Understanding and responding to climate change impacts in inclusive WASH programs - a conceptual framework

Acknowledgements

Citation

The Institute for Sustainable Futures at the University of Technology Sydney

The Institute for Sustainable Futures at the University of Technology (ISF-UTS) is an interdisciplinary research and consulting organisation. ISF-UTS has been setting global benchmarks since 1997 in helping governments, organisations, businesses and communities achieve change towards sustainable futures. We utilise a unique combination of skills and perspectives to offer long term sustainable solutions that protect and enhance the environment, human wellbeing and social equity.

ISF acknowledges and respects the Aboriginal and Torres Strait Islander custodians of Australia and the Gadigal peoples upon which the UTS City Campus now stands. We continue to value the generations of knowledge Aboriginal and Torres Strait Islander Peoples embedded within our University and we pay our respect to their Elders past, present and emerging.

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Introduction

Conceptual framework used for research

There are many different ideas and practices from water, sanitation and hygiene (WASH), climate change adaptation (CCA) and gender and social inclusion (GSI) academic and civil society sectors that are relevant to supporting civil society organisations (CSOs) to understand and respond to climate change impacts. Our research required a framework to translate and integrate these ideas so they could be applied, in practice, to understand and assess how climate change affects WASH and GSI outcomes from WASH projects.

In our research project, ISF-UTS worked collaboratively with the CSO partners to develop practical climate change assessment methods and approaches. The "research team" refers to The Institute for Sustainable Futures at the University of Technology Sydney (ISF-UTS), Plan International in Indonesia (YPII), Plan International Australia (PIA), WaterAid Timor-Leste (WATL) and WaterAid Australia (WAA) team members working jointly.

An initial version of the framework was developed and used to:

1. support the research team, who bring different sectoral and disciplinary expertise, knowledge and viewpoints, to jointly understand the many different ways that climate change could affect rural WASH projects and communities.

2. ground the research in the latest academic literature relating to climate change adaptation and resilience, WASH and GSI, and use this literature to support a robust and applicable framework.

3. guide the research team's development of assessment methods and approaches.

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The initial version of the conceptual framework was then iteratively refined through the process of applying it to develop climate change assessment methods and approaches.

The framework is presented in Figure 1, and will be of interest to anyone seeking to integrate WASH, CCA and GSI considerations, especially those in the WASH sector. The remainder of this document describes each numbered element of the conceptual framework, as it is presented in Figure 1. Box 1 presents climate change terms used throughout the document.
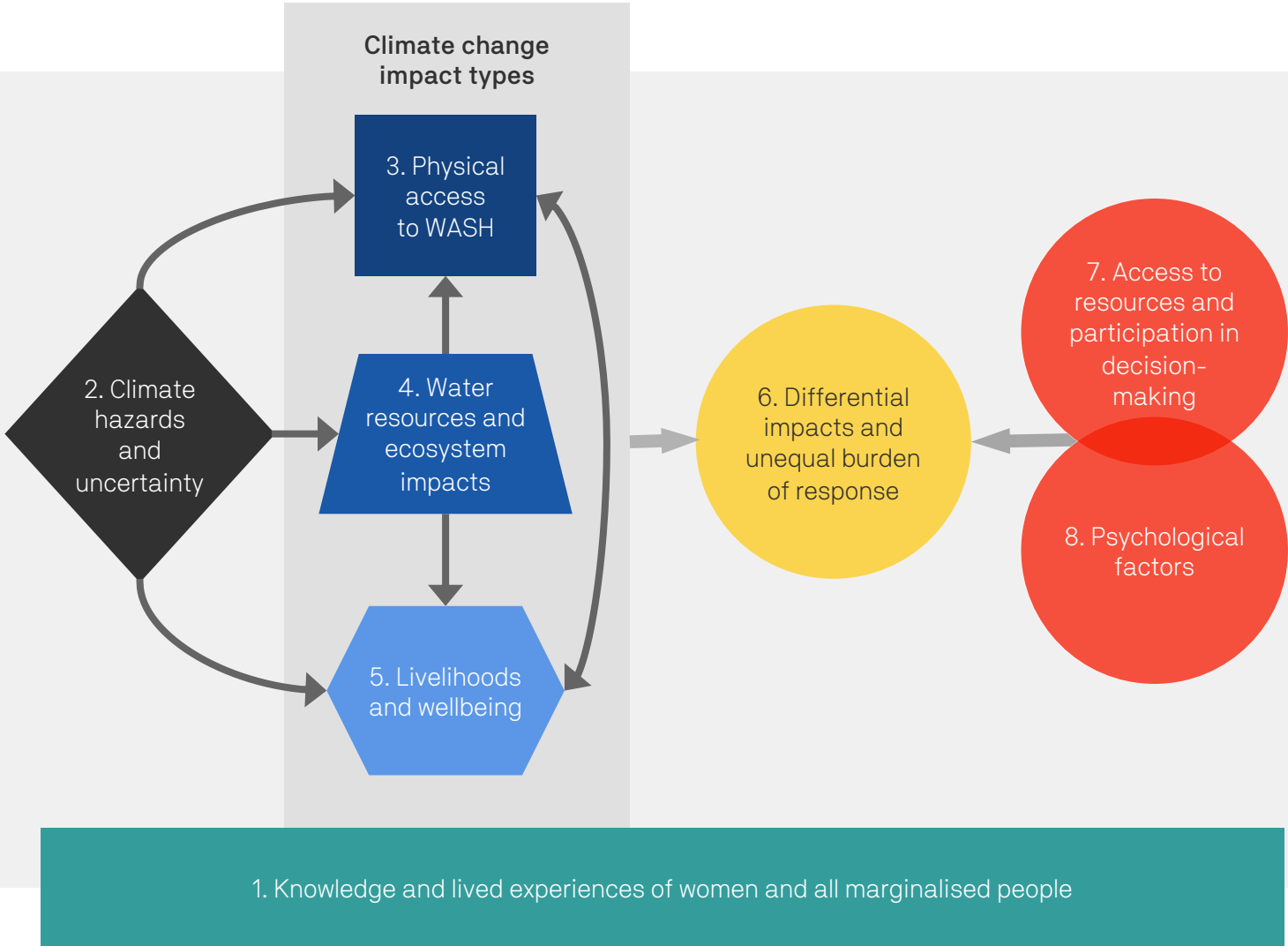

Figure 1: Conceptual framework for integrating WASH, CCA and GSI

Box 1: Climate change terms

Climate change: A change of climate that is attributed directly or indirectly to human activity, altering the composition of the global atmosphere and is in addition to natural climate variability observed over comparable time periods (UN General Assembly, 1992).
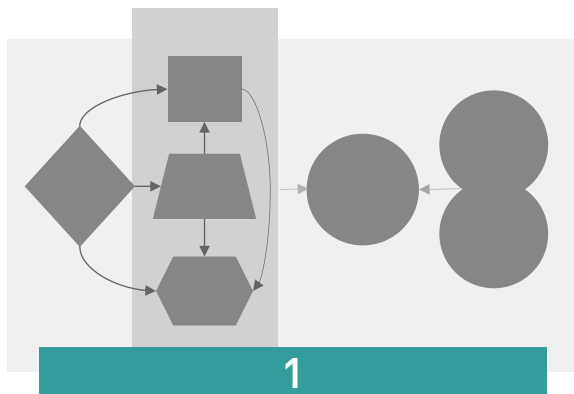
Climate change impacts: Effects of climate change on human and natural systems. Impacts can have beneficial or adverse outcomes for livelihoods, health and wellbeing, ecosystems and species, services, infrastructure, and economic, social and cultural assets (IPCC, 2018).

Climate change risk: The potential for adverse consequences from a climate-related hazard for human and natural systems, resulting from the interactions between the hazard and the vulnerability and exposure of the affected system. Risk integrates the likelihood of exposure to a hazard and the magnitude of its impact. Risk also can describe the potential for adverse consequences of adaptation or mitigation responses to climate change (IPCC, 2018).

Risk vs uncertainty: Risks relate to uncertain outcomes of known future events ("unknown knowns") and can also often be quantified, for example, predictions exist for sea level rise. Uncertainty relates to uncertain outcomes of unknown future events ("unknown unknowns") and cannot usually be quantified as they are not predictable or uniform (Wiltshire 2014).

Climate change adaptation: The process of adjustment to actual or expected climate change and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects (IPCC, 2014).

Resilience: The capacity of a system to absorb disturbance and reorganise so as to retain essentially the same function, structure, and feedbacks - to have the same identity (Walker and Salt, 2012). Resilience of socio-ecological systems emphasises flexibility and adaptiveness, recognising complex feedbacks and the need for diverse participation in decision-making processes (Biggs et al., 2015).

1. Knowledge and lived experiences of women and all marginalised people

This section describes the first element of the conceptual framework, which underpins all other elements of the framework. The impacts of climate change are experienced locally. To be effective, adaptation responses need to be locally appropriate and designed, led and implemented by local leaders and their communities. Climate change impacts are also experienced – and responded to – differently by various groups within local communities, for example, men, women, children, people with disabilities and minority and marginalised groups. The varied experiences of climate change are often due to socially ascribed roles and underlying inequalities that lead to differences in resource access and use, levels of wealth, knowledge and power.

Women and other marginalised people's diverse local knowledge, ideas and experiences are valuable and essential for adapting to climate change but are often missing or underutilised from household level decision-making to more formal governance structures (McNamara et al. 2020). While there is diversity in terms of women's experiences of climate change (e.g., through differences in age, class, ethnicity and environmental setting), the dominance of men's perspectives in policy and practice excludes women's knowledge and experiences.

The gendered nature of local knowledge is important to consider when developing climate change adaptation approaches for several reasons. Firstly, it is important to consider whose knowledge is considered valid in the design and implementation of climate change responses. The dominance of patriarchal natural resource management and environmental governance approaches tend to sideline some accounts of human-nature interactions. This includes women and marginalised groups, who are often either left out of, or greatly outnumbered in, decision-making institutions. Secondly, large-scale technology and market-focused climate change responses with an emphasis on maintaining economic growth have not integrated aspects of social equity and gender justice. Integrating the diverse experiences of women and marginalised groups would highlight questions of equity relating to distribution of resources and sustainability for all members of a community. Lastly, the benefits of climate change programs should be equitably shared across individuals in a community. To achieve equitable benefits, climate change adaptation initiatives need to draw on and value diverse knowledge and experiences of climate change impacts.

Recognising heterogeneity within marginalised groups is critical to inform rights-based approaches to climate change responses for inclusive WASH. There are varied needs and lived experiences across identity groups, and marginalisation is not fixed but dependent on the context in which people are situated. Intersectionality aims to analyse how interlocking systems of power (e.g., sexism, racism, able-bodism) affect individuals in a multitude of ways and demonstrate how systems themselves generate intersectional effects (Choo and Feree, 2010). For example, the prejudices women face in regard to menstrual hygiene are often more to do with taboos around participation in community life and factors such as class, religion, ethnicity than gender (Kings, 2017).

An example from North America explores the impacts of climate change on Indigenous communities – another marginalised group. Authors note that Indigenous men experience climate change differently to women, given their relationship with, and knowledge of water (for women) and hunting (for men). As climate change displaces Indigenous people from their traditional lands, their connection to natural resources and traditional practices including water and hunting is disrupted, but in different ways for men and women (Vinyeta et al. 2015). This highlights the need to take an intersectional lens to understanding climate change impacts on any group of people.

The conceptual framework for this research is strongly grounded in the gendered nature and diverse experiences of climate change. Across each aspect of the research, we have aimed to integrate the knowledge and lived experiences of women and marginalised groups, as illustrated in Figure 1.
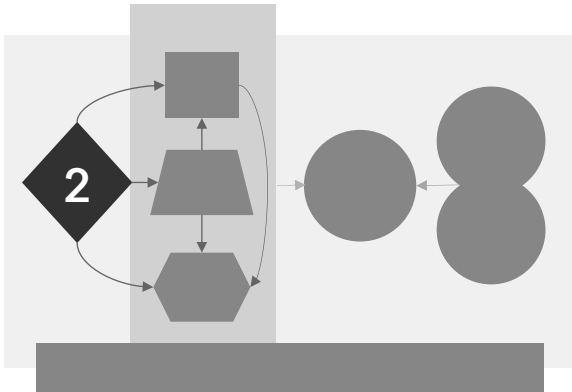
2. Climate hazards and uncertainty

The second element of the conceptual framework describes climate hazards and uncertainty. A climate hazard is the potential occurrence of a climate-related event, trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources (IPCC, 2014).

Climate hazards can be slow in their onset, for example, a gradual decline in precipitation or increase in mean sea level over a period of years – climate hazards of this type are sometimes called "stresses". They can also be quick in their onset, for example, cyclones or flash floods – climate hazards of this type are sometimes called "shocks". Some examples of climate hazards include:

Flooding	Storms	Dry spells	Drought	Wildfires
Landslide	Heatwaves	Desertification	Erosion	Salinisation
Snowmelt	Storm surge	Sea level rise	Tornado	Subsidence

Climate change influences the frequency, intensity, duration, timing, and geographic distribution of climate hazards. Depending on the region of the world, climate change may make the impacts of some climate hazards more severe or frequent, or may create new hazards that have never before been experienced in an area.

There is significant uncertainty associated with how climate change will influence climate hazards in local areas in the future and what the resultant consequences will be. This uncertainty stems from many sources, including:

• Imprecise data or incomplete understanding of the climate system

• Uncertainties about human behaviours and societies' future actions

• Confusion and misinformation about climate change concepts

Consequently, it is often not possible to know precisely how climate change will influence climate hazards and how hazards will affect local communities and environments.
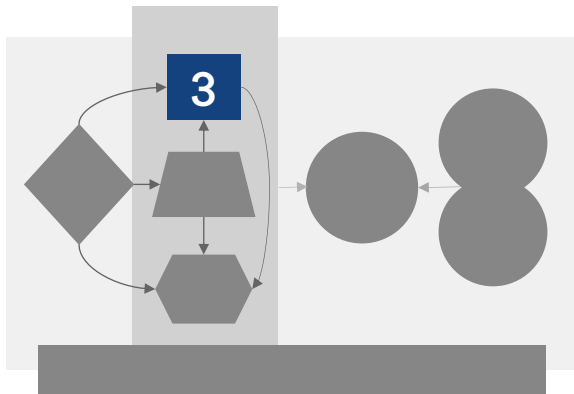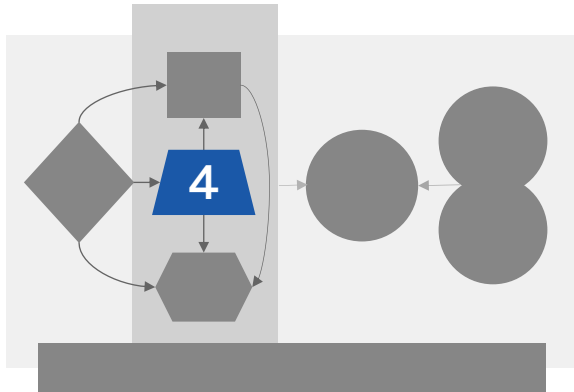
3. Physical impacts of climate change on WASH services and access

The third element of the conceptual framework describes the physical impacts of climate change on WASH services and access, and as illustrated in Figure 1, this element has linkages to several other elements of the framework. Climate change impacts on WASH can be interpreted in terms of the risks that physical hazards pose for WASH services and access. The level of risk that a particular climate hazard poses may be considered a function of the likelihood that a physical WASH system (e.g., a piped water supply or sanitation facility) is exposed to hazard and the severity of consequences if it is exposed.

Adaptations, such as physical modifications to WASH infrastructure, can lower levels of risk. Risk can be lowered by reducing the exposure of the WASH system to climate hazards or by constructing or modifying infrastructure to be more robust and resistant to damage or disruption due to climate hazards. The examples in Box 2 below describe ways in which climate change can physically affect rural WASH systems and possible adaptation options.

Box 2: Examples of physical impacts of climate change on WASH impacts and possible adaptations

| Climate hazard	Possible WASH impact	Possible adaptation
Drought	• Depletion of drinking water sources leading to use of unsafe sources or longer journeys to collect water	• Install deep boreholes that are more resistant to drought than shallow or surface water supplies, or increase water storage capacity
	• Insufficient water for flushing toilets or managing personal hygiene	• Promote waterless composting toilets and prioritisation of rationing water for hygiene practices
Flooding	• Floodwater carries contaminants from pits and septic tanks into drinking water sources	• Properly seal water sources to prevent surface runoff from entering or site latrines far away drinking water points
	• Flooding conditions make it difficult or impossible to reach and use a toilet	• Site latrines outside of flood-prone areas or promote constructing them to be attached to homes
Cyclones	• Intake pipes at water source become clogged with debris blown in	• Build protection (e.g., spring box) at the water intake
	• High winds damage or destroy latrine superstructures	• Construct latrine superstructure out of high-quality building materials
Sea level rise	• Drinking water sources become salinised	• Relocate drinking water points further away from the coast
	• Erosion from encroaching coastline causes sanitation infrastructure to collapse	• Relocate latrines further away from the coast

4. Impacts of climate change on water resources and ecosystems

This element of the conceptual framework describes how climate change affects the water resources and ecosystems on which WASH services depend. In particular, climate hazards and climate change can interact with human activities to exacerbate the degradation of water resources and ecosystems.

These climate change impacts may have temporary or permanent implications for WASH. For example:

- Increased intensity of rainfall, combined with deforestation on hillsides, can lead to landslides that destroy WASH infrastructure or permanently change the course of rivers.

- Sea level rise, combined with high level of groundwater abstraction, can lead to temporary or permanent salinisation of groundwater resources.

- Increased annual rainfall, combined with deforestation, can lead to higher groundwater tables that can inundate toilet pits.

- Increased intensity of rainfall, combined with clearance of vegetation and compaction of topsoil for living spaces, can lead to greater surface runoff that spreads contaminants to water sources or inundates toilets.

- Decreased rainfall, combined with increased water abstraction (e.g., driven by population increase, high water consumption per capita, or greater water demand driven by an increase of extremely hot days) can lead to the overexploitation and eventual depletion of water resources.

Improved land and water resource management practices, and restoration of native ecosystems, can enhance the ability of WASH systems to withstand more severe weather driven by climate change.
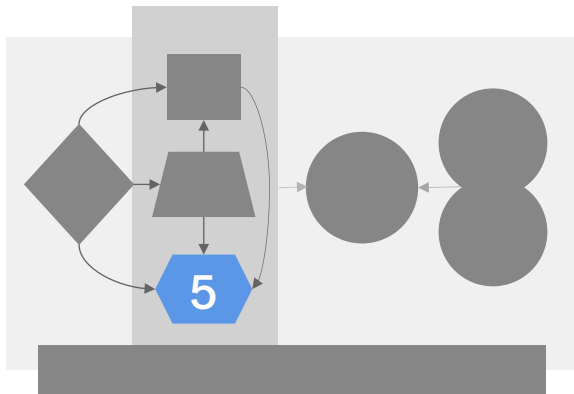
# 5. Climate change impacts on livelihoods and wellbeing

This element of the conceptual framework relates to climate change impacts on livelihoods and wellbeing. There are many ways in which climate change can affect the livelihoods and wellbeing of people and communities. Climate change impacts are complex, non-linear and inter-connected, and cannot be considered in isolation from one another. Section 4 of the conceptual framework describes climate change impacts on water resources and ecosystems, which are critical aspects underpinning livelihoods and wellbeing.

In rural areas, many people's livelihoods and wellbeing are connected to, and reliant on, natural resources, agriculture and the environment. Due to gendered power dynamics, women are often more dependent than men on common property resources and rain-fed agriculture. Climate change is already impacting these environmental assets, particularly through changes to the quantity and quality of water resources. Livelihoods and wellbeing are also dependent on physical access to WASH (Section 3 of the conceptual framework), with health indicators closely aligned with measures of WASH access (Bartram and Cairncross, 2010).

Examples of climate change impacts on livelihoods and wellbeing relevant to this research are provided below.

- Climate change and weather uncertainty creates particular challenges for food production. Climate change can alter rainfall amounts and timing, heat, pests, weather-related erosion, landslides and reduce soil productivity. These changes can degrade agricultural production and food security, including aquaculture and fisheries' productivity.

- Climate change can cause negative impacts on ecosystems, which may affect food availability and food production systems (e.g., pollination), land instability, reduce soil productivity, availability and accessibility of ecosystem products such as building materials, fuel for fire. Climate change impacts on ecosystems, climate change hazards (e.g., extreme rainfall) combined with other land use changes and waste management practices may also result in landslides.

- Climate change affects human health, including through vector-borne diseases (related to water availability and resultant water storage practices), nutrition impacts related to reduced or changed food production.

- Climate change causes impacts on transportation and access including to health facilities, markets, education and food production locations, due to landslides, flooding, and other impacts.

It is therefore critical to acknowledge the impacts of climate change on livelihoods and wellbeing, and the linkages and interconnections with other elements in our conceptual framework.
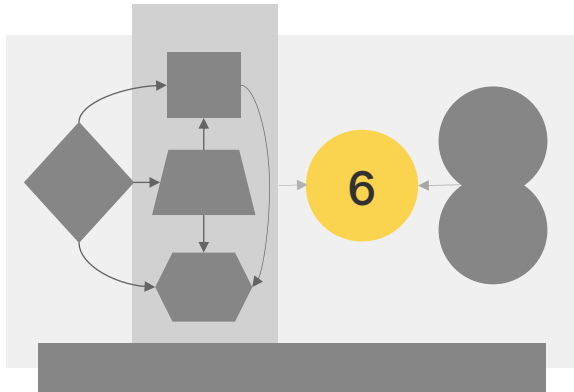
6. Differential impacts and unequal burden of response

Section 6 of the conceptual framework represents the intersection of the biophysical elements of the framework (on the left side) and the social elements (on the right side). These elements intersect and result in differential impacts and an unequal burden of response, which are described below.

Climate change is not experienced equally by all members of a community. Rather, marginalised segments are usually more vulnerable to climate change impacts because they are likely to have less access to resources, information and decision-making processes (Habtezion, 2013). Climate change is likely to have more severe impacts for the poor, women, children, sexual and gender minorities, people with disabilities, indigenous and other ethnic minorities.

As mentioned in Section 1, socially ascribed gender roles mean there is an unequal burden of response to climate change. In some cultures and communities, women's responsibility is often supply of food and clean water. Additionally, women are particularly likely to be tasked with full responsibility for childcare and other caregiving roles during times of disaster, which has implications for their ability to participate in the response and affects their personal safety (Lane and McNaught, 2009).

The examples below show differential impacts and unequal burden of response to climate change impacts on WASH, while Box 3 describes some different approaches to gender and social inclusion in WASH relevant to this research.

Water quality impacts

- Women and girls usually are tasked with filtering or boiling water, and boiling water using an indoor wood stove raises their risk of respiratory illness.

- Poor households are less likely to have access to household water treatment technologies.

- Marginalised groups are less likely to have access to information about climate events (e.g., early warning systems), and therefore be less able to prepare (e.g., to store clean water in their home before a storm hits).

Water scarcity impacts

- If more distant waterpoints must be used because primary water sources are dry, women and girls may bear the burden of collecting water and may be at risk of harassment while travelling to access water.

- Community elites may capture scarce water sources and dictate the terms of access for less powerful groups.

- Water scarcity may result in more stress on families and household disputes blaming women or children for not being able to procure water.

- Water fees may rise making safe water unaffordable for poorer households.

- Women typically have higher water needs for hygiene and thus impacted more.

- Poor households are less likely to have resources to store water (e.g., safe storage tanks) or collect water safely from alternative sources (e.g., rainwater harvesting systems).

Physical access to WASH facilities

- People with disabilities, or limited physical abilities (e.g., pregnant women or the elderly), are more likely to struggle to access waterpoints and toilets when land conditions become water-logged, muddy or slippery.

- On extremely hot days, water-carrying women and girls (especially elderly women) can be affected by heat stress/exhaustion.

- "Climate-proofing" WASH infrastructure (e.g., raised platforms with steps to avoid floods) can make it more difficult for people to access.

Destroyed or damaged toilets

- Poor households are more likely to struggle to repair toilets damaged by climate hazards and may be more likely to be driven to revert to open defecation.

- If toilets are no longer usable because they've been destroyed or damaged by climate hazards, women and girls are more likely to face issues with privacy or harassment while defecating or managing menstrual hygiene.

Box 3: Approaches to gender and social inclusion in WASH

Within the Climate Change Response in Inclusive WASH project, we draw on two frameworks for gender analysis.

The first is CARE's Gender Equality and Women's Voice Guidance (2018), which promotes attention to change in three domains: agency, relations and structures.

The second is Carrard et al.'s framework for exploring gender equality outcomes from WASH programs (2013), which argues that gender equality outcomes can be classified across two intersecting dimensions: (i) individual changes or changes in relationships; and (ii) experienced within the household sphere or in the public arena (social and community networks and governance institutions).

We also consider the practical and the strategic needs of women in relation to WASH.

Practical gender needs are needs that have been identified by women in relation to their current socially defined roles. For example, providing women with a water tap may make their lives easier by reducing the time burden of collecting water, so they may have more time for other domestic work. Meeting these practical needs improves the wellbeing of women, although it doesn't change their status in society.

Strategic gender needs vary by context and are identified by women as a result of their lower social status. They tend to challenge gender divisions of labour, power and control, as well as traditionally defined norms and roles (Halcrow, 2010). An example is including women as managers of WASH facilities. Through this role, they become more respected for their capabilities which results in changes in power relations.

In line with the Water for Women Fund, this research project aims to take a gender-transformative approach to its intentions, process and impact. A gender-transformative approach seeks to understand and target structural causes as well as the symptoms of gender inequality, leading to a sustainable change in power relations and social structures for equitable access to resources, opportunities and decision-making (Winterford et al., 2020). Change is a non-linear and long-term process, influenced by a diverse set of actors and interventions.

When transforming gender relations, backlash and unintended negative consequences are a risk that needs to be addressed. Therefore, seeking an understanding of the complex dynamics of people's lives and taking a "do no harm" approach is vital to gender-transformative practice (Water for Women Fund, 2018).
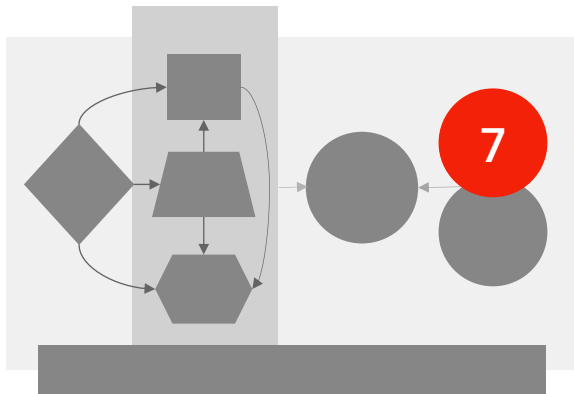
7. Access to resources and participation in decision-making

Section 7 of the framework describes how access to resources and participation in decision-making relates to the differential impacts and unequal burden of response to climate change (Section 6). The level of vulnerability to climate change that people have is often interpreted in terms of their exposure and sensitivity to climate impacts, and as well as their capacity (or lack thereof) to respond to the impacts. Individuals and groups have different levels of exposure, sensitivity, and capacity to respond due to inequalities in access to resources and participation in decision-making. Not only do these inequalities increase vulnerability to climate change, their lack of capacity to adapt to climate change can exacerbate inequalities, leading to a vicious cycle of disadvantage. This section firstly describes examples of inequality in access to resources, followed by inequality in participation in decision-making.

Access to, and control over, resources necessary for adaptation varies within communities and even households. Social inequality manifests in some individuals and groups having better access or control over resources. These individuals and groups can then use these resources to maintain WASH access against climate change impacts more than others. For example, there may be gender inequality in access and control of financial resources due to men's traditional role in waged or salaried employment. Women's traditional role is often doing unpaid care work in the home, and some women lack diverse employment opportunities and access to credit. Women may be dependent on men to generate and spend income for WASH climate change adaptations such as storm-resistant toilets or water storage tanks for the dry season. People with disabilities and their carers may have less employment opportunities, and thus more limited financial resources. Disability-sensitive sanitation facilities usually cost more to construct than standard facilities, which poorer households may not be able to afford.

Access to education and information also influences how people are impacted by, and respond to, climate change. Men may have better access to education and information about climate change and water management than women. This reifies men's positions as water decision-makers on the basis that they "know more". There may be inequality in men's and women's access to climate forecasts, early warning information and emergency and post-disaster services.

Land management provides another example of social inequality leading to unequal access to resources. Privileged groups or individuals often own land with secure water sources, while marginalised groups often dwell in areas where water access is easily disrupted by climate impacts. Women also may not have the same rights to land ownership as men, making them dependent on spouses or male family members to access land to develop new water sources or sanitation facilities.

Inclusive participation in decision-making can improve a household or community's capacity to adapt to climate change. Participation in decision-making can range on a continuum between co-option (weak participation) to collective action (strong and meaningful participation), with consultation located in the middle of the continuum (Arnstein, 1969). Co-option occurs when compliant community members are allowed to attend meetings, governed by the elite's rules. Consultation occurs when community members are actively expressing their views and are listened to by decision-makers (Arnstein, 1969). Collective action occurs when community members make the decisions and have ownership of the process to set their own rules and actions (Arnstein, 1969).

Some individuals or groups may have less influence on decision-making about how households or communities respond to climate change to maintain or improve WASH access. For example, household decisions on where to build a new household toilet to avoid increased flooding may exclude the views of women and girls if they are not consulted. The capacity of women and other marginalised groups to adapt to climate change is also constrained by the extent to which they have opportunities to advocate and seek support from networks and institutions outside of their immediate family.

At the community level, decisions will be influenced by whose voices are listened to and who has the final say. Perceptions that men are more decisive or efficient may lead to men having an outsized role in community decision-making in WASH following an extreme weather event. For example, usually men are given the responsibility to make decisions on restoring WASH access following a major cyclone.
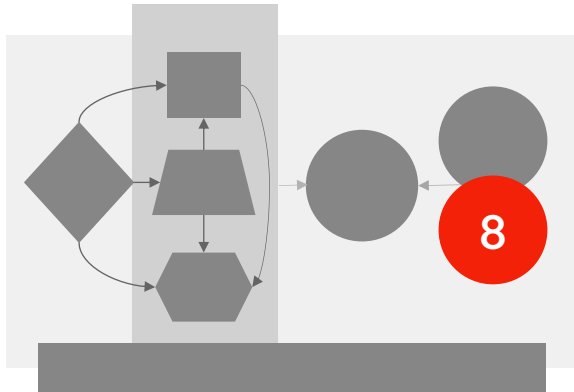
8. Psychological factors affecting behaviours

The final section of the framework, Section 8, describes how psychological factors affect behaviour, which is critical to incorporate into the design of climate change adaptation initiatives. In addition to having strong capacity and support from equitable institutions, individuals must choose to take action to offset deleterious impacts of climate change. Research shows that a range of psychological factors can affect the willingness of individuals to take action to protect themselves and others from climate change (Mortreux and Barnett, 2017):

1. **Risk attitudes:** People's perceptions of the probability and severity of climate risks, their own ability to effectively respond, and the costs and benefits of taking action. This also includes cultural biases, such as religious beliefs that God will not allow certain climate change impacts to happen.

2. **Personal experience:** People who have experienced climate impacts on sanitation may be more likely to act in the future to avoid a repeat of negative outcomes. On the other hand, people that have successfully coped with past climate impacts may become complacent and over-confident about responding to more severe impacts in the future.

3. **Trust and expectations in authorities:** People who do not trust authorities for example, if they feel they have been treated unfairly in the past may not take advice on preparing WASH for climate change impacts. Additionally, people may view governments or NGOs as being responsible for building climate-resilient WASH.

4. **Place attachment:** In situations where climate change necessitates the relocation of living spaces, people may be reluctant to move due to cultural and emotional ties to a place.

5. **Competing concerns:** People living in low- and middle-income countries are often facing multiple stressors and adapting WASH systems to climate change may not be a strong priority for them.

These psychological factors can be gendered and vary across social groups. For example, people may perceive they have low self-efficacy for taking action if they are used to feeling marginalised or excluded from decision-making. Or, ethnic groups that have been treated unfairly by the government may be less inclined to take advice from national climate change authorities.

Personal motivations for action or inaction contribute to the level of impact that people experience. Whatever their reason, if people consciously or subconsciously choose not to take action to protect themselves or others from climate change impacts on WASH, they are liable to be more severely affected. Identifying and supporting positive motivators, and addressing demotivators, to climate action could improve the outcomes of interventions to address any other form of impact.

Conclusion

The framework outlined in this Learning Paper connects concepts and practices from WASH, CCA and GSI disciplines that are relevant to supporting CSOs to understand and respond to climate change impacts. This was used to inform the design, implementation and analysis of research carried out in Indonesia and Timor-Leste in 2019.

The examples listed throughout this paper illustrate that climate change impacts on WASH are experienced differentially, and the burden of responding to impacts is socially defined. The pathways through which climate change impacts are interconnected and cross multiple physical, environmental, and social domains. Hence, a pluralistic approach to understanding and addressing climate change impacts is needed to produce equitable and sustainable WASH outcomes. The inclusive engagement of diverse individuals at the community level is critical for informing how communities and support agencies understand and respond to climate change impacts on WASH and beyond.

Please refer to our website waterforwomen.uts.edu.au/climate-change-response to learn more about our research.

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Water for Women is Australia's flagship water, sanitation and hygiene (WASH) program supporting improved health, equality and wellbeing in Asian and Pacific communities through socially inclusive and sustainable WASH projects. Water for Women is delivering 18 WASH projects in 15 countries together with 11 research projects over five years (2018-2022).

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