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Women's Access to Safe Water in Eastern Indonesia: Intersectional Inequities and Climate Adaptation Pathways

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Abstract

Access to safe water in Eastern Indonesia's small-island settings is shaped by ecohydrological constraints, unequal social relations, and locally embedded management arrangements, all of which are intensified by climate variability and change. Although women are the primary managers of household water, their everyday responsibilities rarely translate into proportional authority in community-level decision making. This study examines how intersectional inequalities shape safe-water access and adaptive capacity in climate-vulnerable small-island contexts. Drawing on a qualitative comparative case study of Buano Island, West Seram, and Tiga Island, Central Maluku, the research integrates in-depth interviews with women household water managers, focus group discussions, and participant observation. The analysis applies thematic coding informed by intersectional analysis and is interpreted through an ethnohydrological lens that situates water within hydrosocial territories comprising water sources, customary norms, household practices, and village authority structures. This integrated analytical strategy explains not only who experiences water insecurity, but also how intersecting ecological and social processes generate differentiated adaptive capacities. Rather than establishing statistical causality, the study identifies relational mechanisms through which gender, class, sociocultural positioning, household status, and settlement location shape water insecurity under climate stress. The findings show that women experience pronounced time poverty and remain under-represented in deliberative water-governance forums. Adaptive capacity is unevenly distributed: economic resources condition access to storage and treatment technologies; sociocultural positioning mediates inclusion in information networks and village participation; and female-headed households face compounded labour, income, and care burdens. At the same time, women enact adaptive practices, including rainwater harvesting, communal storage, selective source use, and modification of customary water-use norms. The study advances an intersectional-ethnohydrological framework for explaining how social inequalities are embedded within hydrosocial systems and translated into unequal water-access outcomes. Policy implications emphasise gender-responsive governance, inclusive co-management, targeted financial support, and infrastructure design aligned with local ecohydrological conditions. These findings extend intersectionality scholarship by

demonstrating how ecohydrological processes and hydrosocial relations jointly produce differentiated adaptive capacities in climate-vulnerable small-island settings.

Keywords. safe-water access; small-island contexts; intersectional analysis; ethnohydrology; gender inequality; climate adaptation.

Introduction

Access to safe water is a foundational condition for public health, ecosystem sustainability, and socio-economic wellbeing.[1] Reliable potable water reduces exposure to water-borne diseases, supports educational participation, sustains household livelihoods, and underpins social stability.[2] Yet climate variability and climate change are placing freshwater systems under increasing pressure, particularly in coastal and small-island environments where limited catchment areas, fragile freshwater lenses, uneven infrastructure, and contested governance arrangements intersect.[3] In such contexts, water insecurity is not merely a technical problem of supply, but a socio-ecological and political condition shaped by power relations, institutional arrangements, and unequal access to resources.[4]

These dynamics are especially pronounced in Eastern Indonesia, particularly in Maluku Province, where many communities inhabit small islands characterised by limited surface-water availability, shallow groundwater reserves, and high exposure to seasonal rainfall variability.[5] Elevated evaporation, prolonged dry periods, El Niño-related rainfall anomalies, and saline intrusion increasingly undermine the reliability and quality of freshwater sources. Consequently, water access in these settings is shaped by the interaction between ecohydrological constraints, household capacities, customary institutions, and village-level governance arrangements, producing uneven patterns of vulnerability and adaptive capacity.[6]

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[1] UN Women, 'Facts and Figures: Women's Leadership and Political Participation; What We Do – UN Women – Headquarters,' UN Women 6 (2022); World Health Organization (WHO) and United Nations Children's Fund (UNICEF), *Progress on Household Drinking Water, Sanitation and Hygiene 2000–2020: Five Years into the SDGs. (*World Health Organization and United Nations Children's Fund, 2021), https://www.who.int/publications/i/item/9789240030848.

[2] Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2022: Mitigation of Climate Change: Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change,* ed. P. R. Shukla, et al. (Cambridge University Press, 2022). https://doi.org/10.1017/9781009157926.

[3] UNESCO, 'The United Nations World Water Development Report 2021: Valuing Water.' *Water Politics* (2021). https://doi.org/10.54679/MOMU6572.

[4] World Health Organization (WHO) and United Nations Children's Fund (UNICEF). *Progress on Household Drinking Water, Sanitation and Hygiene 2000–2020.*

[5] Bokiraiya Latuamury et al., 'The Spatial Dynamics of Land Cover Change along the Wallacea Corridor in the Key Biodiversity Area "Buano Island," Maluku, Indonesia,' *Journal of Degraded and Mining Lands Management* 7, no. 4 (2020), https://doi.org/10.15243/jdmlm.2020.074.2241; Bokiraiya Latuamury et al., 'Small Island Watershed Morphometric and Hydrological Characteristics in Ambon Region, Maluku Province,' *IOP Conference Series: Earth and Environmental Science* 800 (2021), https://doi.org/10.1088/1755-1315/800/1/012047.

[6] United States Agency for International Development (USAID). *Ecosystem-Based Adaptation and Water Security: Evidence Summary,* (United States Agency for International Development, 2017); UNDP/NEMA/UNEP, 'Enhancing the Contribution of Weather, Climate and Climate Change to Growth, Employment and Prosperity,'

This study focuses on Buano Island in West Seram and Tiga Island in Central Maluku, sites that represent contrasting yet analytically comparable small-island water systems. On Buano Island, households rely primarily on rainwater harvesting, shallow wells, and small springs whose discharge declines during the dry season, generating seasonal scarcity and extended collection routines. In contrast, Tiga Island is shaped by carbonate geology and saline intrusion, which constrain groundwater quality and create uncertainty over the safety and reliability of available sources.[7] These contrasting ecohydrological conditions provide critical bases for examining how environmental constraints interact with gender, class, sociocultural positioning, household status, and settlement location to shape lived experiences of water insecurity.[8] Within these hydrosocial contexts, women occupy a central yet structurally constrained position. They bear primary responsibility for household water collection, transport, storage, treatment, and allocation, yet their everyday labour rarely translates into proportional authority in community-level decision making.[9] Although women's experiential knowledge of household water needs is often recognised informally, it remains weakly institutionalised within formal deliberative spaces, infrastructure planning, and resource allocation.[10] This disjuncture reflects not only patriarchal norms, but also historically embedded governance arrangements that position men as public decision-makers, while women are framed primarily as domestic water managers rather than institutional actors.

An intersectional perspective is therefore essential for understanding how water insecurity is produced, experienced, and negotiated in small-island environments. Gender does not operate in isolation; it intersects with class, sociocultural group membership, household status, age, and settlement location to generate differentiated exposures to risk and unequal access to adaptive resources.[11] Women from low-income households, female-headed households, minority sociolinguistic groups, or geographically marginal settlements may experience compounded constraints, including longer collection times, limited access to information, restricted storage capacity, and reduced participation in collective decision-making. Intersectional analysis thus enables this study to move beyond the homogenising category of 'women' and examine how multiple axes of inequality co-produce unequal water-

(Report, 2009). https://www.sidalc.net/search/Record/oai%3Awedocs.unep.org%3A20.500.11822-26899/Description.

[7] Panthea Pouramin etal., 'A Systematic Review of Water and Gender Interlinkages: Assessing the Intersection With Health,' *Frontiers in Water* 2 no. 6 (2020), https://doi.org/10.3389/frwa.2020.00006; Yoshika S. Crider and Isha Ray, 'Water and Development: A Gender Perspective.' *Oxford Research Encyclopedia of Environmental Science* (May 2022), https://doi.org/10.1093/acrefore/9780199389414.013.685.

[8] Miriam Gay-Antaki and Diana Liverman, 'Climate for Women in Climate Science: Women Scientists and the Intergovernmental Panel on Climate Change,' *Proceedings of the National Academy of Sciences of the United States of America* 115, no. 9 (2018), https://doi.org/10.1073/pnas.1710271115.

[9] Vica Marie Jelena Tomberge et al., 'The Physical Burden of Water Carrying and Women's Psychosocial Well-Being: Evidence from Rural Nepal,' *International Journal of Environmental Research and Public Health* 18, no. 15 (2021), https://doi.org/10.3390/ijerph18157908.

[10] Wisdom Sibanda et al., 'Grappling with Gendered Crises: Women's Access and Participation in Water, Sanitation and Hygiene Activities at Tongogara Refugee Camp, Zimbabwe,' *International Journal of Social Science Research and Review* 6, no.7 (2023), https://doi.org/10.47814/ijssrr.v6i7.1462.

[11] Rhodante Ahlers, and Margreet Zwarteveen, 'The water question in feminism: water control and gender inequities in a neo-liberal era.' *Gender, Place and Culture* 16, no. 4 (2009), https://doi.org/10.1080/09663690903003926.

access outcomes.[12] At the same time, women are not passive recipients of vulnerability. Across water-insecure settings, they actively develop and sustain adaptive practices to manage scarcity, protect household health, and maintain everyday water systems. In small-island contexts, these practices include rainwater harvesting, selective source use, household-level treatment, informal scheduling, communal storage, and participation in collective maintenance. However, whether such practices are recognised as legitimate knowledge within village governance depends on local power relations, customary authority, and institutional responsiveness to women's participation.[13]

To analyse these dynamics, this study integrates intersectional analysis with an ethnohydrological perspective. Ethnohydrology conceptualises water not only as a physical resource, but also as a socio-ecological entity embedded in local knowledge systems, customary norms, spiritual meanings, and everyday practices.[14] This perspective is particularly relevant in Eastern Indonesia, where access to water is often mediated through customary institutions, kinship relations, village authority, and locally embedded ecological knowledge. When combined with intersectional analysis, ethnohydrology provides an analytical framework for understanding how hydrosocial territories—comprising water sources, infrastructure, social identities, household practices, and authority relations—produce unequal access to safe water. Despite growing scholarship on gender, water governance, and climate adaptation, empirical studies that explicitly integrate intersectional analysis and ethnohydrology remain limited in Eastern Indonesia. Existing research has often prioritised technical aspects of water supply, hydrological constraints, or generalised descriptions of women's domestic roles, without adequately examining how intersecting social identities and customary institutions mediate access, exclusion, recognition, and adaptive capacity. This gap constrains the development of water-governance strategies that are both ecologically appropriate and socially just for small-island communities.

In this article we address that gap through a qualitative comparative case study of Buano and Tiga islands. We examine how women experience, negotiate, and respond to water insecurity under climate stress, and how intersecting social inequalities shape everyday access to safe water. Specifically, we pursue three objectives: first, to analyse gendered and intersectional inequalities in household water access; second, to examine how class, sociocultural positioning, household status, and settlement location shape adaptive practices; and third, to identify institutional and policy pathways for gender-responsive and climate-just water governance in small-island contexts. Accordingly, we argue that safe-water access should be understood as an intersectional hydrosocial process through which ecological stress is translated into socially differentiated vulnerabilities and adaptive capacities.

[12] E. Lisa F. Schipper et al., 'Climate Resilient Development Pathways,' in *Climate Change 2022: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change,* edited by Hans-Otto Pörtner et al. (Cambridge University Press, 2022), https://doi.org/10.1017/9781009325844.027.

[13] Lata Narayanaswamy et al., 'Why a Feminist Ethics of Care and Socio-Ecological Justice Lens Matter for Global, Interdisciplinary Research on Water Security,' *Frontiers in Human Dynamics* 5 (December 2023), https://doi.org/10.3389/fhumd.2023.1212188.

[14] Kaisa Ilmonen, 'Book Review: Intersectionality,' *European Journal of Women's Studies* 24, no.3 (2017), https://doi.org/10.1177/1350506817713078.

Theoretical framework

This study is grounded in an integrated theoretical framework that combines intersectional analysis, ethnohydrology, and water insecurity to examine access to safe water in small-island contexts. Rather than treating water insecurity as a purely technical or infrastructural problem, the framework conceptualises it as a socio-ecological and politically mediated condition shaped by ecological constraints, social identities, customary authority, and unequal participation in governance processes.[15] This integrated perspective is particularly important in small-island environments, where ecological limits are closely intertwined with social differentiation, customary institutions, and local governance arrangements.[16]

Intersectionality and compounded water inequalities

Intersectional analysis provides a critical lens through which to understand how multiple axes of social differentiation, including gender, class, sociocultural positioning, household status, age, and spatial location, interact to produce unequal experiences of vulnerability, access, and adaptive capacity. Its contribution lies not simply in identifying coexisting inequalities, but in explaining how these dimensions mutually reinforce one another and become embedded in everyday practices, institutional arrangements, and resource-access systems.[17]

In the context of water access, gender alone is insufficient to explain inequality. Women's experiences of water insecurity are shaped by economic resources, household composition, social status, and proximity to infrastructure.[18] Women in low-income households may face longer collection times because they lack adequate storage tanks or treatment technologies. Female-headed households often experience intensified time constraints because water management, income generation, and care responsibilities converge within a single household role. Similarly, women in geographically marginal settlements may encounter delayed or restricted access to information regarding source conditions, maintenance schedules, or collective water-use arrangements.[19]

An intersectional approach also enables an analysis of differentiated agency. Women are not conceptualised solely as vulnerable subjects; they actively engage in adaptive practices such as rainwater harvesting, selective source use, household-level treatment, and informal sharing arrangements. However, whether these practices are recognised, legitimised, or incorporated into formal or customary governance depends on existing power

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[15] Ana Cristina Marques, 'Review: Patricia Hill Collins and Sirma Bilge, Intersectionality,' *International Sociology* 33, no. 5 (2018), https://doi.org/10.1177/0268580918791974d.

[16] Sarah Duignan et al., 'Be like the Running Water: Assessing Gendered and Age-Based Water Insecurity Experiences with Six Nations First Nation,' *Social Science and Medicine* 298 (April 2022), https://doi.org/10.1016/j.socscimed.2022.114864.

[17] UN Women. 'Facts and Figures: Women's Leadership and Political Participation; What We Do – UN Women – Headquarters.'

[18] Janwillem Liebrand, 'Why so Few Expert Women in the Water Sector? Masculinity, Race, Sex, and Policy Narratives of Technology, Gender and Development in Nepal.' *Frontiers in Human Dynamics* 5 (July 2023), https://doi.org/10.3389/fhumd.2023.1207941.

[19] Nathan J. Cook et al., 'Promoting Women's Leadership under Environmental Decentralization: The Roles of Domestic Policy, Foreign Aid, and Population Change,' *Environmental Science and Policy* 139 (January 2023), https://doi.org/10.1016/j.envsci.2022.11.007; Yoshika S. Crider and Isha Ray, 'Water and Development: A Gender Perspective,' *Oxford Research Encyclopedia of Environmental Science* (May 2022), https://doi.org/10.1093/acrefore/9780199389414.013.685.

relations and institutional structures. Intersectional analysis therefore enables a dual analysis of constraint and capacity, revealing how inequality shapes both exposure to risk and the ability to respond.[20]

Ethnohydrology and hydrosocial territories

Ethnohydrology situates water within the sociocultural and institutional contexts through which it is accessed, governed, and valued. It conceptualises water not merely as a physical resource, but as a socio-ecological entity embedded in local knowledge systems, customary norms, spiritual meanings, and everyday practices.[21] This perspective is particularly relevant in Eastern Indonesia, where access to springs, shallow wells, and rainwater-harvesting systems is often mediated through customary institutions, kinship relations, and informal authority networks.[22]

The concept of hydrosocial territories extends this perspective by framing water systems as socially produced configurations linking sources, infrastructure, users, institutions, and power relations.[23] Hydrosocial territories are not neutral physical spaces; they are arenas in which access, authority, recognition, and exclusion are negotiated. Within this framework, Buano and Tiga islands can be understood as distinct hydrosocial settings where ecological conditions and governance arrangements produce specific patterns of constraint and adaptation.[24]

Ethnohydrology also enables analysis of a critical tension: women's central role in everyday water management coexists with their limited authority in formal decision making. Although women are responsible for collection, storage, treatment, and household allocation, they often have restricted influence over infrastructure placement, maintenance rules, and resource allocation. This gap between practical responsibility and institutional authority constitutes a key mechanism through which gendered inequalities in water governance are reproduced.[25]

Gender, climate change, and water insecurity

Climate change intensifies existing inequalities in water access by increasing variability in water availability, quality, and reliability. In small-island contexts, prolonged dry seasons,

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[20] Rutgerd Boelens, *Water, Power and Identity. The Cultural Politics of Water in the Andes* (Routledge, 2015), https://doi.org/10.5771/0257-9774-2016-2-672.

[21] Amie O. West et al., 'Optical Water Quality and Human Perceptions: A Synthesis,' *Wiley Interdisciplinary Reviews: Water* (2016), https://doi.org/10.1002/wat2.1127; Meredith Gartin et al., 'Urban Ethnohydrology: Cultural Knowledge of Water Quality and Water Management in a Desert City.' *Ecology and Society* 15, no.4 (2010): 36. https://doi.org/10.5751/ES-03808-150436.

[22] UN Women, 'Facts and Figures: Women's Leadership and Political Participation; What We Do - UN Women - Headquarters.'

[23] Jeroen Vos and Rutgerd Boelens. 'Neoliberal Water Governmentalities, Virtual Water Trade, and Contestations.' In *Water Justice,* edited by Rutgerd Boelens, Tom Perreault, and Jeroen Vos (Cambridge University Press 2018), https://doi.org/10.1017/9781316831847.019.

[24] Rutgerd Boelens et al., 'Hydrosocial Territories: A Political Ecology Perspective,' *Water International* 41, no. 1 (2016), https://doi.org/10.1080/02508060.2016.1134898.

[25] Lena Hommes et al., 'Rural-Urban Water Struggles: Urbanizing Hydrosocial Territories and Evolving Connections, Discourses and Identities,' *Water International* 44 (April 2019), https://doi.org/10.1080/02508060.2019.1583311.

rainfall anomalies, saline intrusion, and declining spring discharge increase the time and effort required to secure safe water.[26] Given women's central role in household water management, these ecological pressures often translate into greater time burdens, physical strain, and reduced opportunities for education, income generation, and participation in governance.[27]

However, gendered vulnerability is not uniform. It is shaped by intersecting social identities and unequal access to resources. Women with greater economic capacity may mitigate scarcity through investment in storage infrastructure, while those dependent on communal sources may face repeated collection cycles and prolonged waiting times.[28] Women embedded within strong social networks may access information more rapidly than those marginalised from informal communication channels. Female-headed households frequently experience compounded pressures due to the convergence of productive, reproductive, and water-management responsibilities.[29]

We therefore conceptualise gendered water insecurity as a relational outcome produced through the interaction of ecological stress, domestic labour, social hierarchy, and exclusion from decision-making. Women's adaptive practices are recognised as critical forms of situated knowledge, while our analysis also asks whether such knowledge is institutionally acknowledged and integrated into governance processes.

Integrating intersectionality and ethnohydrology

The integration of intersectional analysis and ethnohydrology provides a comprehensive framework for analysing safe-water access in small-island environments. Intersectional analysis explains how overlapping social identities produce unequal barriers and capacities, while ethnohydrology situates these inequalities within locally embedded water systems, customary norms, and hydrosocial territories.[30] Together, these perspectives move the analysis beyond a simple distinction between access and scarcity toward a relational understanding of how water insecurity is produced through material conditions, social identities, and governance arrangements.[31] This integrated framework is particularly suited to the comparative analysis of Buano and Tiga islands. Buano's water insecurity is primarily shaped by seasonal variability and dependence on rainwater harvesting, while Tiga Island's challenges are linked to water-quality uncertainty arising from saline intrusion and geological

[26] UN Women, 'Facts and Figures: Women's Leadership and Political Participation; What We Do – UN Women – Headquarters.'

[27] Carole D. Nounkeu and Jigna M. Dharod, 'Status on the Scale Development to Measure Water Insecurity Experiences at the Household Level: A Narrative Review,' *Advances in Nutrition* 10, no.5 (2019), https://doi.org/10.1093/advances/nmz008.

[28] Sithabile Hlahla et al., 'Climate-Urban Nexus: A Study of Vulnerable Women in Urban Areas of KwaZulu-Natal Province, South Africa.' *Weather, Climate, and Society* 14, no. 3 (2022), https://doi.org/10.1175/WCAS-D-20-0180.1.

[29] UN Women, 'Facts and Figures: Women's Leadership and Political Participation; What We Do - UN Women - Headquarters.'

[30] Jennifer Hove et al., '"Water Is Life": Developing Community Participation for Clean Water in Rural South Africa,' *BMJ Global Health* 4, no. 3 (2019), https://doi.org/10.1136/bmjgh-2018-001377.

[31] Powell Mponela et al., 'Participatory Action Research, Social Networks, and Gender Influence Soil Fertility Management in Tanzania,' *Systemic Practice and Action Research* 36, no. 1 (2023), https://doi.org/10.1007/s11213-022-09601-3.

constraints. Despite these ecological differences, both contexts demonstrate that access to safe water is mediated by gendered labour, household resources, social networks, customary authority, and village-level governance.

The framework guides the empirical analysis in three ways. First, it identifies how ecological constraints are socially differentiated among households and groups through intersecting identity markers. Second, it examines how customary and institutional arrangements regulate access to water sources, infrastructure, and information. Third, it highlights women's adaptive practices while critically assessing whether such practices are recognised within governance processes. We demonstrate that access to safe water in small-island Eastern Indonesia is not solely determined by physical availability, but is fundamentally shaped by authority, recognition, participation, and social justice.[32]

Methodology

Research design and case selection

We employed a qualitative comparative case-study design to examine how access to safe water is shaped by intersecting social inequalities, local ecological conditions, and village-level water-governance arrangements.[33] A qualitative approach was appropriate because the study focused on lived experiences, everyday water practices, gendered labour, institutional participation, and locally embedded forms of adaptation that cannot be adequately captured through aggregate indicators alone.[34]

The research was conducted in two coastal small-island communities in Maluku Province, Eastern Indonesia: Buano Island in West Seram and Tiga Island in Central Maluku. These sites were selected purposively because they share exposure to climate-related water stress but differ in their ecohydrological conditions. Buano Island relies mainly on rainwater harvesting, shallow wells, and small springs whose availability declines during prolonged dry periods. Tiga Island depends more heavily on limited spring sources associated with carbonate geology and is affected by salinity-related water-quality concerns, which may be intensified by coastal exposure and seawater intrusion. This contrast enabled the study to examine how different water-access systems interact with gender, class, household status, sociocultural group membership, and settlement location.[35]

Fieldwork was conducted during the transition from the wet season to the dry season, a period when rainfall begins to decline but household water scarcity has not yet reached its

[32] Gesmar Rosa Santos et al., 'Women, Water and Equity: An Agenda That Makes Sense?' *Desenvolvimento e Meio Ambiente* 62 (November 2023), https://doi.org/10.5380/dma.v62i0.86917; UN Women, 'Facts and Figures: Women's Leadership and Political Participation; What We Do – UN Women – Headquarters.'

[33] Henk Ovink et al., 'The UN 2023 Water Conference and Pathways towards Sustainability Transformation for a Water-Secure World,' *Nature Water* 1, no. 3 (2023), https://doi.org/10.1038/s44221-023-00052-1.

[34] Susan Chiblow, 'An Indigenous Research Methodology That Employs Anishinaabek Elders, Language Speakers and Women's Knowledge for Sustainable Water Governance,' *Water (Switzerland)* 12, no. 11 (2020), https://doi.org/10.3390/w12113058; Lucero Radonic et al., 'Questionable Quality: Using Photovoice to Document Women's Experiences of Water Insecurity in Flint, USA,' *Case Studies in the Environment* 6, no. 1 (2022), https://doi.org/10.1525/cse.2022.1706476.

[35] Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2022: Mitigation of Climate Change: Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change,* ed. P. R. Shukla et al. (Cambridge University Press, 2022), https://doi.org/10.1017/9781009157926.

seasonal peak. This timing allowed us to capture both routine water-management practices and emerging dry-season pressures that shape women's adaptive strategies. However, the seasonal fieldwork horizon is recognised as a methodological limitation because longer-term observation would be needed to capture interannual climate variability and wet-dry season dynamics more fully.[36]

Participants, sampling, and data collection

Data collection combined semi-structured interviews, focus group discussions (FGD), and participant observation. Interviews explored women's everyday experiences of water collection, storage, treatment, time burden, household decision-making, participation in village forums, and climate-related coping practices. FGD were used to examine collective perceptions of water governance, customary norms, shared constraints, and community-level adaptation practices that may not emerge fully through individual interviews. Participant observation documented everyday water practices, including how water was accessed, transported, stored, shared, and managed across household and community settings.[37]

Participants were selected through purposive sampling to capture diverse experiences of water access, household water management, and climate-related adaptation. The primary participants were women who had direct responsibility for household water management, including collection, storage, treatment, allocation, and household-level decision-making. The study also included female-headed households, women involved in community-based water practices, and selected male participants who held institutional roles, including customary leaders, village officials, and water-system caretakers. Male participants were included not as the primary focus of the study, but to contextualise water-governance arrangements, infrastructure maintenance responsibilities, and decision-making structures.[38]

In total, 38 in-depth interviews were conducted: 20 on Buano Island and 18 on Tiga Island. Most interviewees were women household water managers (n = 32), while six interviews were conducted with male institutional actors. Participant selection considered age, economic status, household status, sociocultural group membership, educational background, and settlement location in order to reflect the intersectional focus of the study. Interviews lasted approximately 45–90 minutes and were conducted in Bahasa Indonesia and, where necessary, supported by local language clarification to ensure that participants could express local meanings, customary terms, and water-related practices accurately.

Two FGDs were conducted: one in Buano Island with seven women participants and one in Tiga Island with eight women participants. All FGD participants were women. The FGDs included women household water managers, female-headed households, and community members from different settlement locations. FGD participants partly overlapped with interview participants, but additional women were also included to broaden the discussion across household status, age, economic background, sociocultural group membership, and settlement location. Selected institutional actors were consulted separately to avoid the domination of women's narratives by formal authority figures. Observation focused on wells,

[36] UN Women, 'Facts and Figures: Women's Leadership and Political Participation; What We Do – UN Women – Headquarters.'

[37] Devon W. Carbado et al., 'Essay Intersectionality at 30: Mapping the Margins,' *Harvard Law Review* 2193 (2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3501840.

[38] Andrea J. Nightingale, 'Bounding Difference: Intersectionality and the Material Production of Gender, Caste, Class and Environment in Nepal,' *Geoforum* 42, no. 2 (2011), https://doi.org/10.1016/j.geoforum.2010.03.004.

springs, household tanks, communal storage points, collection routines, waiting times, informal information exchange, and visible differences in storage capacity. These observations helped verify the practical dimensions of water labour and infrastructure use and provided contextual grounding for interview and focus group narratives. Table 1 summarises the participants and qualitative data sources.[39]

Table 1. Summary of participants and qualitative data sources

Category	Buano Island	Tiga Island	Total
Women household water managers	17	15	32
Male institutional actors	3	3	6
Total interviews	20	18	38
Female-headed households included in interviews	5	4	9
Focus group discussions	1 FGD; 7 women participants	1 FGD; 8 women participants	2 FGDs; 15 women participants
FGD composition	Women household water managers, female-headed households, and community members from different settlement locations	Women household water managers, female-headed households, and community members from different settlement locations	Women participants with varied household status, age, economic background, sociocultural group membership, and settlement location
Main data sources	Interviews, FGDs, and participant observation	Interviews, FGDs, and participant observation	Interviews, FGDs, and participant observation

Source. Author's fieldwork, in-depth interviews, focus group discussions, and participant observation in Buano Island and Tiga Island, Maluku Province.

Note: FGDs = focus group discussions. 'Women household water managers' refers to women with primary responsibility for household water collection, storage, treatment, allocation, and decision-making. 'Female-headed households' include widows and women whose spouses are absent due to work or migration. Participants were selected purposively to reflect variation in household status, age, economic background, sociocultural group membership, and settlement location.

Data processing, transcription, and translation

Interview and focus group data were recorded with participant consent where permitted. When recording was not appropriate due to local sensitivities or participant preference, detailed field notes were taken during and immediately after the interaction. Audio recordings and field notes were transcribed in Bahasa Indonesia. Local terms related to customary authority, water sources, household practices, and social relations were retained in the original language where necessary and translated contextually into English during manuscript preparation. The translation process prioritised conceptual equivalence rather than literal word-for-word translation. Terms related to customary norms, social belonging, women's water labour, and water-source classification were checked against field notes and

[39] UNESCO for UN-Water, '*Imminent Risk of a Global Water Crisis, Warns the UN World Water Development Report 2023,*' 22 March 2023, https://www.unesco.org/en/articles/imminent-risk-global-water-crisis-warns-un-world-water-development-report-2023.

participant explanations to avoid losing local meanings. This process was particularly important because the study uses an ethnohydrological lens, in which local terminology and everyday categories of water use are analytically significant.[40]

Analytical procedure and coding

Data were analysed using thematic analysis informed by intersectional analysis and ethnohydrology. The analysis proceeded through three stages: open coding, axial coding, and selective coding. Coding was conducted manually using a structured coding matrix to retain close engagement with interview narratives, field notes, and site-specific meanings. Manual coding was considered appropriate because the dataset was moderate in size and required careful interpretation of locally embedded terms, customary references, and relational dynamics. In the open-coding stage, the analysis identified recurring empirical codes related to water access, time burden, storage capacity, source quality, household responsibilities, informal information flows, participation in village forums, customary authority, and adaptive practices. Examples of initial codes included 'longer dry-season collection time,' 'limited household storage,' 'salinity-related taste concern,' 'female-headed household burden,' 'informal information through kinship networks,' 'exclusion from village meetings,' and 'rainwater harvesting as household adaptation.'

In the axial-coding stage, these initial codes were grouped into broader analytical categories, including gendered water labour, class-based access to technical options, household status and compounded burden, sociocultural positioning and information flows, settlement location and physical access, customary authority, and site-specific ecohydrological constraints. In the selective-coding stage, these categories were compared across Buano and Tiga islands to identify recurring relational mechanisms through which intersecting social positions shaped differentiated experiences of water insecurity and adaptive capacity.[41]

The analytical process was both theory-informed and data-sensitive. Intersectional analysis guided attention to gender, class, sociocultural group membership, household status, age, and settlement location, while ethnohydrology guided interpretation of water sources, customary norms, household practices, and village authority structures as parts of locally embedded hydrosocial territories. Our analysis did not seek to establish statistical causality. Instead, we traced qualitative patterns, cross-site contrasts, and relational mechanisms linking ecological stress, social positioning, and participation in decision-making. Coding decisions were iteratively reviewed against field notes and analytical memos to ensure consistency, transparency, and conceptual coherence throughout the analytical process.[42]

Analytical rigour, reflexivity, and bias mitigation

Analytical rigour was strengthened through triangulation across multiple data sources, including interviews with women household water managers, focus group discussions,

[40] UNESCO for UN-Water, 'Imminent Risk of a Global Water Crisis, Warns the UN World Water Development Report 2023.'

[41] Jeroen Vos and Rutgerd Boelens, 'Neoliberal Water Governmentalities, Virtual Water Trade, and Contestations,' in *Water Justice,* ed. Rutgerd Boelens et al. (Cambridge University Press, 2018), https://doi.org/10.1017/9781316831847.019

[42] Vos and Boelens, 'Neoliberal Water Governmentalities, Virtual Water Trade, and Contestations.'

participant observation, and consultations with village officials, customary leaders, and water-system caretakers. Triangulation enabled the study to compare household-level experiences with institutional perspectives and observed water practices. Member checking was conducted by discussing preliminary interpretations with selected participants and local informants to assess whether the emerging analysis reflected local experiences and meanings. This process was particularly important for validating interpretations related to women's water labour, customary norms, informal information flows, and the role of household status in shaping water access. Field notes and analytic memos were also used to document interpretive decisions, emerging patterns, and potential researcher assumptions during the analytical process.

To reduce researcher bias, the analysis applied reflexive memoing throughout data collection and interpretation. Particular attention was given to the risk of overgeneralising women's experiences, treating sociocultural positioning as a fixed category, or interpreting customary institutions solely as exclusionary structures. The study therefore approached gender, class, sociocultural group membership, and household status as relational and context-specific positions rather than static identity categories. Male institutional actors were included to contextualise governance structures, but their accounts were not allowed to override women's narratives of everyday water labour and adaptive practice.[43]

Ethical considerations

Research permission was obtained from village authorities and customary leaders before fieldwork was conducted. All participants were informed about the purpose of the study, the voluntary nature of their involvement, and their right to withdraw at any stage. Consent was obtained prior to interviews and focus group discussions. Participant identities were anonymised, and sensitive information was handled confidentially.

Fieldwork was conducted with respect for local norms and with particular care to avoid reinforcing social stigma, gendered vulnerability, or community-level tensions. Interviews with women were conducted in settings that prioritised comfort, privacy, and participant safety. The study avoided identifying specific households, customary groups, or individuals in ways that could expose participants to social risk. Ethical sensitivity was especially important because the research addressed household water burdens, gendered authority, social belonging, and unequal participation in village-level governance.[44]

Results

Site-specific water contexts and everyday access constraints

Access to safe water in Buano and Tiga islands is shaped by distinct ecohydrological conditions, uneven infrastructure, and everyday household practices. Although both sites experience water insecurity, the dominant form of constraint differs across the two islands. In Buano Island, water insecurity is primarily associated with seasonal scarcity, declining shallow-well reliability, and limited dry-season storage. In Tiga Island water insecurity is more strongly linked to limited spring sources and salinity-related uncertainty affecting water taste, perceived safety, and reliability.

[43] UNESCO for UN-Water, 'Imminent Risk of a Global Water Crisis.'

[44] UNESCO for UN-Water, 'Imminent Risk of a Global Water Crisis.'

In Buano Island, households rely mainly on rainwater harvesting, shallow wells, small springs, household containers, and communal collection points. During the rainy season, household tanks, drums, and buckets help maintain relatively stable access to domestic water. However, this stability is unevenly distributed. Households with larger storage capacity are better able to reduce collection frequency, while those with limited storage remain dependent on shared wells and communal sources. During the dry season, reduced rainfall and declining shallow-well availability intensify collection burdens. Women reported longer queues, repeated trips, and increased pressure to ration water for cooking, washing, drinking, childcare, and other care-related needs.

As a woman household water manager in Buano explained: 'When the dry season starts, the well water decreases quickly. If we do not collect water early, we have to return again later, and other household work is delayed.'[45] This account illustrates how seasonal scarcity is translated into everyday time pressure, repeated mobility, and household rationing. It also shows that water insecurity in Buano is not experienced solely as an insufficient supply of water, but as a reorganisation of women's daily labour around uncertain water availability.

In Tiga Island, access to safe water is organised around a more limited number of spring sources. Unlike Buano, where seasonal scarcity is the dominant constraint, households in Tiga must also manage uncertainty over water quality, particularly when salinity, taste, or perceived contamination affects the acceptability of spring water. Women therefore adjust their routines by selecting the sources they use—collecting water at specific times; storing water when quality is considered better; and seeking alternatives when spring water becomes unsuitable for household use.

One participant in Tiga noted: 'Sometimes the water tastes salty, so we wait, choose another source, or store water when it tastes better.'[46] This statement indicates that water access in Tiga is shaped not only by physical availability, but also by women's everyday assessments of taste, safety, and reliability. In this context, women's practical knowledge of source conditions becomes central to household water security, even though such knowledge is not always formally recognised in village-level decision-making. The division of water-related labour further reveals the gendered structure of everyday access. Women remain the central actors in daily water management, including collection, transport, storage, treatment, rationing, and household allocation. Men are more commonly involved in episodic infrastructure-related tasks, such as repairing pumps, maintaining pipes or wells, assisting with heavy transport, and participating in formal village or customary meetings. Children may assist with small containers or household storage, but they do not replace women's primary responsibility for daily water provisioning. This division reflects a clear asymmetry: women perform the routine and time-sensitive labour that sustains household water security; men's roles are more closely associated with technical maintenance and formal decision-making.[47]

[45] Participant BW07, Buano Island, 9 November 2024

[46] Participant TG12, Tiga Island, 9 December 2024

[47] Vica Marie Jelena Tomberge et al., 'The Physical Burden of Water Carrying and Women's Psychosocial Well-Being: Evidence from Rural Nepal,' *International Journal of Environmental Research and Public Health* 18, no. 15 (2021), https://doi.org/10.3390/ijerph18157908.

Table 2. Comparative hydrosocial pathways of gendered water burdens across Buano and Tiga islands

Dimension	Buano Island	Tiga Island
Dominant water constraint	Seasonal scarcity which is linked to reduced rainfall, declining shallow-well reliability, and limited dry-season storage.	Limited spring sources and salinity-related uncertainty affecting taste, perceived safety, and reliability.
Main water-access system	Rainwater harvesting, shallow wells, small springs, household tanks, drums, and communal collection points.	Springs, communal access points, household storage containers, and selective source use.
Gendered labour pattern	Women manage daily collection, transport, storage, rationing, and household allocation; men assist mainly with repairs and formal meetings.	Women manage source selection, collection timing, storage, and quality monitoring; men are more visible in infrastructure maintenance and village forums.
Commonly reported time burden	Longer queues, repeated trips, and extended waiting during the dry season.	Additional travel, waiting, and repeated monitoring during salinity- or quality-related episodes.
Class-based infrastructure differences	Larger household tanks reduce collection frequency, while limited storage increases dependence on communal sources.	Better storage allows households to avoid poor-quality collection periods, while limited storage increases exposure to unreliable sources.
Household and care burden	Female-headed households face intensified pressure during dry-season scarcity.	Female-headed households face intensified pressure when quality uncertainty requires repeated source selection.
Participation pattern	Women's daily water knowledge is central but unevenly represented in village forums.	Women's quality-monitoring knowledge is central but weakly incorporated into formal decisions.

Source. Author's fieldwork, in-depth interviews, focus group discussions, and participant observation in Buano Island and Tiga Island, Maluku Province.

Note. This table synthesises qualitative patterns rather than statistical comparisons. The comparison highlights two hydrosocial pathways: scarcity-driven burdens in Buano Island and quality-driven burdens in Tiga Island. 'Women's water knowledge' refers to practical knowledge developed through daily water collection, storage, rationing, source selection, and household-level quality monitoring.

Table 2 illustrates how contrasting ecohydrological conditions generate distinct but comparable hydrosocial pathways of gendered water insecurity. The comparison shows that Buano generates scarcity-driven water burdens, while Tiga generates quality-driven water burdens. In both cases, however, women's everyday labour mediates household access to safe water. The table also demonstrates that these burdens are not distributed evenly. In Buano, households with limited storage capacity are more exposed to dry-season scarcity, longer collection routines, and increased rationing pressure. In Tiga, households with weaker access to information, alternative sources, or storage facilities are more vulnerable to water-quality uncertainty.

Across both sites, class, household status, settlement location, and social ties shape how women manage water-related constraints. Everyday access to safe water is therefore not determined by island hydrology alone, but by the interaction between ecohydrological conditions, infrastructure, household resources, gendered labour, and local governance arrangements. This finding establishes the basis for the subsequent analysis of gendered time burdens and intersectional differences in adaptive capacity.[48]

[48] Gesmar Rosa Santos et al., 'Women, Water and Equity: An Agenda That Makes Sense?' *Desenvolvimento e Meio Ambiente* 62 (November 2023), https://doi.org/10.5380/dma.v62i0.86917.

Gendered time burdens and the distribution of constraints within and across sites

Across Buano and Tiga islands, women consistently occupy the central role in household water management. Their responsibilities extend beyond water collection to include transporting, storing, treating, rationing, and allocating water for drinking, cooking, washing, childcare, and other domestic needs. Although men occasionally contribute to physically demanding or infrastructure-related tasks, such as repairing pumps, maintaining pipes, cleaning wells, or attending village meetings, the routine and time-sensitive labour required to secure household water remains overwhelmingly undertaken by women.

In Buano Island, these time burdens are strongly seasonal. During the rainy season, rainwater harvesting, shallow wells, and household storage containers provide relatively stable access for many households. However, this stability is highly contingent upon storage capacity. Households equipped with larger tanks or multiple storage containers can substantially reduce the frequency of water collection, whereas those with limited storage remain dependent on communal wells, springs, and shared collection points. As rainfall declines during the dry season, reduced groundwater availability increases pressure on communal sources, requiring women to queue for longer periods and undertake repeated collection trips.

One participant described this seasonal burden as follows: *'*During the dry season we cannot collect enough water in a single trip. We often return several times a day, and many household tasks must wait until we have enough water.'[49] This testimony illustrates that seasonal scarcity generates not only physical water shortages but also pronounced time poverty, as household routines, caregiving responsibilities, and income-generating activities become reorganised around increasingly uncertain water availability.

By contrast, women in Tiga Island experience a different configuration of water-related constraints. Rather than being driven primarily by seasonal scarcity, their daily routines are shaped by uncertainty regarding water quality. Because households depend on a limited number of freshwater springs, women devote considerable time to evaluating salinity, taste, and perceived safety before deciding whether water is suitable for domestic use. During periods of saline intrusion or reduced spring reliability, women frequently travel to alternative sources; delay collection until water quality improves; or coordinate informally with neighbouring households.[50]

As one participant explained, *'*Sometimes the spring water tastes salty, so we wait, ask neighbours which source is better, or collect water from another spring even if it is farther away.'[51] This account demonstrates that, in Tiga Island, water insecurity is experienced not only as limited availability but as continual uncertainty regarding water quality. Consequently, women's daily labour involves ongoing assessment, monitoring, and adaptive decision-making rather than simply transporting water from source to household.

Despite these contrasting ecohydrological conditions, both sites reveal a common gendered pattern. Women perform the continuous labour necessary to maintain household

[49] Woman household water manager, Buano Island, 16 November 2024.

[50] Houria Djoudi et al., 'Beyond Dichotomies: Gender and Intersecting Inequalities in Climate Change Studies,' *Ambio* 45 (November 2016), https://doi.org/10.1007/s13280-016-0825-2; Lata Narayanaswamy et al., 'Why a Feminist Ethics of Care and Socio-Ecological Justice Lens Matter for Global, Interdisciplinary Research on Water Security,' *Frontiers in Human Dynamics* 5 (December 2023), https://doi.org/10.3389/fhumd.2023.1212188.

[51] FGD Participant TG01, Tiga Island, 6 December 2024.

water security, whereas men remain more visible in episodic technical maintenance and formal governance processes. Children occasionally assist with carrying smaller containers or household storage, yet their contributions do not substantially reduce women's overall workload. This gendered division of labour demonstrates that responsibility for maintaining everyday water security remains structurally feminised across both communities.[52]

Importantly, these burdens are not experienced uniformly among women. As summarised in Table 2, the distribution of water-related labour is shaped by intersecting social positions rather than gender alone. Economic resources determine whether households can invest in storage infrastructure; household status influences the availability of labour and caregiving support; settlement location affects travel distance and waiting time; while access to information conditions households' ability to respond to changing water conditions. Consequently, the same ecohydrological stress produces markedly different experiences of water insecurity among women occupying different social positions.[53]

The intersectional character of these burdens was reflected in participants' narratives. A female-headed household participant from Buano observed, 'When my husband works outside the village, I collect water alone, take care of the children, and finish all household work myself. There is no one else to help.'[54] Similarly, a participant from Tiga explained, 'Families who have larger tanks do not need to collect water as often as we do. We have to keep checking whether the spring water is suitable every day.'[55]

These accounts demonstrate that gender intersects with economic resources, household structure, and settlement context to shape differentiated experiences of water insecurity. Time poverty therefore emerges not merely from hydrological scarcity but from the interaction between ecological conditions, infrastructure, household assets, caregiving responsibilities, and unequal access to adaptive resources.[56]

Overall, the comparative evidence presented in Table 2 identifies two distinct hydrosocial pathways. In Buano Island, women's time burdens are predominantly scarcity-driven, resulting from declining rainfall, limited storage capacity, and prolonged collection routines. In Tiga Island, by contrast, they are primarily quality-driven, arising from uncertainty regarding salinity and water safety. Despite these different environmental pressures, both pathways converge in demonstrating that women's unpaid labour remains the principal mechanism through which household water security is maintained.[57] The findings therefore

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[52] Ajeesh A K, 'Untranslatable Ecologies: Rethinking Ecotranslation from Postcolonial Margins,' Intersections: Gender and Sexuality in Asia and the Pacific, no. 53 (May 2026), http://intersections.anu.edu.au/issue53/ajeesh-ak.pdf.

Ismiatul Nur et al., 'Women's Leadership, Local Wisdom and Household Resilience during Multiple Crisis (Tsunami, Conflict, Pandemic) in Ambon, Indonesia.' *E3S Web of Conferences* 651 (October 2025), https://doi.org/10.1051/e3sconf/202565103008.

[53] Rick J. Hogeboom et al., 'Resilience Meets the Water-Energy-Food Nexus: Mapping the Research Landscape.' *Frontiers in Environmental Science* 9 (March 2021), https://doi.org/10.3389/fenvs.2021.630395.

[54] Participant BW05, Buano Island, 6 November 2024.

[55] Participant TG03, Tiga Island, 6 December 2024.

[56] Kaisa Ilmonen, 'Book Review: Intersectionality,' *European Journal of Women's Studies* 24, no. 3 (2017), https://doi.org/10.1177/1350506817713078.

[57] Kathleen Kevany et al., 'Water, Women, Waste, Wisdom and Wealth - Harvesting the Confluences and Opportunities,' *Journal of Cleaner Production* 60 (December 2013), https://doi.org/10.1016/j.jclepro.2013.07.018; Karen Bakker and Cynthia Morinville, 'The Governance

reinforce the central argument of this study that access to safe water in small-island settings is produced through the interaction of ecohydrological conditions and intersectional social inequalities, rather than by physical water availability alone.[58]

Intersectional differentiation in adaptive capacity

Adaptive capacity in Buano and Tiga islands is differentiated through the intersection of economic class, household status, sociocultural positioning, age, settlement location, and participation in governance. These dimensions shape how households access water sources, obtain information, invest in storage, participate in decision-making, and respond to scarcity or water-quality uncertainty. Rather than treating adaptive capacity as a fixed household attribute, in this section we analyse adaptive capacity as a relational outcome produced through material resources, social belonging, household structure, intergenerational knowledge, spatial location, and institutional recognition.

Table 3. Intersectional Dimensions Shaping Adaptive Capacity across the Two Small-Island Water Systems

Dimension	Buano Island	Tiga Island	Intersectional mechanism
Economic class	Storage assets buffer dry-season scarcity.	Storage and treatment options buffer salinity-related uncertainty.	Material resources convert adaptive knowledge into practical flexibility.
Household status	Female-headed households face intensified dry-season labour burdens.	Female-headed households face repeated quality-monitoring demands.	Household structure shapes labour availability, care responsibilities, and adaptive options.
Sociocultural positioning and social ties	Kinship proximity affects access to source and maintenance information.	Informal networks shape knowledge of source quality and collection timing.	Social positioning mediates access to information and participation in deliberative spaces.
Age and generation	Older women provide seasonal memory, while younger women support coordination.	Older women interpret spring behaviour, while younger women assist digital communication.	Adaptive capacity is distributed through intergenerational knowledge exchange.
Settlement location	Distance from communal sources increases dry-season effort.	Distance from acceptable-quality sources increases travel during salinity episodes.	Spatial location shapes both physical access and feasible response options.
Participation in governance	Women's everyday water knowledge remains unevenly represented.	Women's quality-monitoring knowledge remains weakly institutionalised.	Practical knowledge is not automatically converted into decision-making authority.

Source. Author's fieldwork, in-depth interviews, focus group discussions, and participant observation in Buano Island and Tiga Island, Maluku Province.

Note. This table synthesises recurring qualitative mechanisms rather than statistical effects. 'Intersectional mechanism' refers to the relational process through which material resources, household structure,

Dimensions of Water Security: A Review,' *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 371, no. 2002 (2013), https://doi.org/10.1098/rsta.2013.0116.

[58] Yoshika S. Crider and Isha Ray, 'Water and Development: A Gender Perspective,' *Oxford Research Encyclopedia of Environmental Science* (May 2022), https://doi.org/10.1093/acrefore/9780199389414.013.685.

sociocultural positioning, age, settlement location, and governance participation shape differentiated adaptive capacity across the two study sites.

Table 3 synthesises these six dimensions of adaptive capacity across the two study sites. It shows that Buano and Tiga are shaped by different ecohydrological pressures, but that both sites produce unequal adaptive possibilities through similar intersectional mechanisms. In Buano, adaptive capacity is closely linked to the ability to buffer dry-season scarcity through storage assets and social support. In Tiga, it is shaped by the ability to manage salinity-related uncertainty through source selection, information access, storage, and treatment practices. Across both islands, women's adaptive knowledge is central to household water security, yet it is unevenly converted into decision-making authority.

Economic class and access to technical options

Economic class shapes households' ability to reduce water-related time burdens and manage risks associated with scarcity and water-quality uncertainty. Across both study sites, this differentiation is most visible in household water-storage capacity, access to simple treatment options, and flexibility in deciding when and where to collect water.[59]

In Buano Island, higher-income households are more likely to own larger rainwater tanks, plastic drums, covered buckets, or multiple storage containers. These assets allow households to store rainwater during the wet season and reduce dependence on communal wells, small springs, or shared collection points during the dry season. By contrast, lower-income households with limited storage capacity must collect water more frequently when household reserves are depleted. During dry periods, this increases women's exposure to longer queues, repeated trips, and extended waiting times.

One woman from a lower-income household in Buano explained: 'Families with large tanks can keep water for many days. We only have small containers, so when the dry season comes, I must go back to the well again and again.'[60] In Tiga Island, economic class shapes adaptive capacity differently. Because the main constraint is not only availability but also salinity-related water-quality uncertainty, households with greater storage capacity are better able to collect and store water when spring water is perceived as fresher, less saline, or more suitable for domestic use. Some households also use simple treatment practices, including cloth filtration, boiling, sedimentation in covered containers, or basic household filters. Lower-income households, however, have fewer opportunities to store water in advance or avoid periods when source quality deteriorates.[61] As one participant in Tiga observed: 'If there is enough storage, we can keep water when the spring tastes good. If not, we must take what is available, even when the taste is not good.'[62]

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[59] Amie O. West et al., 'Optical Water Quality and Human Perceptions of Rivers: An Ethnohydrology Study,' *Ecosystem Health and Sustainability* 2, no. 8 (2016), https://doi.org/10.1002/ehs2.1230; Djoudi et al., 'Beyond Dichotomies: Gender and Intersecting Inequalities in Climate Change Studies.'

[60] Participant BW08, Buano Island, 9 November 2024

[61] Dor Hirsh Bar Gai et al., 'A Comprehensive Review of the Nexus of Food, Energy, and Water Systems: What the Models Tell Us,' *Journal of Water Resources Planning and Management* 148, no. 6 (2022), https://doi.org/10.1061/(ASCE)WR.1943-5452.0001564; Lata Narayanaswamy et al., 'Why a Feminist Ethics of Care and Socio-Ecological Justice Lens Matter for Global, Interdisciplinary Research on Water Security,' *Frontiers in Human Dynamics* 5 (December 2023), https://doi.org/10.3389/fhumd.2023.1212188.

[62] Participant TG06, Tiga Island, 8 December 2024

These class-based differences do not operate independently of local ecohydrological conditions. In Buano, storage capacity buffers seasonal rainfall variability and declining shallow-well availability. In Tiga, storage and simple treatment options help households manage limited spring sources and salinity-related uncertainty. Economic class therefore structures adaptive capacity through everyday material arrangements, including tanks, drums, covered containers, filters, pumps, and access to alternative sources. Women from lower-income households carry heavier burdens not because they lack adaptive knowledge, but because their technical options are constrained by limited storage, weaker purchasing power, and greater dependence on communal sources.

Sociocultural positioning, information flows, and participation in deliberative spaces

Sociocultural positioning in this study refers to socially recognised forms of belonging within village life, including local origin, clan or kinship affiliation, migrant status, neighbourhood location, and proximity to customary or village authority. Across Buano and Tiga islands, these forms of belonging shape how households are positioned within informal communication networks and deliberative spaces related to water management.[63]

Information about water availability, source quality, collection timing, temporary restrictions, infrastructure repair, and communal maintenance is not always distributed through formal channels. Much of this information circulates through kinship ties, neighbourhood relations, women's informal networks, customary leaders, village officials, and water-system caretakers. Women who are closely connected to these networks tend to receive information earlier and can adjust their collection routines more efficiently. By contrast, women who are newly settled, socially peripheral, or less connected to dominant kinship and customary networks may receive information later or indirectly.[64]

A participant from Buano described this uneven information flow: 'Usually we hear about repairs or changes in collection time from relatives or neighbours. If you are not close to them, you may only know after going to the source.'[65] This uneven access to information has practical consequences. In Buano, delayed information about declining well levels, collection schedules, or communal source availability may result in longer queues, repeated trips, or missed opportunities to collect water at more favourable times. In Tiga, delayed information about spring quality, salinity changes, or maintenance activities may require women to visit several sources before finding water perceived as suitable for household use. In Tiga, one FGD participant noted: 'We ask each other which spring is better that day. Those who hear the information first can collect earlier, while others may arrive when the water is already crowded or not good.'[66]

Sociocultural positioning also influences participation in deliberative spaces. Decisions about source protection, infrastructure siting, repair priorities, maintenance responsibilities,

[63] Peter A. Kindle, 'Diversity, Oppression, and Change: Culturally Grounded Social Work,' (2nd ed.), *Journal of Ethnic & Cultural Diversity in Social Work* 25, no. 4 (2016), https://doi.org/10.1080/15313204.2016.1206498; Cynthia T. Fowler, 'Customary Rights and Freshwater Ecology in Pluralistic Societies on the Monsoonal Island of Sumba (Eastern Indonesia),' *Frontiers in Environmental Science* 10 (June 2022), https://doi.org/10.3389/fenvs.2022.842647.

[64] Rick J. Hogeboom et al., 'Resilience Meets the Water-Energy-Food Nexus: Mapping the Research Landscape,' *Frontiers in Environmental Science* 9 (March 2021), https://doi.org/10.3389/fenvs.2021.630395.

[65] Participant BW11, Buano Island, 11 November 2024.

[66] FGD Participant TG03, Tiga Island, 6 December 2024

and access rules are often discussed in village meetings, customary forums, or informal gatherings. Women from households with stronger kinship ties to village leaders or customary authorities are more likely to be informed about, invited into, or represented in such spaces. Conversely, women from socially marginal households, migrant families, or weaker kinship networks may have fewer opportunities to voice concerns about distance from sources, storage limitations, or household-level water burdens.

This pattern should not be interpreted as deliberate exclusion in a narrow sense. Rather, it reflects how everyday governance operates through relational proximity, trust, kinship, and informal authority. These mechanisms may unintentionally reproduce unequal access to information and participation. Sociocultural positioning therefore functions as part of a broader intersectional location, interacting with class, household status, settlement location, and gender to shape adaptive capacity.[67]

Household status and compounded burdens among female-headed households

Household status constitutes an important axis of differentiation in adaptive capacity, particularly among female-headed households. In this study, female-headed households include widows, women whose husbands or partners are absent due to work-related migration, and women who carry primary responsibility for household decision-making and daily care. Across Buano Island and Tiga Island, these households experience compounded burdens because water management, income generation, childcare, elderly care, and domestic decision-making are concentrated within a single household role.[68]

In Buano Island, female-headed households face heightened pressure during the dry season, when declining shallow-well availability and reduced rainwater storage increase dependence on communal wells, small springs, and shared collection points. Women in these households often have to queue for longer periods, make repeated trips, or rely on neighbours when water must be collected from more distant sources. Limited income also constrains their ability to invest in larger rainwater tanks, covered drums, pumps, or simple household treatment devices.[69] One female household head in Buano explained: 'When water is far or the queue is long, I still have to go because there is no one else at home. After that I must cook, wash, and look after the children.'[70]

In Tiga Island, female-headed households encounter a different but equally demanding set of constraints. Because water access depends on limited spring sources and is affected by salinity-related water-quality uncertainty, women must spend additional time monitoring taste, clarity, and perceived safety before using water for drinking, cooking, or childcare. When spring water becomes less acceptable, they may travel to alternative sources, wait for preferred collection times, or store water selectively when quality is considered better. For households with limited storage and limited labour support, these

[67] West et al., 'Optical Water Quality and Human Perceptions of Rivers: An Ethnohydrology Study.'

[68] Kaisa Ilmonen, 'Book Review: Intersectionality,' *European Journal of Women's Studies* 24, no. 3 (2017), https://doi.org/10.1177/1350506817713078.

[69] Kim Robin van Daalen et al., 'Bridging the Gender, Climate, and Health Gap: The Road to COP29,' *The Lancet Planetary Health* 8, no. 12 (2024), https://doi.org/10.1016/S2542-5196(24)00270-5; Sandra Ricart et al., 'How to Reinforce Governance in Water-Tourism Nexus Research? Updating the Hydrosocial Cycle to Loop into Stakeholders' Roles, Interactions, and Power Dynamics,' *Environmental Research Letters* 20, no. 3 (2025), https://doi.org/10.1088/1748-9326/adb447.

[70] Participant BW13, Buano Island, 13 November 2024.

routines intensify time poverty and increase dependence on informal assistance.[71] A female-headed household participant in Tiga stated: 'I have to decide which water can be used for cooking and which water only for washing. If the spring tastes salty, I must look for another source, even when I am already tired.'[72]

Female-headed households also demonstrate active adaptive agency. Their strategies include negotiating collection turns with neighbours; prioritising drinking and cooking water over non-essential uses; sharing transport or containers; coordinating with relatives; and contributing to small-scale maintenance activities where possible. In some cases, they rely on women's informal groups, neighbourhood networks, or water-user arrangements to obtain information about source conditions, repairs, and collection timing.[73]

These findings show that female headship should not be understood simply as a deficit category. Rather, it is an intersectional condition shaped by gender, income, labour availability, household composition, and access to information. Female-headed households may possess strong experiential knowledge and practical problem-solving capacity, but their adaptive options remain constrained when they lack storage assets, labour support, stable income, and representation in village-level water decision-making.

Age, generation, and the uptake of specific practices

Age and generational position shape the forms of adaptive practice used by women in Buano Island and Tiga Island. The findings do not suggest that one generation is more adaptive than another. Rather, they show that different age groups mobilise different types of knowledge, communication practices, and household strategies in response to water scarcity and quality uncertainty.

Younger women are more likely to use mobile phones, SMS, WhatsApp groups, and informal digital communication to exchange information about water availability, collection timing, maintenance activities, and source conditions. These practices are particularly useful when households need timely information about communal wells, springs, repairs, or periods when water quality is perceived to decline. In Buano, such communication helps women coordinate collection during dry-season scarcity. In Tiga, it supports rapid information-sharing about spring conditions, salinity, taste, and alternative sources. As one younger participant from Tiga explained: 'We usually send messages or ask in the group if the spring water is good today. That helps us decide where to collect water.'[74]

Older women, by contrast, rely more strongly on accumulated ecological memory, seasonal knowledge, and long-term experience with particular water sources. They often interpret rainfall patterns, wind conditions, spring behaviour, and household storage needs based on repeated observation across seasons. This knowledge helps households anticipate scarcity, prioritise water uses, and adjust collection routines before conditions become more difficult. One older woman in Buano described this form of knowledge: 'From the rain and

[71] Crider and Ray, 'Water and Development: A Gender Perspective.'

[72] Participant TG09, Tiga Island, 10 December 2024.

[73] Meg Parsons et al., 'Indigenous Environmental Justice within Marine Ecosystems: A Systematic Review of the Literature on Indigenous Peoples' Involvement in Marine Governance and Management,' *Sustainability (Switzerland)* 13, no. 8 (2021), https://doi.org/10.3390/su13084217.

[74] Participant TG18, Tiga Island, 17 December 2024

the wind we already know when the wells [level] will begin to fall. Before that happens, we prepare containers and reduce unnecessary water use.'[75]

Generational differences also shape experimentation with household-level water practices. Younger women may be more willing to try modified storage arrangements, covered containers, basic filtration, or new coordination practices when such information comes from relatives, neighbours, village programmes, religious networks, non-governmental organisations, or government extension activities. Older women may be more selective in adopting new practices, often assessing them against long-standing experience of water quality, taste, source reliability, and household needs.

These findings show that adaptive capacity is distributed across generations. Younger women contribute through coordination, communication, and practical experimentation, while older women contribute through ecological memory, seasonal interpretation, and continuity of household water knowledge. Effective adaptation therefore emerges not from replacing older practices with newer ones, but from combining multiple knowledge systems within households and communities.[76]

Taken together, the six dimensions identified in Table 3 demonstrate that adaptive capacity in small-island water systems is not merely a household attribute, but a relational outcome produced through the intersection of material resources, social belonging, household structure, intergenerational knowledge, spatial location, and institutional recognition. Table 3 also shows that adaptive knowledge does not automatically become institutional authority. Women's everyday knowledge remains central to household resilience, but its recognition within village-level water governance remains uneven.[77]

Discussion

In this study we have demonstrated that safe-water access in small-island Eastern Indonesia is produced through the interaction of ecohydrological constraints, gendered labour, household resources, sociocultural positioning, and village-level governance. The comparison between Buano and Tiga islands shows that water insecurity is not reducible to physical scarcity or infrastructural insufficiency. Rather, it emerges through hydrosocial arrangements in which ecological stress is mediated by unequal social relations, everyday labour, customary authority, and differential access to adaptive resources.[78] Our findings contribute to intersectional water-governance scholarship by showing that women's experiences of water insecurity are not homogeneous. Gender is a central axis of inequality, but it is always mediated by class, household status, settlement location, social belonging, age, and access to

[75] Participant BW15, Buano Island, 16 November 2024.

[76] Elise Jonsson et al., 'An Introduction to Data-Driven Modelling of the Water-Energy-Food-Ecosystem Nexus,' *Environmental Modelling and Software* 181 (October 2024), https://doi.org/10.1016/j.envsoft.2024.106182; Geoffrey MacDonald, 'Towards an Intersectional Literary Criticism: Cross-Identity Representations, Social Location, and Shani Mootoo's Intervention,' *Journal of Postcolonial Writing* 59, no. 2 (2023), https://doi.org/10.1080/17449855.2022.2161832

[77] Sara de Wit, 'Gender and Climate Change as New Development Tropes of Vulnerability for the Global South: Essentializing Gender Discourses in Maasailand, Tanzania.' *Tapuya: Latin American Science, Technology and Society* 4, no. 1 (2021), https://doi.org/10.1080/25729861.2021.1984638; Cynthia T. Fowler, 'Customary Rights and Freshwater Ecology in Pluralistic Societies on the Monsoonal Island of Sumba (Eastern Indonesia),' *Frontiers in Environmental Science* 10 (June 2022), https://doi.org/10.3389/fenvs.2022.842647.

[78] Devon W. Carbado and Cheryl I Harris, 'Essay Intersectionality At 30: Mapping the Margins,' *Harvard Law Review* 2193 (2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3501840.

information. Low-income women, female-headed households, women living farther from water sources, and those with weaker access to village information networks face intensified constraints. Our findings extend intersectional analysis by demonstrating that inequality is not merely accumulated across categories; it is produced relationally through the ways household resources, labour availability, sociocultural recognition, and institutional participation shape everyday water access.[79]

We also advance ethnohydrological analysis by showing that water sources, storage practices, customary norms, and household routines form part of locally embedded hydrosocial territories. Wells, springs, rainwater tanks, and communal collection points are not neutral infrastructures; they are sites where authority, responsibility, legitimacy, and exclusion are negotiated. Women possess detailed knowledge of source reliability, water taste, salinity, seasonal change, storage practices, and household demand. However, this knowledge is often recognised informally while remaining weakly institutionalised in village-level decision making. This gap between practical responsibility and institutional authority is a central mechanism through which gendered water inequalities are reproduced. By integrating intersectionality and ethnohydrology, we offer a theoretical contribution to the study of water insecurity in small-island contexts. Intersectional analysis explains how social inequalities differentiate exposure, burden, and adaptive capacity, while ethnohydrology situates these inequalities within local water systems, customary arrangements, and everyday practices. Their integration enables a more precise understanding of how unequal water-access outcomes are produced simultaneously through material conditions and social relations. This framework is especially relevant for Eastern Indonesia, where water governance is shaped not only by hydrological limits but also by customary institutions, kinship networks, village authority, and gendered divisions of labour.[80]

The novelty of this study lies in its comparative analysis of two small-island water systems with different dominant constraints. Buano Island illustrates a scarcity-driven pathway, where declining rainfall, reduced shallow-well reliability, and limited storage intensify women's dry-season water labour. Tiga Island illustrates a quality-driven pathway, where saline intrusion, spring dependence, and uncertainty over water taste and safety require women to monitor, select, and manage sources carefully. Despite these differences, both sites show that household water security depends heavily on women's unpaid labour and adaptive knowledge. This comparison strengthens the argument that small-island water insecurity must be analysed as both ecohydrological and intersectional. The policy implications are substantial. First, gender-responsive water governance must move beyond women's formal inclusion as meeting participants and ensure that women's everyday knowledge informs infrastructure siting, maintenance rules, water-quality monitoring, and resource allocation.[81] Second, adaptation policies should prioritise targeted support for households facing compounded constraints, especially low-income and female-headed households. Such support may include subsidised storage tanks, safe household treatment options, rainwater-harvesting systems, and locally appropriate water-quality monitoring. Third, village-level co-management should recognise informal women's networks as

[79] Crider and Ray, 'Water and Development: A Gender Perspective.'

[80] West, 'Optical Water Quality and Human Perceptions of Rivers: An Ethnohydrology Study'; de Wit, 'Gender and Climate Change as New Development Tropes of Vulnerability for the Global South.'

[81] Kim Robin van Daalen et al., 'Bridging the Gender, Climate, and Health Gap: The Road to COP29,' *The Lancet Planetary Health* 8, no. 12 (2024), https://doi.org/10.1016/S2542-5196(24)00270-5.

important channels for information sharing, early warning, and collective adaptation. Fourth, infrastructure planning must be tailored to site-specific ecohydrological conditions: storage-oriented interventions are especially critical in scarcity-driven settings such as Buano, while source protection, salinity monitoring, and treatment support are particularly important in quality-driven settings such as Tiga.

These findings also have broader implications for climate adaptation in small-island regions. Adaptation cannot be effective if it treats households as socially uniform units or assumes that infrastructure alone will resolve water insecurity. Climate-resilient water policy must address the social organisation of water labour, unequal access to information, household-level resource disparities, and the limited institutional recognition of women's knowledge. Without such attention, adaptation interventions risk reproducing the very inequalities they seek to reduce.[82] Overall, this study shows that access to safe water in small-island Eastern Indonesia is shaped by more than environmental exposure. It is produced through the intersection of climate stress, hydrosocial territories, gendered labour, and unequal recognition within local governance. By foregrounding women's lived experiences and adaptive practices, we demonstrate that socially just water governance requires not only improved infrastructure, but also institutional arrangements that recognise women as knowledge holders, decision makers, and central actors in climate adaptation. This is the article's core contribution to intersectional water studies, ethnohydrology, and climate-just governance in small-island contexts.[83]

Conclusion

In this study we have demonstrated that safe-water access in Buano and Tiga islands is produced through the intersection of ecohydrological constraints, gendered labour, household resources, sociocultural positioning, and village-level governance. Water insecurity in small-island Eastern Indonesia is therefore not simply a consequence of physical scarcity or inadequate infrastructure, but a hydrosocial process through which ecological stress is socially differentiated. In Buano, women's water burdens follow a scarcity-driven pathway shaped by seasonal rainfall variability, declining shallow-well reliability, and unequal household storage capacity. In Tiga, women's burdens follow a quality-driven pathway shaped by limited spring sources, salinity-related uncertainty, and the need for continuous assessment of water suitability. Across both sites, women remain central to household water security while being under-represented in formal decision-making spaces. Our findings show that gendered water inequality is fundamentally intersectional. Women's experiences and adaptive capacities are shaped by economic class, household status, sociocultural belonging, age, settlement location, and access to information. Low-income women and female-headed households face compounded burdens because limited storage, weaker purchasing power, care responsibilities, and reduced institutional representation intersect in everyday water management. By integrating intersectional analysis with ethnohydrology, we advance a framework for understanding safe-water access as both material and political. Springs, wells,

[82] Kathleen Kevany et al.,' Water, Women, Waste, Wisdom and Wealth – Harvesting the Confluences and Opportunities,' *Journal of Cleaner Production* 60 (December 2013), https://doi.org/10.1016/j.jclepro.2013.07.018.

[83] Miriam Gay-Antaki and Diana Liverman, 'Climate for Women in Climate Science: Women Scientists and the Intergovernmental Panel on Climate Change,' *Proceedings of the National Academy of Sciences of the United States of America* 115, no. 9 (2018); Kevany, 'Water, Women, Waste, Wisdom and Wealth.'

rainwater tanks, and communal collection points are not merely technical infrastructures; they are hydrosocial spaces where authority, knowledge, responsibility, and inclusion are negotiated. This contribution extends intersectionality scholarship by showing how ecohydrological processes and local governance arrangements jointly produce differentiated adaptive capacities in climate-vulnerable small-island settings. Policy responses must therefore move beyond infrastructure provision alone. Climate-resilient water governance should recognise women as knowledge holders, adaptive practitioners, and legitimate decision-makers, while prioritising low-income and female-headed households through targeted storage, rainwater harvesting, treatment technologies, water-quality monitoring, and inclusive village-level planning. Ultimately, equitable safe-water access depends not only on improving infrastructure, but also on transforming the social relations through which knowledge, authority, and adaptive opportunities are distributed.

Limitations and policy implications

Our study has several limitations. Its qualitative comparative design prioritises analytical depth over statistical generalisation; therefore, the findings should be understood as context-specific rather than universally representative. Nevertheless, the study offers analytical transferability for understanding similar small-island settings where ecological constraints, gendered labour, social inequality, and local governance intersect. Our analysis is limited to two small island cases in Maluku Province, namely Buano Island and Tiga Island. Future research should include a wider range of island settings, longer seasonal observation, and more detailed monitoring of water quality, spring discharge, rainfall variability, and saline intrusion. In this study we have also foregrounded gender, class, household status, sociocultural positioning, age, social ties, and settlement location, while other axes of differentiation, including disability, religion, and migration status, require further investigation. The findings have important policy implications for gender-responsive, intersectional, and climate-adaptive water governance in small-island contexts. Policy responses should move beyond infrastructure provision alone and address the social relations that shape access, participation, information flows, and adaptive capacity. Women's practical knowledge of water collection, storage, quality monitoring, rationing, and household-level adaptation should be formally recognised in village-level water planning, maintenance arrangements, and decision-making processes.

At the local level, this requires a stronger substantive representation of women, including low-income women and female-headed households, on water committees, in customary forums, and in village deliberation processes. Infrastructure support should prioritise household and communal storage, basic water-treatment options, transparent maintenance schedules, and accessible information systems on source availability and water quality. In Buano, interventions should prioritise dry-season storage, rainwater harvesting, and equitable access to communal sources. In Tiga, interventions should prioritise water-quality monitoring, salinity-sensitive infrastructure, and alternative source management. Overall, effective water governance in small island Eastern Indonesia requires technical solutions that are integrated with social inclusion, institutional recognition, and accountability. Recognising women not merely as household water users, but as knowledge holders and decision-making actors, is essential for building more equitable, climate-resilient, and socially just water systems. Although the qualitative design enabled rich contextual understanding, future studies integrating longitudinal hydrological monitoring with mixed-

methods approaches would strengthen the explanatory scope of intersectional water-governance research.

References

Ahlers, Rhodante, and Margreet Zwarteveen. 'The water question in feminism: water control and gender inequities in a neo-liberal era.' *Gender, Place and Culture* 16, no. 4 (2009): 409–26. https://doi.org/10.1080/09663690903003926.

Bakker, Karen, and Cynthia Morinville, 'The Governance Dimensions of Water Security: A Review.' *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 371, no. 2002 (2013): 20130116. https://doi.org/10.1098/rsta.2013.0116.

Ajeesh A K, 'Untranslatable Ecologies: Rethinking Ecotranslation from Postcolonial Margins,' Intersections: Gender and Sexuality in Asia and the Pacific, no. 53 (May 2026):103-119 http://intersections.anu.edu.au/issue53/ajeesh-ak.pdf

Boelens, Rutgerd, Jaime Hoogesteger, Erik Swyngedouw, Jeroen Vos, and Philippus Wester. 'Hydrosocial Territories: A Political Ecology Perspective.' *Water International* 41, no. 1 (2016): 1–14. https://doi.org/10.1080/02508060.2016.1134898.

Boelens, Rutgerd. '*Water, Power and Identity. The Cultural Politics of Water in the Andes*.' Routledge, 2015. https://doi.org/10.5771/0257-9774-2016-2-672.

Carbado, Devon W., and Cheryl I Harris. 'Essay Intersectionality at 30: Mapping the Margins.' *Harvard Law Review* 2193 (2019): 19–52. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3501840.

Chiblow, Susan. 'An Indigenous Research Methodology That Employs Anishinaabek Elders, Language Speakers and Women's Knowledge for Sustainable Water Governance.' *Water (Switzerland)* 12, no. 11 (2020): 1–13. https://doi.org/10.3390/w12113058.

Cole, Stroma, Paula Tallman, Gabriela Salmon-Mulanovich, and Binahayati Rusyidi. 'Water Insecurity Is Associated with Gender-Based Violence: A Mixed-Methods Study in Indonesia.' *Social Science and Medicine* 344 (March 2024): 1–12. https://doi.org/10.1016/j.socscimed.2023.116507

Cook, Nathan J., Michelle E Benedum, Ganesh Gorti, and Sitashma Thapa. 'Promoting Women's Leadership under Environmental Decentralization: The Roles of Domestic Policy, Foreign Aid, and Population Change.' *Environmental Science and Policy* 139 (January 2023): 240–49. https://doi.org/10.1016/j.envsci.2022.11.007.

Crider, Yoshika S., and Isha Ray. 'Water and Development: A Gender Perspective.' *Oxford Research Encyclopedia of Environmental Science*, (May 2022): 1–13. https://doi.org/10.1093/acrefore/9780199389414.013.685.

Daalen, Kim Robin van, Laura Jung, Sara Dada et al. 'Bridging the Gender, Climate, and Health Gap: The Road to COP29.' *The Lancet Planetary Health* 8, no. 12 (2024): e1088–e1105. https://doi.org/10.1016/S2542-5196(24)00270-5.

de Wit, Sara. 'Gender and Climate Change as New Development Tropes of Vulnerability for the Global South: Essentializing Gender Discourses in Maasailand, Tanzania.' *Tapuya: Latin American Science, Technology and Society* 4, no. 1 (2021): 1–24. https://doi.org/10.1080/25729861.2021.1984638.

Djoudi, Houria, Bruno Locatelli, Chloe Vaast, Kiran Asher, Maria Brockhaus, and Bimbika Basnett Sijapati. 'Beyond Dichotomies: Gender and Intersecting Inequalities in Climate Change Studies.' *Ambio* 45 (November 2016): S248–S262. https://doi.org/10.1007/s13280-016-0825-2.

Duignan, Sarah, Tina Moffat, and Dawn Martin-Hill. 'Be like the Running Water: Assessing Gendered and Age-Based Water Insecurity Experiences with Six Nations First Nation.' *Social Science and Medicine* 298 (April 2022): 1–9. https://doi.org/10.1016/j.socscimed.2022.114864.

Fowler, Cynthia T. 'Customary Rights and Freshwater Ecology in Pluralistic Societies on the Monsoonal Island of Sumba (Eastern Indonesia).' *Frontiers in Environmental Science* 10 (June 2022): 1–14. https://doi.org/10.3389/fenvs.2022.842647.

Gai, Dor Hirsh Bar, Ekundayo Shittu, Y. C. Ethan Yang, and Hong-Yi Li. 'A Comprehensive Review of the Nexus of Food, Energy, and Water Systems: What the Models Tell Us.' *Journal of Water Resources Planning and Management* 148, no. 6 (2022): 1–17. https://doi.org/10.1061/(ASCE)WR.1943-5452.0001564.

Gartin, Meredith, Beatrice Crona, Amber Wutich, and Paul Westerhoff. 'Urban Ethnohydrology: Cultural Knowledge of Water Quality and Water Management in a Desert City.' *Ecology and Society* 15, no. 4 (2010). https://doi.org/10.5751/ES-03808-150436.

Gay-Antaki, Miriam, and Diana Liverman. 'Climate for Women in Climate Science: Women Scientists and the Intergovernmental Panel on Climate Change.' *Proceedings of the National Academy of Sciences of the United States of America* 115, no. 9 (2018): 2060–65. https://doi.org/10.1073/pnas.1710271115.

Hlahla, Sithabile, Mulala Danny Simatele, Trevor Hill, and Tafadzwanashe Mabhaudhi. 'Climate-Urban Nexus: A Study of Vulnerable Women in Urban Areas of KwaZulu-Natal Province, South Africa.' *Weather, Climate, and Society* 14, no. 3 (2022): 933–48. https://doi.org/10.1175/WCAS-D-20-0180.1.

Hogeboom, Rick J., Bas W. Borsje, Mekdelawit M. Deribe et al. 'Resilience Meets the Water-Energy-Food Nexus: Mapping the Research Landscape.' *Frontiers in Environmental Science* 9 (March 2021): 1–18. https://doi.org/10.3389/fenvs.2021.630395.

Hommes, Lena, Rutgerd Boelens, Leila M. Harris, and Gert Jan Veldwisch. 'Rural-Urban Water Struggles: Urbanizing Hydrosocial Territories and Evolving Connections, Discourses and Identities.' *Water International* 44 (April 2019): 81–94. https://doi.org/10.1080/02508060.2019.1583311.

Hove, Jennifer, Lucia D'Ambruoso, Denny Mabetha et al. '"Water Is Life": Developing Community Participation for Clean Water in Rural South Africa.' *BMJ Global Health* 4, no. 3 (2019): 1–13. https://doi.org/10.1136/bmjgh-2018-001377.

Ilmonen, Kaisa. 'Book Review: Intersectionality,' *European Journal of Women's Studies* 24, no. 3 (2017): 294–96. https://doi.org/10.1177/1350506817713078.

Intergovernmental Panel on Climate Change (IPCC). *Climate Change 2022: Mitigation of Climate Change: Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change,* edited by P. R. Shukla, J. Skea, R. Slade et al. Cambridge University Press, July 2022. https://doi.org/10.1017/9781009157926.

Jonsson, Elise, Andrijana Todorović, Malgorzata Blicharska et al. 'An Introduction to Data-Driven Modelling of the Water-Energy-Food-Ecosystem Nexus.' *Environmental Modelling and Software* 181 (October 2024): 1–12. https://doi.org/10.1016/j.envsoft.2024.106182.

Kevany, Kathleen, Maarten Siebel, Katherine Hyde, Dima Nazer, and Donald Huisingh. 'Water, Women, Waste, Wisdom and Wealth – Harvesting the Confluences and Opportunities.' *Journal of Cleaner Production* 60 (December 2013): 4–10. https://doi.org/10.1016/j.jclepro.2013.07.018.

Kindle, Peter A. 'Diversity, Oppression, and Change: Culturally Grounded Social Work,' (2nd ed.). *Journal of Ethnic & Cultural Diversity in Social Work* 25, no. 4 (2016): 325–26. https://doi.org/10.1080/15313204.2016.1206498.

Latuamury, B., H. Marasabessy, M. Talaohu, and W. Imlabla. 'Small Island Watershed Morphometric and Hydrological Characteristics in Ambon Region, Maluku Province.' In *IOP Conference Series: Earth and Environmental Science* 800 (2021): 1–16. https://doi.org/10.1088/1755-1315/800/1/012047,

Latuamury, Bokiraiya, Hendrik S.E.S. Aponno, Husain Marasabessy, Miranda H. Hadijah, and Wilma Imlabla. 'The Spatial Dynamics of Land Cover Change along the Wallacea Corridor in the Key Biodiversity Area "Buano Island," Maluku, Indonesia.' *Journal of Degraded and Mining Lands Management* 7, no. 4 (2020): 2241-2251. https://doi.org/10.15243/jdmlm.2020.074.2241.

Liebrand, Janwillem. 'Why so Few Expert Women in the Water Sector? Masculinity, Race, Sex, and Policy Narratives of Technology, Gender and Development in Nepal.' *Frontiers in Human Dynamics* 5 (July 2023): 1–15. https://doi.org/10.3389/fhumd.2023.1207941,

MacDonald, Geoffrey. 'Towards an Intersectional Literary Criticism: Cross-Identity Representations, Social Location, and Shani Mootoo's Intervention.' *Journal of Postcolonial Writing* 59, no. 2 (2023): 172–85. https://doi.org/10.1080/17449855.2022.2161832.

Marques, Ana Cristina. 'Review: Patricia Hill Collins and Sirma Bilge, Intersectionality.' *International Sociology* 33, no. 5 (2018): 615–17. https://doi.org/10.1177/0268580918791974d.

Mponela, Powell, Julius Manda, Michael Kinyua, and Job Kihara. 'Participatory Action Research, Social Networks, and Gender Influence Soil Fertility Management in Tanzania.' *Systemic Practice and Action Research* 36, no. 1 (2023): 141–63. https://doi.org/10.1007/s11213-022-09601-3.

Narayanaswamy, Lata, Robert Ferritto, Marya Hillesland et al. 'Why a Feminist Ethics of Care and Socio-Ecological Justice Lens Matter for Global, Interdisciplinary Research on Water Security.' *Frontiers in Human Dynamics* 5 (December 2023): 1–11. https://doi.org/10.3389/fhumd.2023.1212188.

Nightingale, Andrea J. 'Bounding Difference: Intersectionality and the Material Production of Gender, Caste, Class and Environment in Nepal.' *Geoforum* 42, no. 2 (2011): 153–62. https://doi.org/10.1016/j.geoforum.2010.03.004.

Nounkeu, Carole D., and Jigna M. Dharod. 'Status on the Scale Development to Measure Water Insecurity Experiences at the Household Level: A Narrative Review.' *Advances in Nutrition* 10, no. 5 (2019): 864–75. https://doi.org/10.1093/advances/nmz008.

Nur, Ismiatul Ramadhian, Rizka Puspitasari, M. Arifin, Bokiraiya Latuamury, and Rina Suryani Oktari. 'Women's Leadership, Local Wisdom and Household Resilience during Multiple Crisis (Tsunami, Conflict, Pandemic) in Ambon, Indonesia.' *E3S Web of Conferences* 651 (October 2025): 1–16. https://doi.org/10.1051/e3sconf/202565103008.

Ovink, Henk, Sulton Rahimzoda, Johannes Cullman, and Angelo Jonas Imperiale. 'The UN 2023 Water Conference and Pathways towards Sustainability Transformation for a Water-Secure World.' *Nature Water* 1, no. 3 (2023): 212–15. https://doi.org/10.1038/s44221-023-00052-1.

Parsons, Meg, Lara Taylor, and Roa Crease. 'Indigenous Environmental Justice within Marine Ecosystems: A Systematic Review of the Literature on Indigenous Peoples' Involvement in Marine Governance and Management.' *Sustainability (Switzerland)* 13, no. 8 (2021): 1–33. https://doi.org/10.3390/su13084217.

Pouramin, Panthea, Nidhi Nagabhatla, and Michela Miletto. 'A Systematic Review of Water and Gender Interlinkages: Assessing the Intersection with Health.' *Frontiers in Water* 2, no. 6 (2020): 1–25. https://doi.org/10.3389/frwa.2020.00006.

Radonic, Lucero, Cara Jacob, Rowenn Kalman, and E. Yvonne Lewis. 'Questionable Quality: Using Photovoice to Document Women's Experiences of Water Insecurity in Flint, USA.' *Case Studies in the Environment* 6, no. 1 (2022): 1706476. https://doi.org/10.1525/cse.2022.1706476.

Ricart, Sandra, Rubén Villar-Navascués, Flaminia Squitieri et al. 'How to Reinforce Governance in Water-Tourism Nexus Research? Updating the Hydrosocial Cycle to Loop into Stakeholders' Roles, Interactions, and Power Dynamics.' *Environmental Research Letters* 20, no. 3 (2025): 1–14. https://doi.org/10.1088/1748-9326/adb447.

Santos, Gesmar Rosa, Daniela Nogueira, and Diego Antonio França de Freitas. 'Women, Water and Equity: An Agenda That Makes Sense?' *Desenvolvimento e Meio Ambiente* 62 (November 2023): 960–78. https://doi.org/10.5380/dma.v62i0.86917.

Schipper, E. Lisa F., Aromar Revi, Benjamin L. Preston et al. 'Climate Resilient Development Pathways.' In *Climate Change 2022: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change,* edited by Hans-Otto Pörtner, Debra C. Roberts, Melinda Tignor et al. Cambridge University Press, 2022. https://doi.org/10.1017/9781009325844.027.

Sibanda, Wisdom, Melissa M. Hansen, and Geoffrey Mukwada. 'Grappling with Gendered Crises: Women's Access and Participation in Water, Sanitation and Hygiene Activities at Tongogara Refugee Camp, Zimbabwe.' *International Journal of Social Science Research and Review* 6, no. 7 (2023): 212–28. https://doi.org/10.47814/ijssrr.v6i7.1462.

Tomberge, Vica Marie Jelena, Janine Stefanie Bischof, Regula Meierhofer, Akina Shrestha, and Jennifer Inauen. 'The Physical Burden of Water Carrying and Women's Psychosocial Well-Being: Evidence from Rural

Nepal.' *International Journal of Environmental Research and Public Health* 18, no. 15 (2021): 1–11. https://doi.org/10.3390/ijerph18157908.

UN Women. 'Facts and Figures: Women's Leadership and Political Participation; What We Do – UN Women – Headquarters.' UN Women 6 (2022).

UNDP/NEMA/UNEP. '*Enhancing the Contribution of Weather, Climate and Climate Change to Growth, Employment and Prosperity*.' Report, 2009. https://www.sidalc.net/search/Record/oai%3Awedocs.unep.org%3A20.500.11822-26899/Description.

UNESCO. 'The United Nations World Water Development Report 2021: Valuing Water.' *Water Politics* (2021). https://doi.org/10.54679/MOMU6572.

UNESCO for UN-Water. 'Imminent Risk of a Global Water Crisis, Warns the UN World Water Development Report 2023.' 22 March 2023. https://www.unesco.org/en/articles/imminent-risk-global-water-crisis-warns-un-world-water-development-report-2023.

United States Agency for International Development (USAID). *Ecosystem-Based Adaptation and Water Security: Evidence Summary.* United States Agency for International Development, 2017.

Vos, Jeroen, and Rutgerd Boelens. 'Neoliberal Water Governmentalities, Virtual Water Trade, and Contestations.' In *Water Justice,* edited by Rutgerd Boelens, Tom Perreault, and Jeroen Vos. Cambridge University Press, 2018. https://doi.org/10.1017/9781316831847.019.

West, Amie O., Justin M. Nolan, and J. Thad Scott. 'Optical Water Quality and Human Perceptions: A Synthesis.' *Wiley Interdisciplinary Reviews: Water* 3, no. 2 (2016): 167–80. https://doi.org/10.1002/wat2.1127.

West, Amie O., Justin M. Nolan, and J. Thad Scott. 'Optical Water Quality and Human Perceptions of Rivers: An Ethnohydrology Study.' *Ecosystem Health and Sustainability* 2, no. 8 (2016): e01230. https://doi.org/10.1002/ehs2.1230.

World Health Organization (WHO) and United Nations Children's Fund (UNICEF). *Progress on Household Drinking Water, Sanitation and Hygiene 2000–2020: Five Years into the SDGs.* World Health Organization and United Nations Children's Fund, September 2021. https://www.who.int/publications/i/item/9789240030848.