentrations in surrounding environments, with potential implications for nearby residents and workers (Wimalasena et al., 2021; Yan et al., 2020). The developer should consequently demonstrate that critical infrastructure is functional before occupancy and establish a documented mechanism for identifying, correcting, and verifying deficiencies during construction and early operation, consistent with the need for systematic environmental assessment and management of rapidly developing residential areas (Rahmasary et al., 2021; Yan et al., 2020).

Local government should lead regulatory oversight and cross-sector coordination, including integration of drainage and waste services beyond the project boundary, monitoring of compliance with relevant requirements, and verification that essential safeguards remain functional after handover (Sibbald et al., 2021). This role is important because drainage, waste management, environmental sanitation, vector control, and access to health services extend across administrative and sectoral boundaries and therefore require coordinated governance rather than isolated project-level interventions (French et al., 2021; Khatri et al., 2023). The Puskesmas should lead population-health functions, including registration of new residents, health promotion, priority-disease surveillance, maternal-child outreach, tuberculosis follow-up, continuity of hypertension and diabetes care, and referral coordination, consistent with the increasingly integrated role of primary-care networks in Indonesia (Setiaasih et al., 2025; Arsyad et al., 2022). This division of responsibilities is consistent with contemporary PHC evidence emphasizing integrated primary care, multidisciplinary workforce capacity, referral and communication linkages, community engagement, surveillance, and multisectoral coordination across different levels of the health system (French et al., 2021; Khatri et al., 2023; Khatri et al., 2023).

Table 6. Recommended actions and lead implementation responsibility

Action	Lead responsibility	Supporting actors	Minimum monitoring evidence
Water supply and wastewater/septic safeguards	Developer	Local government; Puskesmas environmental-health staff	Commissioning records; water-quality checks; desludging plan
Drainage, flood, and standing-water control	Developer during construction/handover; local government after handover	Residents; Puskesmas	Post-rain inspection; flood-event log; corrective-action record
Construction waste, dust, and vector habitat control	Developer	Local government	Site inspection checklist; complaint log; vector-habitat removal record
New-resident health registration and health promotion	Puskesmas	Developer; neighbourhood organizations	Registration coverage; outreach schedule; attendance records
TB, maternal-child health, hypertension, and diabetes follow-up	Puskesmas	Referral facilities; local government	Program registers; referral completion; continuity indicators
Cross-sector compliance and post-handover oversight	Local government	Developer; Puskesmas	Inspection minutes; assigned responsible unit; unresolved-action tracker

Monitoring should compare conditions across four implementation stages—pre-construction baseline, construction, early occupancy, and full occupancy—using a limited set of measurable and auditable indicators (Khatri et al., 2023; World Health Organization, 2021). Repeated measurement across implementation stages can help distinguish baseline conditions from changes associated with construction and population occupancy and can support timely identification of service-delivery gaps (Khatri et al., 2023; Khatri et al., 2023). The indicators should include outpatient visits, priority-disease counts, maternal-child health-service uptake, tuberculosis follow-up, continuity of hypertension and diabetes care, water-quality results, waste-collection regularity, flood events, standing-water findings, and completed vector-control actions, thereby combining health-service, disease-surveillance, and environmental-health measures (Arsyad et al., 2022; Setiaasih et al., 2025).

Establishing the baseline before construction provides a reference against which subsequent changes can be assessed, while repeated monitoring allows responsible institutions to identify emerging gaps and implement corrective measures (Khatri et al., 2023; Sibbald et al., 2021). The use of a limited, context-specific indicator set is consistent with primary-health-care measurement approaches that emphasize selecting indicators relevant to local priorities and using monitoring information to support planning, resource allocation, and system improvement. Environmental indicators should preferably be assessed during both dry and rainy seasons, because rainfall and seasonal hydrological conditions can influence drainage performance, flooding, standing water, and vector-breeding habitats (French et al., 2021; Geldsetzer et al., 2019). This monitoring framework can therefore function as an adaptive management mechanism, linking measurable changes in health and environmental conditions to defined institutional responsibilities, predefined response actions, and subsequent verification of whether corrective measures have been effective. Table 6 summarizes the proposed division of lead responsibility. The assignment is intended to reduce ambiguity: coordination is shared, but each action should have a designated lead institution and a documented monitoring record.

This study is limited by its reliance on secondary and rapid-assessment data. The source did not provide a sampling frame, response rate, full household instrument, individual enumerator information, geocoded observations, consistent disease denominators, or complete explanations for missing categories. The 21-household assessment should therefore be interpreted as a screening dataset rather than a representative community survey, and the study does not infer causal effects of the planned development on current disease patterns. Future baseline updates should use a documented questionnaire or checklist, record item-level missingness, apply consistent disease definitions and denominators, geocode environmental observations, and repeat measurements across seasons. Service-readiness monitoring should additionally include travel time, opening hours, workload, referral use, water-quality testing, and response times for drainage, waste, and vector-control problems.

4. Conclusions

The baseline shows that peri-urban housing growth should be managed as a combined health-service and environmental-readiness issue. Existing facilities provide several points of care, but public primary-care distribution remains concentrated, and the Samata workforce has relatively small environmental-health, pharmacy, and laboratory components. Routine records show simultaneous respiratory, tuberculosis, gastrointestinal, and chronic-disease demands, while household screening identifies well use, septic systems, flood exposure, density, and standing-water potential as relevant environmental pathways. These findings support repeated monitoring rather than a one-time baseline assessment. Implementation responsibilities should be explicit. The developer should be responsible for project-level water, wastewater, drainage, construction waste, dust, and vector safeguards until formal handover. Local government should be responsible for regulatory compliance, cross-sector coordination, external drainage and waste-service integration, and post-handover oversight. The Puskesmas should be responsible for health surveillance, health promotion, maternal-child health, tuberculosis follow-up, chronic-disease continuity, and referral coordination. A shared monitoring record should document actions, responsible units, completion dates, and unresolved risks.

Acknowledgement

The authors acknowledge PT Enviro Celebes Konsultan for providing access to the database and supporting information required for this study. Appreciation is extended to the Government of Gowa Regency for its support and facilitation during the research process. The authors would like to express their sincere gratitude to the Institute for Research and Community Service/*Lembaga Penelitian dan Pengabdian kepada Masyarakat* (LPPM) of Sekolah Tinggi Ilmu Kesehatan Makassar, Universitas Indonesia Timur and

Universitas Nahdlatul Ulama Sulawesi Tenggara for their institutional support during the preparation of this study.

Author Contribution

All authors have read and agreed to the submitted version of the manuscript.

Funding

This research received no external funding.

Ethical Review Board Statement

The present study involved secondary analysis of pre-existing aggregate/de-identified records and did not recruit participants or collect new human-subject data.

Informed Consent Statement

No new informed consent was obtained for the present secondary analysis. Consent procedures for the original rapid assessment were not documented in the source material available to the authors.

Data Availability Statement

The study analyzed secondary project baseline records. Access to the underlying project database is subject to permission from the relevant data custodians.

Conflicts of Interest

The authors declare no conflict of interest.

Declaration of Generative AI Use

During the preparation of this manuscript draft, the authors used generative artificial intelligence assistance to support language drafting, organization, and formatting. After using this tool, the authors must review, verify, and edit the content as needed and take full responsibility for the content of the publication.

Open Access

©2026. The authors. This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit: <http://creativecommons.org/licenses/by/4.0/>

References

- Agustina, R., Dartanto, T., Sitompul, R., Susiloretni, K. A., Suparmi, Achadi, E. L., Taher, A., Wirawan, F., Sungkar, S., Sudarmono, P., Shankar, A. H., Thabrany, H., Soewondo, P., Ahmad, S. A., Kurniawan, M., Hidayat, B., Pardede, D., Mundiharno, Nelwan, E. J., Lupita, O., Setyawan, E., Nurwahyuni, A., Martiningsih, D., & Khusun, H. (2019). Universal health coverage in Indonesia: Concept, progress, and challenges. *The Lancet*, 393(10166), 75–102. [https://doi.org/10.1016/S0140-6736\(18\)31647-7](https://doi.org/10.1016/S0140-6736(18)31647-7)
- Anvari, E., Noorimotlagh, Z., Mirzaee, S. A., Nourmoradi, H., Bahmani, M., Roshan, N., Silva Martinez, S., Kamran, S., & Ahmadi, I. (2025). Establishing the mechanisms involved in the environmental exposure to polychlorinated biphenyls (PCBs) in the risk of male

- infertility. *Reproductive Sciences*, 32(3), 537–554. <https://doi.org/10.1007/s43032-025-01794-x>
- Aprilia, A., Wahidin, A. B., & Syafriadi. (2025). Seismic activity analysis in Indonesia: Integrating machine learning, geospatial data, and environmental factors for risk assessment. *JPF (Jurnal Pendidikan Fisika) Universitas Islam Negeri Alauddin Makassar*, 13(1), 12–26. <https://doi.org/10.24252/JPF.V13I1.54081>
- Arsyad, D. S., Hamsyah, E. F., Qalby, N., Qanitha, A., Westerink, J., Cramer, M. J., Visseren, F. L. J., Doevendans, P. A., & Ansariadi, A. (2022). The readiness of public primary health care (PUSKESMAS) for cardiovascular services in Makassar city, Indonesia. *BMC Health Services Research*, 22(1), 1112. <https://doi.org/10.1186/s12913-022-08499-w>
- Ayanore, M., Asampong, R., Akazili, J., Awoonor-Williams, J. K., & Akweongo, P. (2022). Sub-national variations in general service readiness of primary health care facilities in Ghana: Health policy and equity implications towards the attainment of universal health coverage. *PLOS ONE*, 17(6), e0269546. <https://doi.org/10.1371/JOURNAL.PONE.0269546>
- Caruso, B. A., Sevilimedu, V., Fung, I. C. H., Patkar, A., & Baker, K. K. (2015). Gender disparities in water, sanitation, and global health. *The Lancet*, 386(9994), 650–651. [https://doi.org/10.1016/S0140-6736\(15\)61497-0](https://doi.org/10.1016/S0140-6736(15)61497-0)
- Chaudhuri, S., & Roy, M. (2017). Rural-urban spatial inequality in water and sanitation facilities in India: A cross-sectional study from household to national level. *Applied Geography*, 85, 27–38. <https://doi.org/10.1016/j.apgeog.2017.05.003>
- Connolly, C., Keil, R., & Ali, S. H. (2020). Extended urbanisation and the spatialities of infectious disease: Demographic change, infrastructure and governance. *Urban Studies*, 58(2), 0042098020910873. <https://doi.org/10.1177/0042098020910873>
- French, M. A., Barker, S. F., Taruc, R. R., Ansariadi, A., Duffy, G. A., Saifuddaolah, M., Zulkifli Agussalim, A., Awaluddin, F., Zainal, Z., Wardani, J., Faber, P. A., Fleming, G., Ramsay, E. E., Henry, R., Lin, A., O'Toole, J., Openshaw, J., Sweeney, R., Sinharoy, S. S., Kolotelo, P., Jovanovic, D., Schang, C., Higginson, E. E., Prescott, M. F., Burge, K., Davis, B., Ramirez-Lovering, D., Reidpath, D., Greening, C., Allotey, P., Simpson, J. A., Forbes, A., Chown, S. L., McCarthy, D., Johnston, D., Wong, T., Brown, R., Clasen, T., Luby, S., Leder, K., & RISE Consortium. (2021). A planetary health model for reducing exposure to faecal contamination in urban informal settlements: Baseline findings from Makassar, Indonesia. *Environment International*, 155, 106679. <https://doi.org/10.1016/j.envint.2021.106679>
- Geldsetzer, P., Manne-Goehler, J., Marcus, M.-E., Ebert, C., Zhumadilov, Z., Wesseh, C. S., Tsabedze, L., Supiyev, A., Sturua, L., Bahendeka, S. K., Sibai, A. M., Quesnel-Crooks, S., Norov, B., Mwangi, K. J., Mwalim, O., Wong-McClure, R., Mayige, M. T., Martins, J. S., Lunet, N., ... Jaacks, L. M. (2019). The state of hypertension care in 44 low-income and middle-income countries: A cross-sectional study of nationally representative individual-level data from 1.1 million adults. *The Lancet*, 394(10199), 652–662. [https://doi.org/10.1016/S0140-6736\(19\)30955-9](https://doi.org/10.1016/S0140-6736(19)30955-9)
- Greenhalgh, T. (2025). Case studies: A guide for researchers, educators, and implementers. *BMJ Medicine*, 4(1). <https://doi.org/10.1136/BMJMED-2025-001623>
- Haemmerli, M., Powell-Jackson, T., Goodman, C., Thabrany, H., & Wiseman, V. (2021). Poor quality for the poor? A study of inequalities in service readiness and provider knowledge in Indonesian primary health care facilities. *International Journal for Equity in Health*, 20(1), 239. <https://doi.org/10.1186/S12939-021-01577-1>
- Hone, T., Macinko, J., & Millett, C. (2018). Revisiting Alma-Ata: What is the role of primary health care in achieving the Sustainable Development Goals? *The Lancet*, 392(10156), 1461–1472. [https://doi.org/10.1016/S0140-6736\(18\)31829-4](https://doi.org/10.1016/S0140-6736(18)31829-4)
- Husin, A., Nengsih, Y. K., & Helmi, H. (2025). The impact of environmental education on intergenerational knowledge transfer and household behavior: A quantitative study from Palembang. *International Journal of Environmental Impacts*, 8(1), 33–40. <https://doi.org/10.18280/IJEI.080104>

- Hutchings, P., Willcock, S., Lynch, K., Bundhoo, D., Brewer, T., Cooper, S., Keech, D., Mekala, S., Mishra, P. P., Parker, A., Shackleton, C. M., Venkatesh, K., Rey Vicario, D., & Welivita, I. (2022). Understanding rural–urban transitions in the Global South through peri-urban turbulence. *Nature Sustainability*, 5(11), 924–930. <https://doi.org/10.1038/s41893-022-00920-w>
- Hutton, G., & Chase, C. (2017). Water supply, sanitation, and hygiene. In *Disease control priorities, third edition (Volume 7): Injury prevention and environmental health* (pp. 171–198). World Bank. <https://doi.org/10.1596/978-1-4648-0522-6.CH9>
- Jimenez, G., Matchar, D., Koh, G. C. H., Tyagi, S., Van Der Kleij, R. M. J. J., Chavannes, N. H., & Car, J. (2021). Revisiting the four core functions (4Cs) of primary care: Operational definitions and complexities. *Primary Health Care Research & Development*, 22, e68. <https://doi.org/10.1017/S1463423621000669>
- Kapoor, S., Mohanty, V., Y. Balappanavar, A., Chahar, P., & Rijhwani, K. (2022). Primary health care workforce in Southeast Asia region, existing status and strategies for non-communicable diseases and oral health alliance: A scoping review. *Cureus*, 14(2). <https://doi.org/10.7759/CUREUS.22362>
- Khatri, R. B., Erku, D., Endalamaw, A., Wolka, E., Nigatu, F., Zewdie, A., & Assefa, Y. (2023). Multisectoral actions in primary health care: A realist synthesis of scoping review. *PLOS ONE*, 18(8), e0289816. <https://doi.org/10.1371/JOURNAL.PONE.0289816>
- Khatri, R., Endalamaw, A., Erku, D., Wolka, E., Nigatu, F., Zewdie, A., & Assefa, Y. (2023). Continuity and care coordination of primary health care: A scoping review. *BMC Health Services Research*, 23(1). <https://doi.org/10.1186/S12913-023-09718-8>
- Lye, C. T., Ng, T. H., & Law, J. W. (2024). The role of general and specific pro-environmental education in household waste management in Malaysia: Evidence from quantile regression. *Environmental Challenges*, 15, 100933. <https://doi.org/10.1016/j.ENVC.2024.100933>
- Mahendradhata, Y., & Hort, K. (2017). *The Republic of Indonesia health system review*. World Health Organization Regional Office for the Western Pacific.
- Mills, F., Maysarah, S., Priadi, C. R., Willetts, J., Evans, B., & Foster, T. (2025). Risk factors for well contamination in urban Indonesia: Evidence to inform siting of wells and sanitation systems. *Journal of Water and Health*, 23(12), 1415–1429. <https://doi.org/10.2166/WH.2025.036>
- Nasim, N., El-Zein, A., & Thomas, J. (2022). A review of rural and peri-urban sanitation infrastructure in South-East Asia and the Western Pacific: Highlighting regional inequalities and limited data. *International Journal of Hygiene and Environmental Health*, 244, 113992. <https://doi.org/10.1016/j.IJHEH.2022.113992>
- Odagiri, M., Thomas, A., Listyasari, M., Mills, F., Bain, R. E. S., Muhammad, Z., Slaymaker, T., Mardikanto, A., Gultom, A., Indiyani, A., Rangkuti, H., & Willetts, J. (2021). Safely managed on-site sanitation: A national assessment of sanitation services and potential fecal exposure in Indonesia. *International Journal of Environmental Research and Public Health*, 18(15), 8204. <https://doi.org/10.3390/ijerph18158204>
- Poague, K. I. H. M., Blanford, J. I., & Anthonj, C. (2022). Water, sanitation and hygiene in schools in low- and middle-income countries: A systematic review and implications for the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 19(5), 3124. <https://doi.org/10.3390/IJERPH19053124>
- Prüss-Ustün, A., Wolf, J., Bartram, J., Clasen, T., Cumming, O., Freeman, M. C., Gordon, B., Hunter, P. R., Medlicott, K., & Johnston, R. (2019). Burden of disease from inadequate water, sanitation and hygiene for selected adverse health outcomes: An updated analysis with a focus on low- and middle-income countries. *International Journal of Hygiene and Environmental Health*, 222(5), 765–777. <https://doi.org/10.1016/j.ijheh.2019.05.004>
- Rahmasary, A. N., Koop, S. H. A., & van Leeuwen, C. J. (2021). Assessing Bandung's governance challenges of water, waste, and climate change: Lessons from urban Indonesia. *Integrated Environmental Assessment and Management*, 17(2), 434–444. <https://doi.org/10.1002/IEAM.4334>

- Setiaasih, R., Sunjaya, D. K., Sofiatin, Y., Afriandi, I., Hilfi, L., & Herawati, D. M. D. (2025). Readiness of health posts for primary health care integration in Indonesia: A mixed-methods study. *BMC Public Health*, 25(1), 1429. <https://doi.org/10.1186/S12889-025-22520-X>
- Sibbald, S. L., Paciocco, S., Fournie, M., Van Asseldonk, R., & Scurr, T. (2021). Continuing to enhance the quality of case study methodology in health services research. *Healthcare Management Forum*, 34(5), 291–296. <https://doi.org/10.1177/08404704211028857>
- Singh, N. S., Sharma, R., Parween, T., & Patanjali, P. K. (2018). Pesticide contamination and human health risk factor. In *Modern age environmental problems and their remediation* (pp. 49–68). Springer. https://doi.org/10.1007/978-3-319-64501-8_3
- Smith, K., Fearnley, C. J., Dixon, D., Bird, D. K., & Kelman, I. (2023). *Environmental hazards: Assessing risk and reducing disaster* (7th ed.). Routledge. <https://doi.org/10.4324/9781351261647>
- Wimalasena, N. N., Chang-Richards, A., Wang, K. I. K., & Dirks, K. N. (2021). Housing risk factors associated with respiratory disease: A systematic review. *International Journal of Environmental Research and Public Health*, 18(6), 2815. <https://doi.org/10.3390/IJERPH18062815>
- Wolf, J., Johnston, R. B., Ambelu, A., Arnold, B. F., Bain, R., Brauer, M., Brown, J., Caruso, B. A., Clasen, T., Colford, J. M., Esteves-Mills, J., Evans, B., Freeman, M. C., Gordon, B., Kang, G., Lanata, C. F., Medlicott, K. O., Prüss-Ustün, A., Troeger, C., Boisson, S., & Cumming, O. (2023). Burden of disease attributable to unsafe drinking water, sanitation, and hygiene in domestic settings: A global analysis for selected adverse health outcomes. *The Lancet*, 401(10393), 2060–2071. [https://doi.org/10.1016/S0140-6736\(23\)00458-0](https://doi.org/10.1016/S0140-6736(23)00458-0)
- World Health Organization. (2021). *Primary health care measurement framework and indicators: Monitoring health systems through a primary health care lens*. World Health Organization. <https://www.who.int/publications/i/item/9789240044210>
- Yan, H., Ding, G., Feng, K., Zhang, L., Li, H., Wang, Y., & Wu, T. (2020). Systematic evaluation framework and empirical study of the impacts of building construction dust on the surrounding environment. *Journal of Cleaner Production*, 275, 122767. <https://doi.org/10.1016/J.ICLEPRO.2020.122767>

Biographies of Authors

Sulaiman, Public Health Study Program, Sekolah Tinggi Ilmu Kesehatan Makassar, Makassar, South Sulawesi 90241, Indonesia.

- Email: emanstikma@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: <https://sinta.kemdikbud.go.id/authors/profile/6828105>

Jufri, Public Health Study Program, Sekolah Tinggi Ilmu Kesehatan Makassar, Makassar, South Sulawesi 90241, Indonesia.

- Email: N/A
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: 58773574100
- Homepage: <https://scholar.google.com/citations?user=aT2g-P0AAAAJ&hl=id>

Muti Sahida, Nursing Study Program, Sekolah Tinggi Ilmu Kesehatan Makassar, Makassar, South Sulawesi 90241, Indonesia.

- Email: mutisahida1991@gmail.com
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A

Rusli, Department of Social and Political Sciences, Universitas Indonesia Timur, Makassar, South Sulawesi 90221, Indonesia.

- Email: N/A
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: <https://sinta.kemdiktisaintek.go.id/authors/profile/6721122>

Syahrudin, Department of Social and Political Sciences, Universitas Nahdlatul Ulama Sulawesi Tenggara, Kendari, Southeast Sulawesi 93116, Indonesia.

- Email: syahrudin@unusultra.ac.id
- ORCID: N/A
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A