© Volume 2, Issue 8, ***August*** 2026 | JATIR
ISSN: 3139-8464 (p)

Advancing Sustainable Development Goals Through Humanitarian WASH Interventions: Evidence, Gaps, And A Transformative Agenda for Water, Sanitation, And Hygiene in Crisis Settings

[1]Henry Omara, [2]Assoc. Prof. Mark Kiiza
[1]Department of Environmental Management, Selinus University of Sciences and Literature Rome-Italy
[2]School of Arts and Social Science Kampala University– Uganda

Abstract*—Access to water, sanitation, and hygiene remains among the most acutely unmet needs in humanitarian crises globally, yet the relationship between humanitarian WASH interventions and Sustainable Development Goal achievement has been treated in both policy discourse and academic literature as incidental to the primary emergency mandate rather than as a strategic priority. This article addresses that gap through a systematic narrative review of 87 peer-reviewed studies, intergovernmental reports, NGO programme evaluations, and framework documents published between 2020 and 2025, synthesising evidence on how humanitarian WASH interventions contribute to, constrain, or create pathways toward SDG achievement across health (SDG 3), education (SDG 4), gender equality (SDG 5), equitable access (SDG 10), climate action (SDG 13), and governance (SDG 16). Four analytical arguments organise the synthesis. First, humanitarian WASH constitutes a structural SDG investment whose returns extend across multiple goal dimensions when designed with deliberate SDG alignment. Second, the humanitarian-development nexus remains the central governance gap preventing WASH interventions from generating durable SDG progress beyond the immediate crisis period. Third, climate change is fundamentally reshaping the scale, character, and SDG implications of humanitarian WASH need in ways that existing SDG monitoring frameworks do not yet adequately reflect. Fourth, localization, focusing community knowledge, local actors, and context-adaptive governance, represents the most consequential systemic change available for improving both WASH quality and SDG alignment in humanitarian settings. Drawing

ISSN: 3139-8464 (p)

on these four arguments, the review proposes the Humanitarian WASH-SDG Integration Framework (HWSIF), synthesising evidence across five strategic domains: health systems strengthening, gender-transformative programming, climate-adaptive infrastructure, community governance, and Leave No One Behind targeting. The article concludes with six recommendations directed at humanitarian actors, national governments, UN agencies, bilateral donors, and the research community, constituting an agenda for transformative action toward the full realisation of humanitarian WASH programming as a structural investment in sustainable development.

Index Terms—WASH; Sustainable Development Goals; humanitarian-development nexus; climate resilience; Leave No One Behind; fragile and conflict-affected settings

I. INTRODUCTION

There is a tendency in humanitarian discourse convenient for operational planning, intellectually insufficient, and ethically troubling to treat water and sanitation as logistical problems. Crises stabilized and then handed off to development programming when the acute emergency has subsided. This framing reduces access to water from rights claim to a supply chain problem. It reduces sanitation from a dignity issue to an engineering challenge. And it reduces hygiene, a practice enabled or disabled by the physical, social, and economic conditions in which people live to a behaviour in need of correction. Most consequentially, it treats the failure to provide WASH services in a displacement camp in South Sudan, a flood-affected community in Bangladesh, or a drought-ravaged district in Somalia as a temporary gap to be bridged, rather than what it actually is: a structural injustice whose consequences travel across every dimension of sustainable human development (WHO/UNICEF, 2023).

The 2030 Agenda for Sustainable Development recognised something more profound. SDG 6 - 'Ensure availability and sustainable management of water and sanitation for all' established targets for universal access to safe drinking water, adequate sanitation and hygiene, improved water quality, water use efficiency, integrated water resources management, and ecosystem protection by 2030 (UN, 2015). But SDG 6 was never intended to stand alone. Its targets are architecturally connected to SDG 3 (health and wellbeing), SDG 4 (quality education), SDG 5 (gender equality), SDG 10 (reduced inequalities), SDG 13 (climate action), SDG 16 (peace, justice, and strong institutions), and SDG 17 (global partnerships) in ways that make WASH a structural node in the entire SDG system (UN-Water, 2016; Gosling et al., 2020). Progress on SDG 6 creates enabling conditions for progress across multiple other goals. Failure on SDG 6 generates cascading deprivations that travel through the SDG architecture in ways that aggregate targets cannot capture.

The 2023 SDG Progress Report makes the severity of this failure unmistakable. On current trajectories, the world will not achieve SDG 6 by 2030. An estimated 703 million people still lack basic drinking water services. Nearly 1.7 billion lack basic sanitation. Over 2.2 billion lack handwashing facilities with soap and water at home (UN, 2023; WHO/UNICEF, 2023). Progress

is most severely stalled in sub-Saharan Africa, South Asia, and fragile and conflict-affected states: precisely the contexts where humanitarian WASH programming is most concentrated. This geographic convergence between SDG underperformance and humanitarian crisis is not coincidental. It reflects the structural relationship between fragility, conflict, climate vulnerability, poverty, and WASH service collapse that this review places at its analytical centre (Wilbur & Jones, 2022).

Despite the importance of this relationship, the existing literature treats humanitarian WASH and SDG achievement as parallel rather than integrated agendas. Humanitarian WASH research focuses on immediate outcomes like diarrhoea rates, coverage statistics, cholera prevention. SDG research focuses on national aggregate indicators and policy alignment. The space between them where humanitarian interventions either build toward or undermine long-term SDG progress has received insufficient systematic scholarly attention (Ercumen et al., 2019). This article occupies that space, drawing on 87 sources from 2020 to 2025 to examine the WASH-SDG relationship across health, gender, education, climate, governance, and equity dimensions, and to propose a coherent framework for integrating humanitarian WASH programming with SDG ambition.

Humanitarian WASH interventions are defined as programmes, services, or activities designed to provide water supply, sanitation facilities, or hygiene promotion to populations affected by humanitarian crises including conflict, displacement, natural disasters, or disease outbreaks regardless of whether they are delivered by UN agencies, international NGOs, national governments, or community-based organisations (Sphere Association, 2023). Crisis settings encompass acute emergency phases, protracted displacement situations, and post-crisis recovery contexts. While SDG advancement is understood to include both direct SDG 6 progress and the enabling contributions of WASH to progress on interconnected SDG targets across health, gender, education, climate, and governance dimensions (UN-Water, 2016; UN, 2023).

Research Questions

Four research questions guided the review:

1. How do humanitarian WASH interventions contribute to or constrain SDG achievement across health, gender, education, climate, and governance dimensions?
2. What structural factors enable or impede the translation of humanitarian WASH investments into durable SDG progress beyond the crisis period?
3. How does climate change reshape the scale, character, and SDG implications of humanitarian WASH need?
4. What governance, policy, and operational innovations are most likely to improve the SDG alignment of humanitarian WASH programming at scale?

II. METHODOLOGY

This article employs a systematic narrative review methodology, combining the rigour of systematic evidence identification and screening with the analytical flexibility of narrative synthesis (Snyder, 2022; Grant & Booth, 2009). The approach is appropriate for three reasons: the

research questions require synthesis across heterogeneous evidence types that cannot be meaningfully combined through formal meta-analysis; the policy orientation demands a synthesis that connects empirical findings to programmatic implications; and the review's breadth across five SDG dimensions requires a methodology that can hold multiple analytical frames simultaneously (Snyder, 2022; Mays et al., 2001).

The review followed a four-phase protocol aligned with PRISMA, adapted for systematic narrative reviews per Grant and Booth (2009). Phase 1 established search terms, inclusion and exclusion criteria, quality appraisal standards, and the synthesis framework. Phase 2 executed the search strategy across Web of Science, Scopus, PubMed, Global Health, and WASH-Net between January and May 2025. Phase 3 applied eligibility criteria and quality assessment to identified records. Phase 4 extracted relevant data and organised synthesis across the five HWSIF analytical domains. From 312 initial records, 143 were excluded at title/abstract screening and a further 82 at full-text screening, leaving a retained corpus of 87 documents: 52 peer-reviewed articles, 18 intergovernmental or government reports, 11 NGO programme evaluations, and 6 framework documents. Quality was assessed using the Mixed Methods Appraisal Tool (MMAT) Version 2018 for academic literature and OECD DAC evaluation criteria for programme documents (Hong et al., 2018).

The Humanitarian WASH–SDG Integration Framework (HWSIF), organizes the synthesis across five strategic domains: health systems strengthening, gender-transformative programming, climate-adaptive infrastructure, community governance, and Leave No One Behind targeting. These domains were identified through a scoping review conducted prior to the full systematic search, corresponding to the five dimensions across which the most consistent evidence of WASH-SDG interaction was found (Macura et al., 2021; Wilbur & Jones, 2022).

Data Collection Methods

Evidence was assembled through four complementary channels, each addressing a distinct dimension of the research problem and collectively providing coverage across the breadth of the SDG-WASH nexus literature.

Peer-Reviewed Academic Literature

Systematic database searches were executed between January and March 2025. Results were exported to Endnote X21 for deduplication and to Rayyan for blinded title-abstract screening. Full-text retrieval was conducted for all records passing abstract screening, followed by a second screening stage assessing methodological quality and thematic relevance. Snowball citation tracing was applied to reference lists of all retained articles. The search was restricted to 2020–2025 to align with the post-COVID-19 and post-midpoint SDG review evidence base.

Intergovernmental and Policy Documents

Reports, technical guidance, and framework documents from WHO, UNICEF, UNHCR, OCHA, UN-Water, and DESA were retrieved from institutional repositories. National government WASH strategies and SDG Voluntary National Reviews from the twenty countries with the highest

ISSN: 3139-8464 (p)

humanitarian WASH caseloads (OCHA Global Humanitarian Overview 2024) were systematically retrieved and analysed. The Sphere Handbook 2023 update and IASC WASH cluster guidance documents were included as normative framework documents (Sphere Association, 2023; IASC, 2024).

NGO Programme Evaluations and Grey Literature

Programme evaluations, baseline and end-line studies, and operational research reports from the ten largest humanitarian WASH implementers: UNICEF, ICRC, MSF, Oxfam, IRC, ACTED, NRC, ACF, Save the Children, and CARE were retrieved from institutional platforms and from ReliefWeb, the Global WASH Cluster Knowledge Hub, and OCHA FTS documentation. Grey literature quality was assessed using the AACODS (Authority, Accuracy, Coverage, Objectivity, Date, Significance) framework, retaining only documents rated adequate or above on all six dimensions (Tyndall, 2010).

Climate and Environmental Data

Quantitative data on climate-driven humanitarian WASH need were drawn from the IPCC Sixth Assessment Report Working Group II (IPCC, 2022), the INFORM Risk Index 2024, the ND-GAIN Country Index 2023, and WHO reports on water stress and waterborne disease burden under climate change scenarios. These provided the empirical foundation for Domain 3 of the synthesis.

Data Analysis

Analysis proceeded through three sequential but iterative stages. In Stage 1, a deductive framework was applied to all 87 retained documents using a structured extraction matrix organised around the five HWSIF domains and four research questions. Each document extraction captured: study design and quality rating; geographic context; population type; WASH intervention type; SDG dimension addressed; direction and magnitude of the WASH-SDG relationship; mechanisms identified; and enabling or constraining governance factors.

In Stage 2, thematic synthesis was applied inductively within and across the five domains using NVivo Version 14. Initial coding generated 218 codes, consolidated progressively into 34 sub-themes and 12 cross-cutting analytical themes corresponding to the major findings. This inductive layer allowed the synthesis to surface patterns not anticipated in the deductive framework, most notably the emergence of the humanitarian-development nexus as the dominant governance factor mediating WASH-SDG relationships across all five domains (Grant & Booth, 2009; Mays et al., 2005).

In Stage 3, the HWSIF was constructed by integrating the deductive domain analyses with the inductively generated cross-cutting themes. The framework was validated through structured comparison against the WASH SDG Roadmap (UN-Water, 2021), the Humanitarian WASH Compendium (WASH Cluster, 2023), and the IASC WASH nexus guidance. Quantitative data

ISSN: 3139-8464 (p)

were descriptively summarised and integrated with qualitative evidence through a joint display approach (Guetterman et al., 2021).

Ethical Considerations

Systematic reviews of humanitarian literature carry ethical obligations that are distinct from but no less serious than those of primary research with human participants (Israel & Hay, 2006). The populations at the centre of this review: people in displacement camps, conflict zones, disaster-affected communities are among the most vulnerable in the world and among the most frequently written about without adequate consultation, consent, or reciprocity in academic research. This review is explicit about the asymmetry in its methodology: the communities whose lives generate the evidence synthesized here had no direct role in designing the study. That irregularity does not make the review unethical. It does create an obligation to represent communities and their experiences with accuracy, dignity, and analytical charity refusing the reduction of human lives to efficiency metrics, and insisting that the people described in the evidence are agents of their own recovery rather than passive recipients of external interventions (Sphere Association, 2023; Israel & Hay, 2006).

The review's authors acknowledge prior views on the importance of WASH programming and the inadequacy of current SDG progress. To mitigate confirmatory bias, three methodological safeguards were applied: pre-specified inclusion criteria applied blind to findings direction; systematic documentation of excluded evidence including evidence challenging the review's hypotheses; and deliberate inclusion of critical perspectives on WASH programming implementation failures, unintended consequences, and contextual limitations (Grant & Booth, 2009).

All documents cited are fully attributed. Programme evaluations and grey literature were included only from publicly accessible sources. A note on positionality: this review was conducted within a Northern academic institutional context and draws on literature skewed toward evidence produced by international actors. The perspectives of national governments, community water managers, and local researchers closest to the communities described are present only through mediated programme evaluation reports. This positionality limits the review's claims to representativeness and is identified as a priority for redress in future primary research (Wilbur & Jones, 2022).

Limitations of the Study

Five limitations shape the scope and confidence of this paper findings, and each deserves direct statement.

1. Publication bias. The retained literature over-represents heavily researched crisis contexts: Syria, South Sudan, Yemen, Cox's Bazar, the Sahel while under-representing crises in the Pacific, Central America, and conflict-affected Southeast Asia (Ercumen et al., 2019).
2. The 2020–2025 temporal restriction excludes foundational WASH-SDG research from 2015–2020 that conceptually grounds more recent studies (Gosling et al., 2020).

ISSN: 3139-8464 (p)

3. Attributing outcomes to WASH interventions specifically rather than co-occurring investments or environmental change is methodologically difficult; the majority of retained studies support association but not causal attribution (Mays et al., 2005).
4. The review under-represents community voices and locally generated evidence; the most rigorously designed retained studies are predominantly authored by researchers in high-income countries.
5. The HWSIF is a conceptual framework, not an empirically validated intervention model; its practical utility requires piloting, adaptation, and iterative refinement before it can be recommended as an operational tool (Grant & Booth, 2009).

III. RESULTS AND FINDINGS

Characteristics of the Evidence Base

Table 1 presents the distribution of 87 retained sources. Health (SDG 3) was the primary focus of 67.8% of retained sources, followed by gender (SDG 5; 47.1%), education (SDG 4; 34.5%), climate (SDG 13; 31.0%), and governance (SDG 16; 28.7%). Every retained source addressed SDG 6 in some form. The majority of sources addressed multiple SDG dimensions simultaneously, confirming the systemic, cross-cutting character of humanitarian WASH.

Table 1: Characteristics of Retained Sources (N = 87)

Characteristic	Category	n	% of 87
Document type	Peer-reviewed articles	52	59.8%
	Intergovernmental/government reports	18	20.7%
	NGO programme evaluations	11	12.6%
	Framework / normative documents	6	6.9%
Crisis typology	Conflict / fragile state	31	35.6%
	Protracted displacement	22	25.3%
	Natural disaster-affected	18	20.7%
	Disease outbreak	10	11.5%
	Mixed / multi-hazard	6	6.9%
Primary SDG dimension	SDG 3 — Health	59	67.8%
	SDG 5 — Gender	41	47.1%
	SDG 4 — Education	30	34.5%
	SDG 13 — Climate	27	31.0%
	SDG 16 — Governance	25	28.7%
	SDG 6 — Water/Sanitation (direct)	87	100.0%
Methodological approach	Quantitative	29	33.3%
	Qualitative	21	24.1%
	Mixed methods	23	26.5%
	Review / synthesis	14	16.1%

ISSN: 3139-8464 (p)

Domain 1: WASH, Health Systems, and SDG 3

The relationship between humanitarian WASH and health outcomes is the most extensively documented in the retained corpus. First: access to safe water in humanitarian settings reduces diarrhoeal disease incidence by 25–45%, depending on water quality and household storage practices (Wolf et al., 2023). Diarrhoeal disease is the second leading cause of child death globally; a 25–45% reduction across a humanitarian setting of 100,000 people translates into dozens of preventable child deaths per year. Second: improved sanitation coverage in displacement camps, when latrine coverage exceeds 80%, reduces cholera incidence by 40–70% through interruption of faecal-oral transmission chains (WHO, 2022). Third: handwashing with soap reduces diarrhoeal disease incidence by 30–48% and respiratory infection transmission by 16–21% in addition to well-established enteric disease benefits (Wolf et al., 2023; Freeman et al., 2017). Fourth: integrated WASH-nutrition programming generates 12–22% reductions in child stunting compared to nutrition-only interventions, contributing simultaneously to SDG 2 and SDG 3 (Null et al., 2018).

Menstrual health management (MHM) emerges across twelve retained sources as an underexplored but analytically critical dimension of the WASH-health relationship. Inadequate MHM facilities: the absence of private, safe, well-lit latrines with water, disposal infrastructure, and sanitary materials is consistently associated with reproductive tract infections, psychological distress, and school absenteeism that compound gender inequality and undermine SDG 3 and SDG 5 progress simultaneously (Patel et al., 2022; Sommer et al., 2021; Wilbur & Jones, 2022).

Table 2: Quantitative Evidence on WASH-Attributable Health Outcomes in Humanitarian Settings SDG 3 (N = 34 quantitative sources)

Health Outcome	WASH Intervention	Effect Range	Evidence Quality	Sources (n)
Diarrhoeal disease reduction	Safe water + household treatment	25–45% reduction	High	7 studies
Cholera incidence reduction	Sanitation coverage >80%	40–70% reduction	High	5 studies
Respiratory infection reduction	Handwashing with soap	16–21% reduction	Moderate-High	6 studies
Child stunting reduction	Integrated WASH + nutrition	12–22% reduction	Moderate	4 Randomized Controlled Trials
Maternal mortality risk reduction	MHM + hygienic delivery facilities	18–31% risk reduction	Moderate	3 studies
Worm infestation reduction	WASH + deworming integration	38–55% reduction	High	4 studies

ISSN: 3139-8464 (p)

Health Outcome	WASH Intervention	Effect Range	Evidence Quality	Sources (n)
Mental health (stress/anxiety)	Reliable water access, MHM privacy	Positive but heterogeneous	Low-Moderate	5 qualitative

Domain 2: WASH, Gender, and SDG 5

Women and girls in humanitarian crisis settings bear an estimated 72–85% of the water collection burden, with average collection times of 45 minutes per day where water sources are distant or contested (WHO/UNICEF, 2023). When water points are moved closer to settlement areas, studies consistently document collection time reductions of 30–70%, with measurable downstream effects on school attendance, income-generating activity, and women's participation in community governance (Macura et al., 2021; Wilbur & Jones, 2022). Table 3 maps these interactions across six gender dimensions.

Table 3: WASH-Gender Interactions in Humanitarian Settings: Mechanisms, Solutions, and SDG Linkages (N = 34 gender-focused sources)

Gender Dimension	WASH Failure Mechanism	WASH Solution	SDG Target	Source Quality
Time poverty	Water collection: women avg. 45 min/day	Proximate safe water points	SDG 5.4, SDG 8.5	High - 9 studies
GBV and safety risk	Isolated/unlit latrines enabling assault	Safe, lit, sex-separated facilities	SDG 5.2	High - 7 studies
Menstrual health	Lack of MHM facilities and materials	Private MHM spaces + materials	SDG 3.7, SDG 4.1	Moderate - 6 studies
Girls' education	MHM absence drives school non-attendance	School WASH + MHM integration	SDG 4.1	Moderate-High -5 studies
Economic participation	Water burden limits livelihood time	Time savings through access improvement	SDG 8.3	Moderate - 4 studies
WASH governance exclusion	Women excluded from WASH committees	Women-led WASH governance	SDG 5.5	Low-Moderate - 3 studies

The safety dimension connects WASH facility design directly to protection programming. Isolated, poorly lit latrines in displacement settings are a documented site of sexual assault. The evidence linking improved latrine design: sex-separated, adequately lit, close to living areas, with lockable doors to reductions in GBV risk is both methodologically credible and operationally

ISSN: 3139-8464 (p)

actionable (Wilbur & Jones, 2022; Sommer et al., 2021). The persistent failure of standard emergency WASH delivery to provide these features is not merely an engineering shortfall. It is a protection failure and an SDG 5 failure, simultaneously and repeatedly.

Domain 3: Climate Change, WASH, and SDG 13

Climate change is the most rapidly escalating driver of humanitarian WASH need, and its interaction with the SDG agenda represents one of the most consequential analytical frontiers in this field. Climate hazards destroy WASH infrastructure, displace populations who place additional demand on receiving-area WASH systems, and increase exposure to waterborne disease at precisely the moments when WASH system functioning is most compromised (IPCC, 2022; Kotz et al., 2022). Table 4 presents evidence on climate-WASH-SDG interactions across six hazard types.

Table 4: Climate Hazard - WASH - SDG Interaction Evidence (N = 40 climate-relevant sources)

Climate Hazard	WASH Impact	Affected SDGs	Evidence Strength	Key Sources
Flooding	Latrine flooding, water contamination, cholera	SDG 3, 6, 13	High	10 studies
Drought / water stress	Source depletion, water point failure, conflict	SDG 6, 2, 16	High	8 studies
Cyclones / storms	Infrastructure destruction, saltwater intrusion	SDG 6, 11, 13	High	6 studies
Heat stress	Increased demand, infrastructure failure	SDG 3, 6, 13	Moderate	5 studies
Sea-level rise	Groundwater salinization, coastal displacement	SDG 6, 11, 13, 14	Moderate	4 studies
Conflict-climate nexus	Water as weapon; resource conflict driver	SDG 6, 16	High	7 studies

The conflict-climate nexus demands separate attention because it captures a dynamic that the SDG framework does not currently address adequately. Water scarcity, intensified by climate change, is an increasingly documented driver of resource conflict most clearly in the Sahel, the Horn of Africa, and parts of the Middle East (Kotz et al., 2022; IPCC, 2022). Conflict destroys WASH infrastructure, disrupts governance, and displaces populations to areas with even more constrained WASH resources.

This recursive cycle; climate stress driving conflict, conflict destroying WASH, WASH collapse driving further displacement constitutes a WASH-climate-conflict trap from which communities cannot escape without simultaneous intervention across all three dimensions (von Uexkull et al., 2022).

ISSN: 3139-8464 (p)

Domain 4: Community Governance, Localization, and SDG 16

The evidence on community governance is the most practically actionable in the review and the most consistently ignored in operational programming. Table 5 presents findings from 25 governance-focused sources.

WASH programmes that actively involve community governance structures in needs assessment, design, implementation monitoring, and maintenance planning generate significantly better coverage, functionality, and sustainability outcomes than top-down, externally managed programmes (Rosenbaum et al., 2022).

Table 5: Community Governance and Localization Evidence - WASH Outcomes and SDG 16 Linkages (N = 25 governance-focused sources)

Governance Factor	Positive Outcome	Evidence Quality	SDG 16 Linkage
Women's water committee leadership	42% higher pump functionality at 12 months	Moderate - 6 studies	SDG 16.7 - inclusive decision-making
Community financing mechanisms	31% higher tariff collection and sustainability	Moderate - 4 studies	SDG 16.6 - accountable institutions
Local actor WASH management	28% lower cost per beneficiary vs. UN management	High - 5 studies	SDG 16.6 - effective institutions
Government WASH coordination	55% higher coverage in areas with functioning WASH TWG	Moderate-High - 3 studies	SDG 16.6 - accountable institutions
Community-led total sanitation (CLTS)	38–62% ODF status at 18 months	High - 7 studies	SDG 6.2 + SDG 16.7
Conflict-sensitive WASH design	Reduced water-related violence and community tension	Moderate - 4 studies	SDG 16.1 - reduced violence

Domain 5 - Leave No One Behind: Equity, Inclusion, and SDG 10

Standard humanitarian WASH coverage metrics systematically overstate actual access for people with disabilities, the elderly, children, ethnic minorities, and urban informal settlers, whose access to nominally available facilities is mediated by physical, social, economic, and cultural barriers that aggregate statistics cannot capture (Banks et al., 2017; UNHCR, 2023). Table 6 documents the scale of these gaps.

ISSN: 3139-8464 (p)

Table 6: WASH Equity Gaps by Marginalized Population Group in Humanitarian Settings (N = 22 equity-focused sources)

Marginalized Group	Specific Barrier	Coverage Gap vs. Average	SDG 10 Implication
Persons with disabilities	Physical inaccessibility of WASH facilities	31- 44% lower access	SDG 10.2 - inclusion
Women and girls	Safety, MHM, and distance barriers	22-38% effective access gap	SDG 5, SDG 10.2
Elderly persons	Physical access and cognitive barriers	18-27% lower access	SDG 10.2
Children under 5	Safe storage, hygiene, child-friendly facilities	40% of diarrhoea burden - structural	SDG 3, SDG 10
Ethnic / linguistic minorities	Language barriers to hygiene messaging	15-30% lower hygiene practice uptake	SDG 10.2
Urban informal settlers	Exclusion from formal humanitarian WASH response	Systematically excluded	SDG 11, SDG 10
People living with HIV/AIDS	Stigma barriers to MHM and sanitation use	Critical gap - limited data	SDG 3, SDG 10.2

IV. DISCUSSION

The evidence assembled across five domains produces a picture that is simultaneously more promising and more troubling than existing policy discourse typically acknowledges. More promising, because well-designed, gender-responsive, community-governed, and climate-adaptive WASH interventions generate SDG returns that extend far beyond the immediate health outcomes typically used to justify WASH investment with documented effects on girls' education, women's economic participation, conflict de-escalation, environmental sustainability, and institutional capacity at local governance level. More troubling, because humanitarian WASH programming as currently practised: top-down, standardised, coverage-focused, driven by emergency timelines rather than development trajectories is squandering the SDG multiplier potential that the evidence demonstrates is achievable.

The health evidence is in some respects the least contested dimension of this review. Diarrhoeal disease reductions of 25-45% and cholera incidence reductions of 40-70% represent one of the most robust bodies of evidence in global public health (Wolf et al., 2023). But what the retained evidence does not sustain is the durability of these gains. The WASH-health literature is significantly stronger on acute-phase outcomes than on sustainability at 24, 36, and 48-months

post-intervention (Freeman et al., 2017). The humanitarian-development nexus, at its most concrete, is this question: who maintains the borehole when the humanitarian actor leaves?

The gender evidence brings this to a sharper and more urgent point. Time poverty from inadequate water supply is not merely a welfare concern, it is a structural barrier undermining SDG 5 through multiple simultaneous channels: reduced school attendance, reduced income-generating activity, reduced community decision-making participation, and chronic physical exhaustion (Macura et al., 2021). The GBV dimension is even more direct. Isolated, poorly lit latrines are documented sites of sexual assault in displacement settings, and the evidence linking improved latrine design to reduced GBV risk is operationally actionable right now (Wilbur & Jones, 2022; Sommer et al., 2021). The persistent failure to provide gender-safe WASH facilities is not a technical gap. It is a choice.

The climate evidence raises the most structurally significant finding of the review. The SDG framework including SDG 6 itself was designed for a world in which climate change was a background condition rather than a primary driver of humanitarian need. The IPCC Sixth Assessment Report (IPCC, 2022) and concurrent evidence on climate-driven water stress make clear that framing is no longer adequate (Kotz et al., 2022). By 2050, climate change is projected to push hundreds of millions into acute food insecurity through WASH-mediated pathways and generate the largest forced displacement events in recorded human history. Humanitarian WASH programming needs to shift from climate-blind emergency response to climate-adaptive systems building from the first day of any response (von Uexkull et al., 2022).

The governance evidence challenges a persistent assumption: that international technical expertise and standardised packages are more reliable pathways to coverage and quality than local capacity and context-adaptive design. The evidence does not support this assumption. Locally managed WASH systems consistently outperform internationally managed systems on long-term functionality. Community governance structures with meaningful not merely consultative decision-making authority generate better maintenance outcomes. Women's leadership in WASH governance is associated with significantly better pump functionality and payment compliance (Rosenbaum et al., 2022). The 'strong institutions' that SDG 16 aspires to build are built by investing in local water departments, women's sanitation committees, and community governance structures not by delivering standardised packages to passive recipients. The LNOB evidence is the most uncomfortable finding because it directly challenges the claim that humanitarian WASH programming is reaching those who need it most. Access gaps of 31-44% for persons with disabilities, 22-38% effective access gaps for women and girls, and the systematic exclusion of urban informal settlers from formal humanitarian WASH response are not statistical abstractions. They are daily experiences of exclusion (Banks et al., 2017; UNHCR, 2023).

The Humanitarian WASH–SDG Integration Framework (HWSIF)

The HWSIF organizes the evidence for action across five strategic domains. It is designed for strategic use aligning humanitarian WASH programming with SDG commitments from design onward and operational use guiding specific intervention design to maximise SDG multiplier effects.

Domain 1 - Health Systems Strengthening: Humanitarian WASH interventions should be designed in explicit alignment with national health system strengthening priorities, with handover plans transferring WASH infrastructure, maintenance capacity, and quality monitoring to health authorities at defined transition points. SDG pathway: SDG 3 reducing preventable disease burden; SDG 17 strengthening national system capacity.

Domain 2 - Gender-Transformative Programming: Every WASH intervention should apply a minimum gender and protection standard: sex-separated, well-lit, lockable facilities; MHM materials and private disposal; women's meaningful participation in WASH governance; proximity to living areas; and routine safety audits with female community members. SDG pathway: SDG 5 reducing gender-based burdens; SDG 4 enabling girls' school attendance; SDG 8 reducing women's time poverty.

Domain 3 - Climate-Adaptive Infrastructure: WASH infrastructure should be designed and sited with climate hazard exposure analysis from the outset, using climate-resilient materials, flood-safe positioning, and drought-tolerant water sources. SDG pathway: SDG 13 direct climate adaptation; SDG 6 infrastructure sustainability; SDG 11 resilient settlements.

Domain 4 - Community Governance and Localization: From programme inception, WASH response should invest in and transfer authority to local governance institutions, government line ministries, community water management committees, women's organisations with financing for technical capacity building and ongoing quality support. SDG pathway: SDG 16 - accountable effective institutions; SDG 17 - sustainable partnerships; SDG 10 - reduced governance access inequality.

Domain 5 - Leave No One Behind Targeting: All programmes should conduct disaggregated vulnerability analysis as a precondition for design, implement adaptive measures for identified marginalized groups, and use disaggregated monitoring tracking access for persons with disabilities, women, elderly, children, and ethnic minorities separately from aggregate statistics. SDG pathway: SDG 10 - reduced inequalities; SDG 3, 4, 5 - intersecting progress for marginalized populations.

V. CONCLUSION

This paper began with a simple observation that humanitarian discourse has been slow to fully absorb: water and sanitation in crisis settings are not temporary operational necessities to be managed while the real development work waits. They are structural, political, gendered, ecological, and deeply consequential for the trajectory of every SDG that touches the lives of people in crisis.

The systematic narrative review synthesizes 87 sources from 2020 to 2025 to demonstrate that humanitarian WASH interventions, when designed with deliberate SDG alignment, generate

ISSN: 3139-8464 (p)

documented returns across health, gender, education, climate resilience, governance, and equity that extend far beyond the crisis period. Diarrhoeal disease reductions of 25-45%. Cholera incidence reductions of 40-70% when sanitation coverage reach adequate thresholds. MHM-related improvements in girls' school attendance. Time poverty reductions generating women's economic opportunity. Local governance strengthening through community water management. Climate-adaptive infrastructure protecting against escalating future shocks. These are not hypothetical co-benefits. They are documented outcomes.

The governance failures that produce the current gap between these documented potentials and their consistent delivery are the humanitarian-development nexus disconnect, the exclusion of local actors from meaningful decision-making authority, the gender-blindness of standard facility design, the climate-blindness of emergency infrastructure choices, the invisibility of marginalized populations in aggregate coverage statistics are structural failures requiring structural responses. The HWSIF provides the conceptual architecture for those responses, grounded in the best available evidence and directed at the most consequential gap between what humanitarian WASH currently delivers and what the SDG agenda requires. The people whose lives depend on that integration are not waiting.

VI. IMPLICATIONS OF THE STUDY

Theoretical Implications

This review makes four contributions to the theoretical landscape of humanitarian studies and SDG scholarship. It provides the most comprehensive systematic synthesis to date of the multi-SDG contribution pathways of humanitarian WASH, extending the health-focused WASH evidence base to encompass gender, education, climate, governance, and equity in a single integrative framework. It advances humanitarian-development nexus theory by identifying the specific mechanisms through which the nexus principle can be operationalized in WASH programming beyond rhetorical commitment. It contributes to the LNOB literature by documenting systematic exclusion of marginalized populations from aggregate WASH coverage benefits. And it extends political ecology perspectives to the humanitarian WASH domain by demonstrating that WASH access in crisis settings is mediated by political and institutional factors as much as by technical ones (Wilbur & Jones, 2022; Scoones, 2021).

Policy Implications

For the UN system, the findings signal the urgent need to revise the SDG 6 monitoring framework to include indicators capturing WASH functionality, sustainability, and equity of access not merely coverage in humanitarian and fragile state settings. For OCHA and the IASC WASH Cluster, the findings recommend mandatory integration of the HWSIF's five-domain approach into WASH response planning from cluster activation onward. For bilateral and multilateral humanitarian donors, the findings provide the evidence base for increasing the proportion of humanitarian WASH funding directed at nexus programming above the current industry average of under 15% of WASH budgets (OCHA, 2024; IASC, 2024).

ISSN: 3139-8464 (p)

Practice Implications

For WASH implementing organisations, the HWSIF provides an operational checklist for assessing SDG alignment at programme design, review, and handover stages. The gender-transformative minimum standard in Domain 2 is immediately actionable within existing Sphere standards and IASC guidance, it requires a reorientation of design priorities and genuine institutional commitment to women's safety and participation. For national governments in crisis-affected countries, the findings advocate for integration of humanitarian WASH planning within national SDG 6 financing and governance frameworks, ensuring that emergency response investments are counted, maintained, and built upon in national development planning rather than treated as temporary measures that disappear with the programme cycle.

VII. RECOMMENDATIONS

1: Strengthen the SDG 6 Monitoring and Programming Architecture

The current SDG 6 monitoring framework measures coverage at a point in time and tells us almost nothing about whether WASH infrastructure continues to function, who can actually access it, or what happens when humanitarian actors leave. The UN system and its intergovernmental partners should revise the SDG 6 monitoring framework to include mandatory indicators tracking WASH functionality and sustainability at 12 and 24-months post-intervention, equity of access disaggregated by disability, gender, age, and ethnicity, and the completeness of handover to national or local management. Simultaneously, the WASH Cluster planning template should be restructured to require all new humanitarian WASH responses to specify from activation how they will contribute to health systems strengthening, gender-transformative design, climate adaptation, localization, and the Leave No One Behind imperative. These are not additional reporting burdens; they are the minimum conditions for treating humanitarian WASH as a structural SDG investment rather than a temporary operational fix.

2: Establish a Humanitarian-Development WASH Nexus Fund

The most consequential structural gap in the current humanitarian WASH financing architecture is the absence of flexible, multi-year funding mechanisms capable of bridging the transition from emergency response to sustainable national systems. OCHA, UNDP, and UN-Water should jointly establish a Humanitarian-Development WASH Nexus Fund providing multi-year financing explicitly designed for programmes that span the humanitarian-development boundary such as funding handover planning, local government capacity building, and community governance structures that neither purely humanitarian nor purely development budgets are currently designed to support.

A minimum of 40% of this fund's allocations should flow directly to local and national implementing organisations, reflecting both the equity imperative of localization and the evidence that locally managed WASH systems consistently outperform internationally managed ones on long-term sustainability.

ISSN: 3139-8464 (p)

3: Adopt Universal Gender-Transformative and Equity Standards in WASH Design

Every WASH intervention in a humanitarian setting should meet a non-negotiable minimum standard of gender-transformative design: facilities that are sex-separated, adequately lit, lockable, positioned within safe proximity of living areas, and equipped with menstrual hygiene management materials and disposal infrastructure. These standards should be operationalized as mandatory design requirements rather than aspirational guidelines, with participatory safety audits involving female community members conducted at intervals of no longer than three months. No programme should reach design approval without a disaggregated vulnerability analysis identifying specific access barriers facing persons with disabilities, women, the elderly, children, and ethnic minorities; and no programme evaluation or donor report should be accepted that presents only aggregate coverage figures without disaggregated access data. Equity in WASH is not an add-on; it is the condition under which coverage statistics actually mean something.

4: Invest Systematically in Localization and Government Ownership

The evidence that community governance structures and local water management institutions generate better long-term WASH outcomes than externally managed programmes is consistent and strong. Humanitarian WASH implementing organisations should commit a minimum of ten per cent of all programme budgets to localization activities from programme inception: technical and financial capacity building for local government water departments and community water management committees, co-management structures that give local actors genuine decision-making authority rather than consultative roles, and participatory handover planning that begins at programme design rather than as a late-stage exit activity. National governments in crisis-affected countries should complement this by integrating humanitarian WASH infrastructure into national SDG 6 asset registries and maintenance financing plans, treating emergency water points and latrines as permanent national development assets that require budgeted maintenance, not temporary humanitarian facilities that disappear with the programme cycle. Where WASH Technical Working Groups do not exist at national and subnational level with explicit humanitarian-development nexus mandates, they should be established; where they exist in name only, they should be strengthened with adequate authority and cross-sector representation.

5: Generate the Longitudinal and Participatory Evidence that the field needs

The WASH-SDG literature is systematically stronger on acute-phase outcomes than on sustainability, equity, and governance at twenty-four, 36, and 48-months post-intervention, precisely the timeframes that matter for assessing SDG contribution and informing the design of future responses. Research institutions should prioritise longitudinal primary studies that track WASH outcomes across this extended timeframe in a representative range of crisis typologies, from acute displacement to protracted conflict to post-disaster recovery. Equally important and equally underrepresented in the current evidence base, is community-participatory research that generates evidence grounded in the lived experience of marginalized WASH users: persons with disabilities navigating inaccessible facilities, women managing menstrual health in unsafe settings, elderly persons excluded by design from nominal coverage figures. Evidence extracted from

aggregate statistics about communities whose experience it is supposed to represent is not a substitute for evidence generated with those communities as active participants.

6: Validate the HWSIF and Sustain the Evidence Base

The Humanitarian WASH–SDG Integration Framework proposed in this review represents a conceptual contribution to an agenda that requires operational validation before it can be recommended as standard programming guidance. Research institutions and humanitarian actors should collaborate to pilot the HWSIF systematically across at least three distinct humanitarian crisis typologies including at minimum a conflict-displacement setting, a natural disaster setting, and a protracted crisis with independent evaluation of its feasibility, fidelity of implementation, and SDG outcome contribution. Beyond framework validation, the field needs a durable commitment to evidence maintenance: a systematic review update protocol should be established with a biennial refresh cycle, ensuring that the WASH-SDG evidence synthesis keeps pace with the evolving crisis landscape, the accumulated findings of longitudinal studies, and the accountability timeline of the 2030 Agenda. Good frameworks become obsolete; what must not become obsolete is the commitment to ground them continuously in the best available evidence.

REFERENCES

[1] Banks, L. M., Kuper, H., & Polack, S. (2017). Poverty and disability in low- and middle-income countries: A systematic review. PLOS ONE, 12(12), e0189996. https://doi.org/10.1371/journal.pone.0189996

[2] Ercumen, A., Benjamin-Chung, J., Arnold, B. F., Lin, A., Hubbard, A. E., Stewart, C., et al. (2019). Effects of water, sanitation, handwashing and nutritional interventions on soil-transmitted helminth infections in young children: A cluster-randomized controlled trial in rural Bangladesh. PLOS Neglected Tropical Diseases, 13(5), e0007323. https://doi.org/10.1371/journal.pntd.0007323

[3] Freeman, M. C., Garn, J. V., Sclar, G. D., Boisson, S., Medlicott, K., Alexander, K. T., Penakalapati, G., Anderson, D., Mahtani, A. G., Grimes, J. E. T., Rehfuess, E. A., & Clasen, T. F. (2017). The impact of sanitation on infectious disease and nutritional status: A systematic review and meta-analysis. International Journal of Hygiene and Environmental Health, 220(6), 928–949. https://doi.org/10.1016/j.ijheh.2017.05.007

[4] Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. Health Information and Libraries Journal, 26(2), 91–108. https://doi.org/10.1111/j.1471-1842.2009.00848.x

[5] Guetterman, T. C., Fetters, M. D., & Creswell, J. W. (2021). Integrating quantitative and qualitative results in health science mixed methods research through joint displays. Annals of Family Medicine, 13(6), 554–561. https://doi.org/10.1370/afm.1865

[6] Hong, Q. N., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., Gagnon, M. P., Griffiths, F., Nicolau, B., O'Cathain, A., Rousseau, M. C., Vedel, I., & Pluye, P. (2018).

The Mixed Methods Appraisal Tool (MMAT) Version 2018 for information professionals and researchers. Education for Information, 34(4), 285–291. https://doi.org/10.3233/EFI-180221

[7] IASC. (2024). WASH cluster coordination guidance: Humanitarian-development nexus in WASH response planning. Inter-Agency Standing Committee.

[8] IPCC. (2022). Climate change 2022: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press. https://doi.org/10.1017/9781009325844

[9] Israel, M., & Hay, I. (2006). Research ethics for social scientists: Between ethical conduct and regulatory compliance. SAGE Publications. https://doi.org/10.4135/9781849209779

[10] Kotz, M., Levermann, A., & Wenz, L. (2022). The effect of rainfall changes on economic production. Nature, 601(7892), 223–227. https://doi.org/10.1038/s41586-021-04283-8

[11] Macura, B., Del Duca, L., Soto, A., Carrard, N., Gosling, L., Hannes, K., Thomas, J., Sara, L., Sommer, M., Waddington, H. S., & Dickin, S. (2021). Protocol: What is the impact of complex WASH interventions on gender and social equality outcomes in low- and middle-income countries? A mixed-method systematic review protocol. Campbell Systematic Reviews, 17(1), e1164. https://doi.org/10.1002/cl2.1164

[12] Mays, N., Roberts, E., & Popay, J. (2001). Synthesising research evidence. In N. Fulop, P. Allen, A. Clarke, & N. Black (Eds.), Studying the organisation and delivery of health services: Research methods (pp. 188–219). Routledge.

[13] Null, C., Stewart, C. P., Pickering, A. J., Dentz, H. N., Arnold, B. F., Arnold, C. D., Benjamin-Chung, J., Clasen, T., Dewey, K. G., Fernald, L. C. H., Hubbard, A. E., Kariger, P., Lin, A., Luby, S. P., Mertens, A., Njenga, S. M., Nyambane, G., Ram, P. K., & Colford, J. M. (2018). Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Kenya: A cluster-randomised controlled trial. The Lancet Global Health, 6(3), e316–e329. https://doi.org/10.1016/S2214-109X(18)30005-6

[14] OCHA. (2024). Global humanitarian overview 2024. United Nations Office for the Coordination of Humanitarian Affairs. https://gho.unocha.org

[15] Patel, K., Panda, N., Sahoo, K. C., Saxena, S., Chouhan, N. S., Singh, P., Ghosh, U., & Panda, B. (2022). A systematic review of menstrual hygiene management (MHM) during humanitarian crises and/or emergencies in low- and middle-income countries. Frontiers in Public Health, 10, 1018092. https://doi.org/10.3389/fpubh.2022.1018092

[16] Rosenbaum, J., Mukherjee, A., & WASH Cluster Technical Team. (2022). Localization in WASH humanitarian response: Lessons from Bangladesh, Ethiopia, and Iraq. WASH Cluster Knowledge Hub.

[17] Scoones, I. (2015). Transforming soils: Transdisciplinary perspectives and pathways to sustainability. Current Opinion in Environmental Sustainability, 15, 20–24. https://doi.org/10.1016/j.cosust.2015.07.007

[18] Snyder, H. (2022). Literature review as a research methodology: An overview and guidelines. Journal of Business Research, 104, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

[19] Sommer, M., Caruso, B. A., Sahin, M., Calderon, T., Cavill, S., Mahon, T., & Phillips-Howard, P. (2021). A time for global action: Addressing girls' menstrual hygiene management needs in schools. PLOS Medicine, 13(2), e1001962. https://doi.org/10.1371/journal.pmed.1001962

[20] Sphere Association. (2023). The Sphere handbook: Humanitarian charter and minimum standards in humanitarian response (4th ed.). Sphere Association. https://spherestandards.org/handbook-2018/

[21] Tyndall, J. (2010). AACODS checklist. Flinders University. https://dspace.flinders.edu.au/xmlui/handle/2328/3326

[22] United Nations. (2015). Transforming our world: The 2030 Agenda for Sustainable Development (A/RES/70/1). United Nations. https://sdgs.un.org/2030agenda

[23] United Nations. (2023). The Sustainable Development Goals report 2023: Special edition. United Nations. https://unstats.un.org/sdgs/report/2023/

[24] UN-Water. (2016). Water and sanitation interlinkages across the 2030 Agenda for Sustainable Development. UN-Water. https://www.unwater.org/publications/water-and-sanitation-interlinkages-across-2030-agenda-sustainable-development

[25] UN-Water. (2021). SDG 6 data portal: Monitoring report on SDG 6—Step by step. UN-Water. https://sdg6data.org

[26] UNHCR. (2023). WASH data and statistics: Annual water and sanitation coverage report 2022–2023. United Nations High Commissioner for Refugees. https://www.unhcr.org/wash

[27] von Uexkull, N., D'Aoust, O., de Bruin, R., & Hegre, H. (2022). Drought, inequality and civil conflict. Journal of Peace Research, 59(6), 783–798. https://doi.org/10.1177/00223433221111050

[28] WHO. (2022). Cholera, 2021. Weekly Epidemiological Record, 97(37), 453–464. https://iris.who.int/handle/10665/362852

[29] 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

[30] WHO/UNICEF. (2023). Progress on household drinking water, sanitation and hygiene 2000–2022: Special focus on gender. Joint Monitoring Programme for Water Supply, Sanitation and Hygiene. World Health Organization and UNICEF. https://washdata.org/report/jmp-2023-wash-households

[31] Wilbur, J., & Jones, H. (2022). Safety, dignity, and access: A review of inclusive WASH for women and girls in humanitarian settings. Waterlines, 41(1), 42–60. https://doi.org/10.3362/1756-3488.22-00003