



# **An assessment of non-economic loss and damage experienced by young women, girls and gender diverse young people in the Pacific due to climate change**

**Literature Review**

6 November 2024

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## Executive Summary

KPMG was engaged by Plan International Australia to undertake a Literature Review ('the Review') on the non-economic loss and damage (NELD) experienced by young women, girls, and gender diverse young people in the Pacific due to climate change. By assessing the available evidence, this Review offers key findings to inform the Australian Government and provide guidance on effective interventions for mitigating climate change induced NELD for young women, girls, and gender diverse people. This could include supporting the effective distribution of the Loss and Damage Fund (the 'Fund') established by the 28<sup>th</sup> session of the Conference of the Parties (COP28).

The Fund was established in 2023 to address the disproportionate loss and damage experienced by developing countries. Developing countries are host to 15 times more victims from climate disasters than developed countries. To date USD 661 million has been pledged (1). Costs of loss and damage are expected to increase annually reaching between USD 290 and USD 580 billion annually in 2030 (2).

### Literature review findings

The literature review made findings across six domains, identifying evidence from existing research linking each domain to NELD impacts for the target cohort. These domains were:

- Physical health;
- Mental health and wellbeing;
- Displacement and mobility;
- Child, early and forced marriage and gender-based violence;
- Education; and
- Livelihoods.

The following high-level findings were identified in each domain:

#### Physical health

Climate impacts the prevalence of communicable and non-communicable diseases, with additional effects on young women and girls:

- **Communicable Diseases:** Zika and dengue pose significant risks to children and pregnant women (3);
- **Non-Communicable Diseases:** Malnutrition, cardiovascular, and respiratory diseases can lead to preterm and stillbirths, and expose children to heat stress and lung diseases (4). Malnutrition and dietary risks are the leading causes of disease in the Pacific islands (5).
- **Food Insecurity:** Climate events can cause major resource shortages. Cyclone Pam (2015) led to an 80% loss of food sources in Vanuatu, resulting in long-term malnutrition and stunted growth in children (6).; and
- **Sexual and Reproductive Health:** Climate-related displacement can increase risky behaviour, transactional sex, and sexual abuse (7). Between 2021-2031, 14 million women in PNG could lose access to contraception, leading to 6.2 million unintended pregnancies and 2.1 million unsafe abortions (8).

## Mental health and wellbeing

The mental health impacts of climate change on young women, girls, and gender-diverse young people in the Pacific islands and areas affected by climate events are profound and multifaceted:

- **Increased Depression and Anxiety:** After Typhoon Sudal, women and children in Micronesia experienced heightened levels of depression and anxiety (9). Similarly, children exposed to Hurricane Sandy in-utero faced significant mental health issues, with female children showing increased risks of anxiety, phobias, depressive disorders, separation anxiety, and generalised anxiety (10);
- **Substance Abuse:** Youth in Micronesia showed increased substance abuse following Typhoon Sudal, indicating a coping mechanism for the stress and trauma experienced (9); and
- **Tangible loss of capacity:** Mental disorders rank first among 22 diseases and health risks for girls aged 5-14 in every Pacific island. In Fiji alone, girls aged 5-14 lost 903 years due to poor mental health in 2021, equating to 1,019 years per 100,000 girls (11).

## Displacement and mobility

Across the Pacific, there were approximately 8.1 thousand internally displaced people from climate induced disasters in 2023. For the 50 per cent of this group who were women and girls, displacement had many impacts:

- **Healthcare Access:** Displacement disrupts healthcare services, making it difficult for women and girls to access essential medical care. This is particularly critical for maternal and reproductive health services, which are often deprioritized during crises (12).;
- **Educational Disruption:** Displacement often leads to the closure of schools and educational facilities, interrupting the education of girls. This disruption can have long-term effects on their educational attainment and future opportunities (12);
- **Increased Exposure to Violence:** Displacement increases the risk of gender-based violence, exploitation, and abuse. Women and girls in displaced communities are more vulnerable to trafficking, domestic violence, and other forms of exploitation (13); and
- **'Trapped populations':** In Kiribati, 94% of households have been affected by climate disasters in the last decade. Two-thirds of the population of the outer islands have migrated, leaving behind a 'trapped population', many of whom are women. These women often cannot travel because their skills are not valued in the Kiribati economy, making it difficult for them to find jobs. Consequently, they bear increased caregiving, household, and family leadership responsibilities (14).

## Child, early and forced marriage and gender-based violence

Climate change can increase the risks of child marriage, gender-based violence, and abuse:

- **Safe spaces:** The aftermath of climate disasters often results in a lack of safe spaces, resources, and access to education, which further increases these risks (15);
- **Increased exposure to violence:** After two tropical cyclones in 2011, there was a 300% increase in new domestic violence cases (16); and
- **Child marriage:** A study in Indonesian villages found a positive correlation between natural disasters and the likelihood of girls entering child marriages. Research in Bangladesh's coastal regions showed that during years with 30 or more days of extreme heat, girls aged 11-14 were twice as likely, and girls aged 15-17 were 30% more likely to marry, compared to baseline years (17).

## Education

Pacific countries are at the epicentre of immediate and physical disruption to education, given the greater frequency and intensity of extreme weather events. But they can also mitigate the effects of climate disaster through increased climate literacy:

- **Infrastructure damage:** Between 50 to 90 percent of 6,000 school buildings across Samoa, Tonga, and Vanuatu were assessed as possibly unable to withstand a strong cyclone. This was evidenced in 2020, when a cyclone in Vanuatu destroyed and damaged 885 schools (18); and
- **Opportunity for mitigation:** The Notre Dame Global Adaptation Initiative (ND-GAIN) has demonstrated improved climate disaster readiness and resilience for each year of education that girls receive. Another study found that nations investing in climate literacy for girls have lower deaths from droughts and floods. For each year of secondary education completed, there is an average six per cent decrease in the likelihood of child marriage or giving birth before 18 (19).

## Livelihoods

The immediate and long-term impacts of climate change can lead to NELD, especially through increased unpaid work and exposure to exploitation or forced labour:

- **Lost working days:** After Cyclone Pam, 3,600 female microentrepreneurs lost 39 days of paid working days each because their time was redirected to unpaid labour, mostly care work. During the 2015-16 El-Nino induced drought in PNG, women were expected to continue food production with limited resources, while their paid and unpaid daily tasks became more arduous, involving long walks to collect water, switching to more drought resistant crops, and effectively utilising food preservation efforts to ensure sustainable availability of food (20).;
- **Increased exposure to heat-affected jobs:** When including unpaid labour, women's losses due to the impact of extreme temperatures on their job increased by 260 per cent compared with men's losses at 76 per cent (21); and
- **Child labour:** Climate change acts as a threat multiplier, especially in agriculture where 70 per cent of child labour is located (22).

## Gaps in evidence

The literature review has also identified areas with low availability of data for these vulnerable cohorts in the Pacific region, including:

- **Health:** Localising research on links between resource scarcity, water and food insecurity and non-communicable diseases with the target cohort;
- **Mental health and wellbeing:** Longitudinal research into mental health effects of climate change for the target cohort;
- **Displacement and mobility:** Localising gender-specific data for internal and external climate-induced displacement, including human trafficking;
- **Child early and forced marriage, gender-based violence:** Localising data on linkages between climate events and these harms;
- **Education:** Localised longitudinal data on impacts of climate change on education outcomes for target cohorts, and subsequent impacts on livelihood and mobility; and
- **Livelihoods:** Localised research on labour exploitation, modern slavery and unpaid labour in climate vulnerable sectors for the target cohort.

While global studies can be extrapolated to an extent, the Australian Government could leverage its research partnerships and investments to build the evidence base. This would support improved targeting of the recommended initiatives, and identification of further measures to support girls, women and gender diverse people within the Pacific context.

## List of Abbreviations

Abbreviation	Meaning
COP28	28 <sup>th</sup> session of the Conference of the Parties
DALYS	Disability-adjusted life years
FGM	Female Genitalia Mutilation
GECI	Girls' Education Challenges Index
HIV	Human immunodeficiency virus
IPV	Intimate Partner Violence
K10	Kessler Psychological Distress Scale
NCDs	Non-communicable diseases
ND-GAIN Index	Notre Dame-Global Adaptation Index
NELD	Non-economic loss and damage
PNG	Papua New Guinea
PTSD	Post-traumatic stress disorder
Review	Literature Review ( <i>this document</i> )
SRH	Sexual and Reproductive Health
SRHR	Sexual and Reproductive Health Rights
STIs	Sexually transmitted infections
sWBGT	simple Wet Bulb Globe Temperature
The Fund	The Loss and Damage Fund
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
USD	United States Dollar
WHO	World Health Organization
YLD	Years lived with disability

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# 1. Introduction

## 1.1 Definition of 'non-economic loss and damage' (NELD)

A 2013 United Nations Framework Convention on Climate Change (UNFCCC) technical paper, *Non-economic losses in the context of the work programme on loss and damage*, defined 'loss and damage' as follows:

Non-economic losses can be understood as the remainder of items that are not economic items; that is non-economic items are those that are not commonly traded in markets [...] There is no clear distinction between losses and damages (23).

NELD refers to the adverse effects of climate change on human societies and the natural environment that are challenging to quantify in financial terms. This is because they are not resources, goods or services which are commonly traded in markets, and cannot be quantified with traditional economic indicators (e.g., inflation, gross domestic product).

The gendered impacts of climate change, notably the intersection between climate injustice and gender inequality are widely recognised. However, little work has been done to ascribe value to the non-economic effects (24).

Several sources highlighted the importance of drawing on regional frameworks in addition to more global conceptions of NELD to address the impacts of climate change (25) (26). This is consistent with the efforts of the NGO and development sector and the Australian Government's efforts to localise response to development and humanitarian disasters (27) (28).

## 1.2 The Pacific islands context

Pacific island nations are disproportionately impacted by the threat of climate change. Given their sea-level proximity, climate change presents major increased risks of climate disasters, coastal erosion, and loss of biodiversity, agriculture and freshwater access (29). This will significantly impact regional security, economic development and wellbeing.

Pacific island countries are often low-lying and dispersed. These geographic characteristics make them more prone to climate disasters, including intensified tropical cyclones and floods, which can be sudden and episodic (30). The Pacific islands are also impacted by slow-onset climate change induced events, including rising sea levels and ocean acidification. Climate change impacts can be realised immediately or over the long-term (30).

Due to these factors, climate impacts are often more severe in the Pacific than other regions (31). For example, sea levels in the western tropical Pacific have risen at twice the global rate since 1993. Damage to social, cultural, and physical infrastructure is already manifesting, with concerns of forced migration and threats to ongoing national integrity as a result (32). Climate change is exposing Pacific Islanders to increased risks of disease, poor mental health and harm from extreme weather events (33). If climate change is unmitigated, 49 million people in East Asia and the Pacific may become climate refugees by 2050 (34).

The capacity of Pacific Island nations to absorb these impacts is also constrained. Despite their different size, structure, income, and population, they share common sources of income. This includes official development assistance, remittances, tourism, and commodities for their growth and development (35). There is a high degree of informal labour and subsistence

agriculture (35). In the medium-term, high debt levels and climate change are acknowledged as being challenges to future growth and development in the region (36).

Young women, girls, and gender diverse young people in the Pacific islands often face heightened inequality, facing gender-based violence, limited decision making at all levels, limited access to education and health systems (37). Climate change magnifies these disparities, as increased frequency of natural disasters and rising sea levels disproportionately affect their livelihoods and safety, exposing them to risks of violence, child marriage, and exploitation, as discussed throughout this review. These challenges require specific research and intervention. Despite this, development and aid funding targeting this cohort is below global averages (38).

Australia is taking a leadership role addressing climate change across the Pacific islands which is evidenced by the range of initiatives taken to support the region with the challenges it faces. This includes:

- Committing \$150 million to regional and global climate funds (39).
- Leading global talks on the New Collective Quantified Goal on Climate Finance (NCQG) (COP29 Presidency).
- Bidding to host the UNFCCC Conference of the Parties (COP31) in partnership with Pacific countries, to highlight the urgency of the challenge for the Pacific region (40).

## 2. Review approach

In consultation with Plan International Australia, the Review was conducted with an agreed scope and methodology which are outlined below.

### 2.1 Review scope

Drawing on evidence that is available, current, and high-quality, the Review examines the following areas of the NELD experienced by young women, girls, and gender diverse young people in the Pacific as a result of climate change:

- Health;
- Mental health;
- Displacement and mobility;
- Child, early and forced marriage and gender-based violence;
- Education;
- Livelihoods; and
- Biodiversity (explored through the other focus areas).

This list is not exhaustive and excludes areas of NELD as they relate to climate change which were out of scope, including ‘cultural heritage’, ‘loss of life’ and Indigenous impacts. These areas require further scoping to comprehensively address the climate-related drivers. They will be an important focus for future work.

In addition to the focus areas above, the following parameters were also set to guide research:

- Sources limited to publications by reputable institutions, organisations or individuals produced from 2014 onwards; and
- Focus on the Pacific islands region, with sources from the wider Pacific region or other regions considered where relevant including to address gaps in the literature.

Whilst developing a model for calculating NELD was out of scope for the Review, any identified pre-existing models or datasets were included for consideration. It is recognised that this is not an exhaustive list of available models and datasets which can support with quantifying NELD.

### 2.2 Review methodology

Three research questions were considered throughout the Review:

1. What does the literature currently recognise and record as the NELD experienced by young women, girls, and gender diverse young people in the Pacific as it relates to climate change (current impacts)?
2. What are the expected NELD on young women, girls, and gender diverse young people based in the Pacific induced by climate change threat factors, including increasing frequency of natural disasters, food shortages, and loss of land (future impacts)?
3. Recognising that models outside the Pacific may be considered, how is the valuation of NELD for young women, girls, and gender diverse people conceptualised in the literature?

Literature on the above focus areas was thematically analysed to assess relevance to the research questions and identify domains from which key findings were developed.

## 2.3 Research gaps

The available research highlighted several priorities. It also identified gaps which would benefit from further exploration to better support detailed policy development.

There was limited available literature on NELD relative to:

- Women and girls in the Pacific islands context;
- Girls, where 'children' as opposed to boys or girls was the most common focus;
- Gender diverse people globally, but particularly in the Pacific islands;
- Costings data and methodologies (existing frameworks focus on economic modelling and valuation);
- The most recent climate change disasters, as there is a lag between the disaster and subsequent research; and
- Longitudinal data and studies both globally and in the Pacific; and

The utility of available literature requires consideration where:

- Some sources included Australia and Oceania in the 'Pacific region', making it harder to isolate the experience of Pacific Islanders;
- Low maturity of data collection methods in the Pacific islands' context were demonstrated; and
- Disaggregated data by age and gender was not available to allow for a more specific focus on the unique needs to girls as a distinct group.

Given the limitations encountered in the available literature, some global examples have been included. These examples were focused included disaggregated data for girls, allowing for consideration of issues such as education and child marriage. This is to further demonstrate the NELD implications of climate change and its impact on women, girls, and gender diverse young people.

## 3. Thematic analysis

### 3.1 Physical health

This section focuses on the health impacts of communicable and non-communicable diseases (NCDs), food and water security, and reproductive health resulting from climate change, on young women, children, and gender diverse people in the Pacific islands.

#### 3.1.1 Impact on diseases

Climate change affects the frequency and intensity of disease incidences, both communicable and non-communicable. Evidence suggests this adversely affects vulnerable populations including young people, women, and pregnant people, however the literature on the Pacific islands is limited (6).

Over the long term through increased rainfall, vector borne diseases (e.g., transmission through mosquitoes, ticks and flees) such as zika, malaria and leptospirosis, are of particular concern in the Pacific islands. The intensified hot and wet climate in the Pacific islands increases the number of favourable breeding sites for mosquitoes (41). Children, women, and pregnant women in the Pacific islands are particularly vulnerable populations at increased risk of and subject to more severe impacts from some diseases. For instance, zika and dengue can have significantly more severe impacts on women than men (3). Both diseases can cause increased menstrual bleeding and be passed to a foetus, increasing the likelihood of miscarriage and severe health conditions for the child once born (3). Pregnant women face increased risk of contracting malaria compared with non-pregnant women, with increased risks of pregnancy complications impacting the health of the mother (42).

Climate change can impact the prevalence and intensity of NCDs. Of main concern is the increased prevalence of malnutrition (discussed in the next section), cardiovascular diseases, and respiratory diseases (4). Research focusing on the Western Pacific Region has found a connection between extreme heat exposure, as a result of climate change, and cardiovascular and respiratory morbidity, mortality, preterm and still births (43). One report in Kiribati and Vanuatu found a link between the 'urban heat island effect' and the exposure of children to heat stress and lung diseases (43).

#### 3.1.2 Impact on food and water security

The literature articulates that climate change impacts food security<sup>1</sup> and water security<sup>2</sup> across the Pacific islands (44). Women, girls, and children are contextually vulnerable to food and water insecurity due to gendered power, roles, and responsibilities affecting decision making, agency and access to food sources (44).

The Pacific islands are particularly vulnerable to the impacts of climate change and its impact on food security, and associated NCDs (45). This leads to an increase in overall calories consumed but little increase in nutritional value, as seen in Figure 1 (45). It is generally

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<sup>1</sup> Food security can be defined as 'a situation where all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and preferences for an active and healthy lifestyle' (118).

<sup>2</sup> Water security can be defined as 'the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development' (119).

recognised in the literature that climate change may act as a risk factor or threat multiplier for nutrition related NCDs in the future (4).

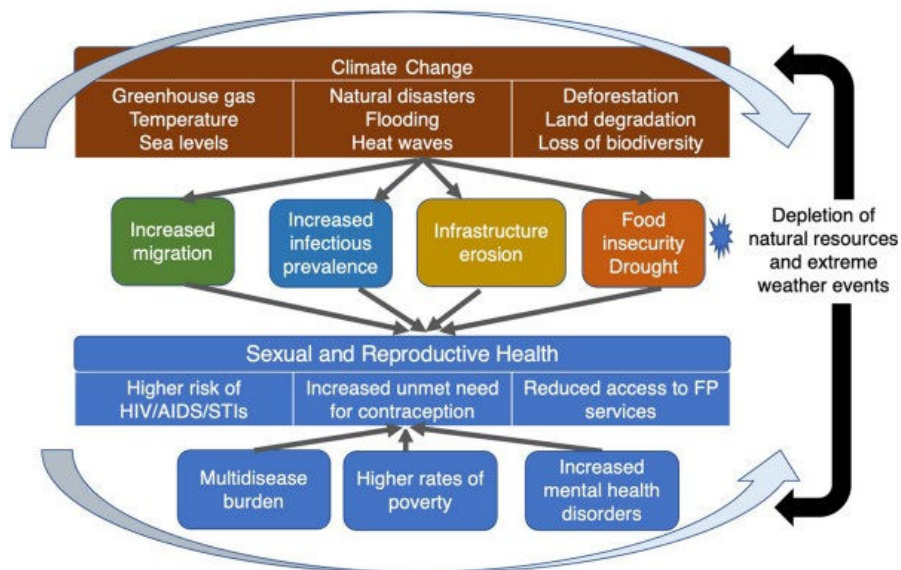
Immediate or disaster driven impacts on agricultural output or food supply include the destruction of crops, food shortages, and increased prices. This was seen in 2015 where up to 80 percent of local food sources were lost in Vanuatu due to Cyclone Pam (6). In the long-term, rising temperatures and increasing rainfall patterns can reduce crop yields. This can result in long-term changes in diet practices and a reliance on imported processed foods (6). Adverse health outcomes from forced changes to traditional diets are direct results of climate change (6). Figure 1 reflects the conceptual representation, as described in the literature, of the relationship where higher temperatures and altered weather patterns impact physical activity levels and the availability of nutritious food contributing to the increased incidence of obesity and other NCDs (46). Women currently face a higher risk of obesity and related NCDs across the Pacific islands (47 percent compared to 38 percent of men) (47).

For children and adolescents, the literature provides robust evidence to support the association of high temperatures and droughts and severe cases of being underweight, and stunting (low height-for-age and impaired growth). In the short term, being underweight was more prevalent in the weeks following a disaster and stunting in the years after, especially for rural children (48). In the Pacific islands, malnutrition and dietary risks (including diet related NCDs) are the top two risk factors causing disease according to the Global Burden of Disease study (5). For women and children the risks are particularly prevalent (49).

Similarly, disasters and longer term impacts of climate change affect water security through increased evapotranspiration (water moving into the atmosphere), ocean acidity and fresh water salinification (saltwater intrusion into fresh water sources), limiting access to safe, usable water (30). Saline contamination of drinking water is a major threat to coastal regions in Pacific island countries, where consumption leads to an increased risk of (pre)eclampsia, hypertension, and infant mortality for pregnant women and girls (50). Limited access to safe water for sanitation and hygiene also affect health outcomes, increasing the risk of illness or infection (51). Unsafe water, poor sanitation, and limited handwashing were the second leading risk factors that accounted for the majority of disability-adjusted life years (DALYs) in the Pacific islands in 2019 (49). In 2020, only 47 percent of people in Papua New Guinea (PNG) had access to limited, basic, or safely managed water and only 23 percent had access to improved sanitation (52).

### 3.1.3 Impact on sexual and reproductive health

The NELD impacts on young women, girls, and gender diverse people relating to sexual and reproductive health (SRH) are demonstrated across the literature. The link between resource scarcity and SRH outcomes, especially human immunodeficiency virus (HIV) and sexually transmitted infections (STIs), is modelled conceptually, as seen below in (7). Food and water insecurity and displacement impact SRH outcomes for young women and girls by contributing to increased sexually risky behaviour, transactional sex, migration-related sexual abuse and exploitation, and worsening the immune response of people already living with HIV (7). However, data from the Pacific islands in regard to SRH outcomes is limited (46).



Abbreviation: FP, family planning; STI, sexually transmitted infection.

Figure 2: Impacts of Climate Change on Sexual and Reproductive Health (7)

Additionally, climate disasters impact menstrual and reproductive health caused by the impairment or suspension of menstrual health facilities or initiatives, and a lack of clean water, sanitation and menstrual products (53). The literature finds that these factors and women's limited capacity to attend to their hygiene during a crisis ultimately leads to infection and illness (53). In Vanuatu for example, following Cyclone Pam, 90 percent of sanitation facilities were destroyed, leaving inadequate access to safe and hygienic sanitation (54).

Furthermore, women may also experience a loss of autonomy over family planning, including access to contraception (8). (55). Gendered societal standards and the impact of climate induced displacement can often lead to restrictions and barriers in access to contraception and family planning resources. One study on 26 countries, noting PNG was the only Pacific island country included, modelled that between 2021-2031, 14 million women will be at risk of losing access to contraception due to climate change related displacement (55). The study estimated that this could lead to 6.2 million unintended pregnancies and 2.1 million unsafe abortions (8). (55).

### 3.1.4 Quantifying the impact

Valuation or quantification of specific health related NELD is limited in the literature. The report, *Quantifying the Impact of Climate Change on Human Health* by the World Economic Forum, quantified climate change's general impacts on health (56). Whilst the Pacific, age or gender were not focuses, the methodology could be leveraged to inform gendered NELD in the Pacific islands.

For each climate event, the related health outcomes were mapped. This involved identifying both the immediate and long-term health impacts, such as mortality, injuries, mental health issues, and the spread of communicable diseases. The next phase involved the quantification of health outcomes by using DALYs. The study used loss of productivity and healthcare costs to quantify the impacts (56). It may be possible to use other valuation methods to determine these impacts which would quantify the NELD experienced by women and girls in the Pacific islands.

The MSI Reproductive Choices study mentioned in Section 3.1.3 above, examined links between access to contraception and climate induced displacement globally. This could serve as an example for modelling the impact on access to contraception in the Pacific islands and the NELD experience by young women, girls, and gender diverse people. This is particularly relevant to the loss of autonomy and adverse reproductive health. The study used the Global Internal Displacement Database to calculate peoples displaced across 26 climate affected countries over the previous 10-year period. Using the estimation that half of that population was female, the study calculated the percentage of women of reproductive age using Demographic and Health Survey's StatCompiler (55). To measure unmet need for contraception the study calculated contraceptive demand using Demographic and Health Surveys data for each individual country. This was projected over the following 10 years based on forecasts for climate displacements (55). The study then used a mathematical model to estimate unintended pregnancies, unsafe abortions, and maternal deaths (55). This modelled the impact of climate change on access to contraception, the risk of unwanted pregnancy and unsafe abortions.

### 3.2 Mental health and wellbeing

An increase in psychological illnesses stemming from climate change has been highlighted as a major health impact (57).<sup>3</sup> From the perspective of Indigenous people in the Pacific the 'land and waters are connected to communities; communities are connected to people; people are connected to health; and health is connected to holistic wellbeing' (58). Pacific Islanders have strong connections to their land, which if impacted by climate events can negatively impact their wellbeing.

Evidence suggests that the direct mental health impacts of climate change are characterised by sadness, anger, anxiety, depression, stress, loss, and grief (57) (9). Both slow-onset events and extreme weather events have been observed to impact the mental health of people in the Pacific. Research highlights how feelings of uncertainty and powerlessness create fear and contribute to distress (57). Furthermore, mental health disproportionately impacts women and children. Women suffer indirect mental health impacts due to relocation or displacement, resulting from loss of livelihood and socio-cultural activities (such as weaving or gathering food) (9). Children are significantly impacted by displacement and suffer from trauma (57). Figure 3 presents the direct and indirect adverse impacts of climate change on health and mental health (9).

Research suggests that mental health can be secondarily impacted by climate change. For example, vector-borne diseases have been shown in studies in Colombia to worsen mental health. This is evident in increased rates of depression and anxiety for mothers of infants with congenital Zika manifestations (59).

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<sup>3</sup> The World Health Organization (WHO) defines mental health as: A state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community. With respect to children, an emphasis is placed on the developmental aspects, for instance, having a positive sense of identity, the ability to manage thoughts, emotions, as well as to build social relationships, and the aptitude to learn and to acquire an education, ultimately enabling their full active participation in society (120).



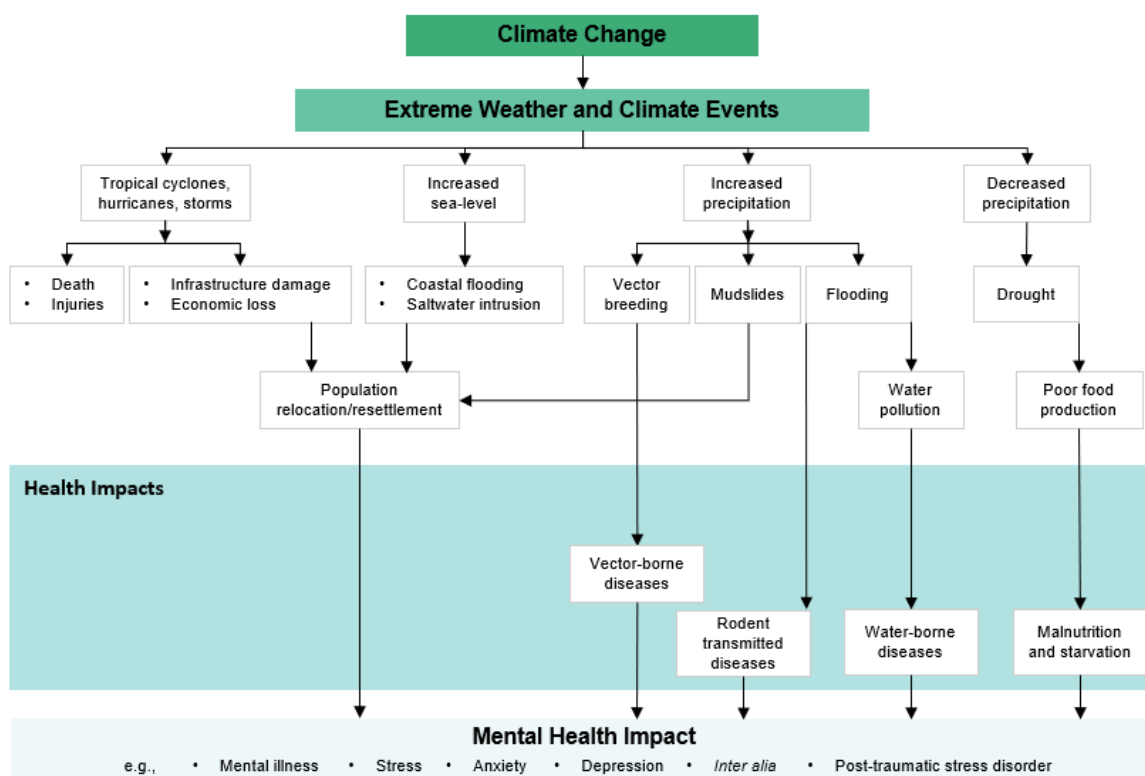


Figure 3: How Climate Change Events Lead to Mental Health Impacts in Pacific Island Countries (9).

Additionally, early and forced child marriages (explored in more detail in Section 3.4) can have follow-on effects as young girls may experience mental health challenges associated with a early and forced marriage. Similarly, other socio-economic challenges such as food insecurity or a lack of resources (examined in Sections 3.1.2 and 3.6) can be linked to poor mental health outcomes (60).

### 3.2.1 Impact on children

Climate change impacts children through increased negative mental health outcomes. Post-climate events, children can experience post-traumatic stress disorder (PTSD), attachment and sleep disorders, depression, anxiety, phobias, and substance abuse (58). As an example of short-term effects, women and children experienced increased depression and anxiety, and youth suffered increased substance abuse after Typhoon Sudal in Yap, within the Federated States of Micronesia in 2004 (9). These conditions lead to negative long-term mental health outcomes such as worsened emotional regulation, cognition, and learning outcomes. This can negatively impact the child’s education and may lead to an increased number of children not completing school (61). More academic research is needed to better understand the mental health outcomes on children in the Pacific post-climate events.

Quantitative data from the Institute for Health Metrics and Evaluation shows the impact of anxiety and depression on DALYs and years lived with disability (YLD) (11). YLD represents the number of years of what could have been a healthy life, that were instead spent in a state of less than full health and is a non-fatal burden (62). For girls aged 5-14 in the Pacific, 10.7 percent of non-fatal health loss in terms of YLD, occurs due to anxiety disorders and 2.3 percent occurs due to depressive disorders. This compares to malaria which accounts for 2.3 percent of total YLDs (11).

Although this data is not specific to climate change-related events, it highlights how anxiety and depression in young girls aged 5-14 can impact their quality of life in the long-term. This is important given the relationship observed between slow-onset events and extreme weather on the mental health of people in the Pacific which, as noted above, will disproportionately impact young women, girls, and gender diverse young people in the Pacific. Data from the Global Burden of Disease (GDB) Compare interactive database shows how mental disorders are ranked first out of 22 communicable, non-communicable diseases and other health risks in every Pacific island for girls aged 5-14 for impact on YLD. Data from GBD Compare on Fiji suggests in 2021 girls aged 5-14 lost 903 years to poor mental health. Per 100,000 girls this equates to 1,019 years (11).

### 3.2.2 Intergenerational impact

Climate change events can create long-term intergenerational mental health and wellbeing impacts. Research in the United States examined the mental health of preschool aged children who were exposed to Hurricane Sandy in-utero. The research found that children who were exposed in-utero had over a 16-fold increased risk for depressive disorders, a five-fold increased risk for anxiety disorders and a three-fold increased risk of attention-deficit/disruptive behavioural disorders (10). Females had a heightened risk of anxiety disorders, phobias, and depressive disorders including dysthymia (persistent depressive disorder), separation anxiety disorder and generalised anxiety disorder. The current research is unclear whether prenatal stress is the main factor contributing to the increase in mental health illnesses, or whether the natural disaster negatively shaped the functioning of the family and the subsequent distress experienced by the child influenced their development.

Although this example is not specific to the Pacific islands, it shows the potential impact of climate disasters on mental health disorders. The various intergenerational impacts of mental ill-health could be explored in future modelling of the NELD associated with climate change.

### 3.2.3 Impacts of displacement on mental health and wellbeing

Research on the Pacific islands highlights the mental health impacts on Indigenous people due to displacement. For Pacific Islanders, the land they live on provides a sense of place and identity. A loss of land leads to a loss of ontological security, which is understood to be a 'feeling of continuity in one's life that is based on a sense of belonging and confidence in one's identity' (63). This is impossible to compensate for, and is difficult to re-establish in the short-term (63). The loss of ontological security relates to a loss of material, social, and cultural security, and disrupts psychological and spiritual wellbeing (9) (64).

Pacific Islanders also experience grief and sadness in response to physical ecological losses that are both current and anticipated (65). On some islands such as Samoa, most of the infrastructure and places that support peoples' livelihoods (see Section 3.6 for definition) are in low-lying areas. With rising sea-levels, Samoans in these areas may have to migrate to higher ground, entailing significant cultural change, and impacting their mental health and wellbeing (66). Research also suggests the emotional toll of climate change events is compounded by a perceived inability to influence its impact (65). In Clissold, McNamara, and Westoby's 2022 study, Pacific Islanders were most anxious about losing their homes and being displaced. A mixed-methods study which analysed participants' psychological distress in Tuvalu reported that participants who experienced psychological distress in their daily lives was directly attributable to climate-related stressors. The two main climate stressors included experiencing environmental impacts at the village level due to climate change and hearing about similar impacts in other parts of the world (65).

Research indicates that adaptive capacity and resilience are enablers of mobility, whereas vulnerability constrains adaptation (58). The ability to adapt depends on a person's agency, wherein people's perceptions impact their ability to move. In the Pacific, some people may feel they are able to adapt and migrate, whereas others feel powerless or lack the material capacity to migrate.

### 3.2.4 Case study: Cyclone Winston

Tropical Cyclone Winston hit Fiji in 2016 leading to 44 deaths and affecting roughly 40 percent of Fiji's population (9). The WHO supported the Fijian Government with providing psychological counselling services to over 11,000 people (67). Sattler et al. identified that after Cyclone Winston, there was an increase in PTSD symptoms due to people losing their resources and source of income (57). Section 3.6 on livelihoods explores in greater detail the impacts on women, specifically, associated with loss of income.

### 3.2.5 Quantifying the impact

Methodologies to quantify the NELD impact for mental health are limited in the literature, with the general literature focusing on qualitative data through interviews and focus groups in the Pacific islands.

In Australia, Deloitte Access Economics utilised a mature, longitudinal data collection method to understand a range of outcomes, including mental health data and government spending on children and young people that experienced climate disasters (68). To measure whether children and young people experienced psychological distress post disaster, they used the Mood and Feelings Questionnaire: Short Version to measure distress in the past two weeks and the Kessler Psychological Distress Scale (K10) (69) (70).

This data was analysed in conjunction with government spending. The analysis did highlight links between psychological distress post disasters, with more individuals suffering in the year after the event, rather than immediately after the event.

Mental health data for people in the Pacific islands is limited. However, current efforts to collect it could be drawn upon for model development. A survey on mental health in Samoa, Tonga, and Tuvalu is being conducted but has not been released yet (71). The Fijian Government collects health related data but the portal is being reconstructed so that data is currently unavailable (72).

## 3.3 Displacement and mobility

The link between climate events and population displacement is well established in the literature. The impacts specific to women, girls, and gender diverse people in the Pacific is less comprehensive. Displacement and mobility refers to 'the involuntary movement of people as a reaction to sudden or developing changes in climate or the occurrence of a disaster, including those which are climate-related' (73).

### 3.3.1 Impacts of displacement

The culmination of the impacts of climate change both from slow-onset and climate disasters trigger decisions to move both internally and externally (57). Non-economic losses associated with climate induced displacement over the long-term involves the long-term degradation of connection to land, community, and kin while the short-term includes intolerable risks for both mobilised and host communities, creating conflict and tension (57). For women, girls, and children, pre-existing vulnerabilities are amplified through climate induced displacement (13).

Across the Pacific, there were approximately 8.1 thousand internally displaced people from climate induced disasters in the 2023 calendar year (74). It is estimated in the literature that 50 percent of displaced people are women and girls (75).

Displaced children and young people living in refugee camps, slums, mega cities, or in protracted displacement are exposed to other impacts of climate, whereby climate induced displacement acts as a threat multiplier for other vulnerabilities (12). Displacement limits access to healthcare, education, and opportunities for growth (12). For women, displacements often cause exposure to new or increased risks, often outside of their control (76).

In the short-term, women and girls have less access and control over decision making processes, resource allocation, and disaster related information (13). In the immediate period following a climate disaster, the needs of women and girls are not usually considered in response efforts. This includes access to hygiene needs, privacy, and protection from exposure to gender-based violence (13). As discussed in Section 3.4, the journey of migration is dangerous for women and girls, exposing them to increased risks of exploitation, sexual violence, human trafficking, child marriage, and gender-based violence (13). The vulnerability of trafficking increases by 20-30 percent post disaster for all people (76). In the Pacific islands, climate induced disasters increases the vulnerability to modern slavery, exploitation, and human trafficking (77).

The literature describes that decisions to move are adaptive in response to the slow-onset impacts of climate change, choosing to migrate due to declining viability of livelihoods, and decreased safety (78). However, the poorest and most vulnerable people, women, and children, do not have the resources to migrate early. In the Pacific islands, women's limited access and influence over decision making often means they are forced to stay behind in so called 'trapped communities', as seen in the Kiribati case study below (79).

When women do get to participate in migration, one of the most profound impacts is the loss of connection to land, as explored in section 3.2.3. In the Pacific islands 95% of land is under some form of customary ownership, it is a key part of culture (80). The disruption to the people-land connection, through displacement, is a significant NELD that may be experienced by Pacific Islanders (80). In some cases across the Pacific, conflict and tension between mobilised and host communities, having damaging effects on social and community cohesion (57).

### 3.3.2 Case study: trapped communities in Kiribati

In Kiribati, 14 percent of all internal migration was attributed to environmental change and 94 percent of households have been affected by climate disasters in the last 10 years (14). Slow-onset impacts of climate change including coastal erosion and saline intrusion have caused adaptive and forced migration, resulting in the influx of migration to South Tarawa (79). About two thirds of the population of the outer islands have migrated, causing severe overcrowding, the proliferation of unplanned and informal shelters, water insecurity, poor sanitation, pollution, and conflict over land ownership (14).

Those left behind on the outer islands are referred to as the 'trapped population' (79). Some unable to leave because they cannot afford to, others, especially women, are unable to move because men have decided that they should not (79). Women may also be unable to travel because their skills are not valued in the Kiribati economy, meaning they are unable to find jobs (79). The women left behind in these 'trapped communities' bear the burden of care-giving, household, and family leadership responsibilities (79).

### 3.3.3 Quantifying the impact

There are many methodologies across the literature that cost the economic impact of displacement, however methodologies for quantifying NELD are limited. The following are examples of datasets and conceptions of NELD that could be useful in the development of a model.

The Internal Displacement Monitoring Centre (IDMC) collects, analyses, and publishes data on the global situation of internally displaced people, including the causes and events that lead to internal displacement (81). The IDMC collects data from all Pacific islands' countries, however, the data is not segregated by gender (82). This data can be used to estimate current and future numbers of displaced people in the Pacific islands.

When considering methods to quantify NELD, an Australian study examining a bushfire and flood conceptualises the impacts of displacement and possible associated with NELD. It explores tangible, intangible, and non-economic costs (83). Examples of intangible costs include community dislocation (the disconnection that occurs when displaced from community), family violence, mental health, and school enrolment and completion (83).

## 3.4 Child, early and forced marriage and gender-based violence

This section examines links between climate disasters and increased rates of child marriage and gender-based violence found in the literature. Child marriage is defined as 'any formal marriage or informal union between a child under the age of 18 to an adult or another child' (84). Child marriage is considered a form of gender-based violence (85). Gender-based violence can include physical, economic, sexual, and psychological abuse and is used against a person because of their gender (85). The literature also highlights links between marrying at age 15 or earlier and increased intimate partner violence (86).

While the root cause of child marriage is gender inequality, other risk factors such as the impacts of climate change are a threat multiplier. Climate change can exacerbate existing inequalities which leads to increased child marriage and gender-based violence (85).

Climate disasters expose girls and gender diverse people to the risk of sexual harassment and abuse post-climate event as they lack safe spaces and services. Post-climate events, families also have less resources and income, which can lead them to engage in harmful coping strategies such as child marriage to relieve their financial burden (87). Other risk factors include loss of access to education, living in poverty, and food shortages (85). Figure 4 highlights the relationship between child marriage and climate events. These themes will be explored in further detail throughout this section.

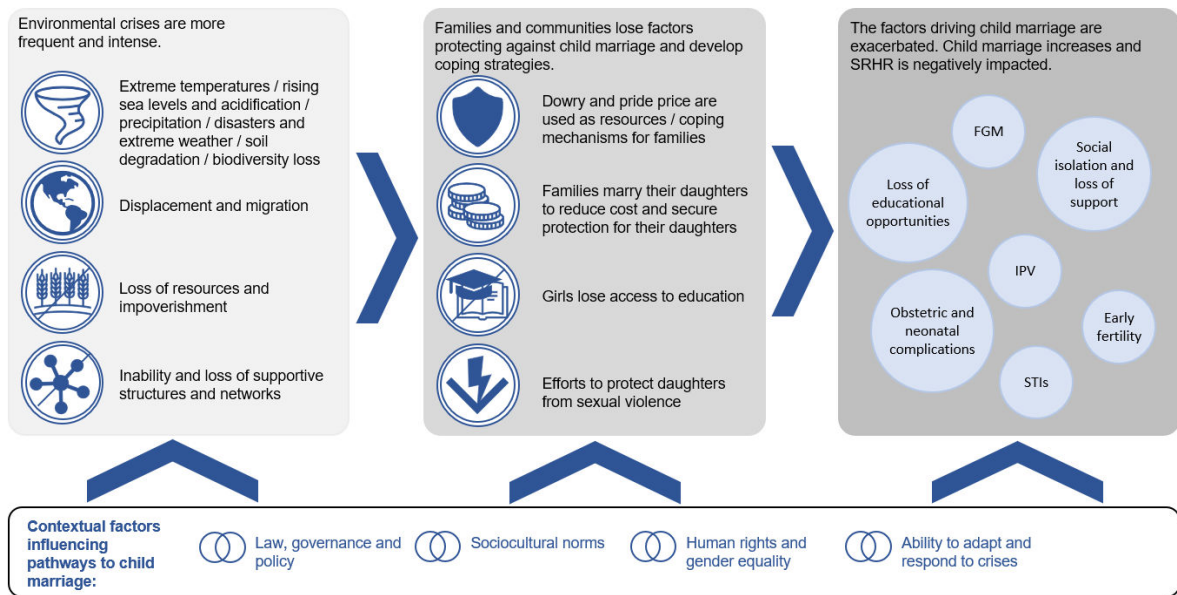


Figure 4: Relationship Between Child Marriage, Climate and Environmental Crisis. SRHR = Sexual and Reproductive Health Rights. IPV = Intimate Partner Violence. STIs = Sexually Transmitted Infections. FGM = Female Genitalia Mutilation (88).

### 3.4.1 Impact on access to protective resources and spaces

During natural disasters, existing inequalities are magnified as women are disempowered to make decisions, and have less autonomy and mobility, which can contribute to family violence (15). Immediately after disasters, women also have less opportunities to seek help, medical care, or temporary shelter (15). Even when girls are able to evacuate to shelters, they may not have adequate sources of protection such as their family and friends, and separate facilities for women may not exist. This poses a risk to young women and girls who can face gender-based violence through sex trafficking. Some parents see child marriage as a means to protect their daughters from sexual violence perpetrated by strangers and can often increase after a climate event. A United Nations Children’s Fund (UNICEF) report indicated that by analysing historical data, a 10 percent deviation in either direction of rainfall (i.e., extremely low or high levels of rainfall) is associated with a one percent increase in levels of child marriage (87). However, they did not indicate which countries were analysed. Research indicates the Pacific islands experience extreme rainfall, which often occurs during tropical cyclones in islands such as Fiji (89). The findings from UNICEF’s report are particularly relevant for the Pacific islands as almost all Pacific Island nations are projected to experience increased rainfall and fewer droughts (90).

Gender-based violence in Fiji has been reported to increase during and after climate events, such as cyclones (91). Reports indicate that shelters are overcrowded and lack privacy, creating unsafe conditions for women. Many bathroom facilities cannot be locked or do not have doors. Domestic rape in overcrowded shelters and sex trafficking of children was also reported after the Fiji floods in 2009 (91). People often evacuate to schools or community halls during climate events which are unable to adequately cater for women and girls’ reproductive needs. As a result, women and young girls take care of their reproductive needs in isolation or at night which puts them at a greater risk of gender-based violence (91). Similarly in Vanuatu after two tropical cyclones in 2011, there was a 300 percent increase in new domestic violence cases reported (16).

Increased gender-based violence during and after disasters has intersectional considerations, with elderly women, women, or girls living with disabilities disproportionately impacted (91). Research in the Pacific has highlighted that women and girls with disabilities are two to three times more likely to be victims of physical and sexual violence (15). While research is limited on the impacts on sexual and gender minorities, some qualitative data such as the quote below highlights increased violence towards sexual and gender minorities. For example,

I was working when [cyclone] Winston came, and I had to go and hide in the toilet. After Winston people said that gays brought Winston [here] and that we are all sinners - they tried to punch me (92)

Women and children facing food insecurity also experience an increased risk of violence in the aftermath of disasters (see section 3.1 on health). Social expectations push women towards supplying food and managing agricultural aspects of the household (see section 3.6 on livelihoods). In the short-term after a climate event, markets are often closed. As a result, women will transition to selling any produce that hasn't been lost, in the streets which exposes them to physical and sexual violence and harassment (91). Food insecurity and disruptions to loss of income put financial strain on families, which can result in the use of child marriage as a coping mechanism to relieve their financial burden (87).

### 3.4.2 Impact on access to education and exposure to health issues

Slow-onset climate events can often result in women and young girls who are usually responsible for gathering water and firewood, having to travel further during droughts for these resources. This puts them at risk of gender-based violence as they are often travelling alone (93).

Climate events also increase the risk of girls dropping out of school (see section 3.5 for further detail). Girls are less likely to return to school after a period of being away from school, which increases a girl's risk for child marriage. Research on South Asia and Africa indicated that with each year of secondary education completed, there is on average a six percent decrease in the likelihood of marrying as a child or having a child before the age of 18 (86). This can have an intergenerational impact, as child marriage can negatively affect the education of the children of child brides (86). This can result in families being trapped in the cycle of poverty.

Gender-based violence can increase the burden on the public health system through increased presentations of physical injury, unwanted pregnancy, exposure to STIs, fertility problems, and mental health conditions such as depression, anxiety, and PTSD (94).

### 3.4.3 Quantifying the impact

In Indonesia, 16 percent of girls are married before they are 18 years old (95). The rates of child marriage are higher in rural areas and can be up to 19 percent. UNICEF conducted a study on the economic cost of child marriage, measured as a percentage of gross domestic product (GDP). The study identified useful examples of NELD, including the impact on education, and maternal and infant mortality rates. This study is contextually useful and could assist in modelling the impact of climate change on child marriage. These aspects of NELD are highlighted in Figure 5.

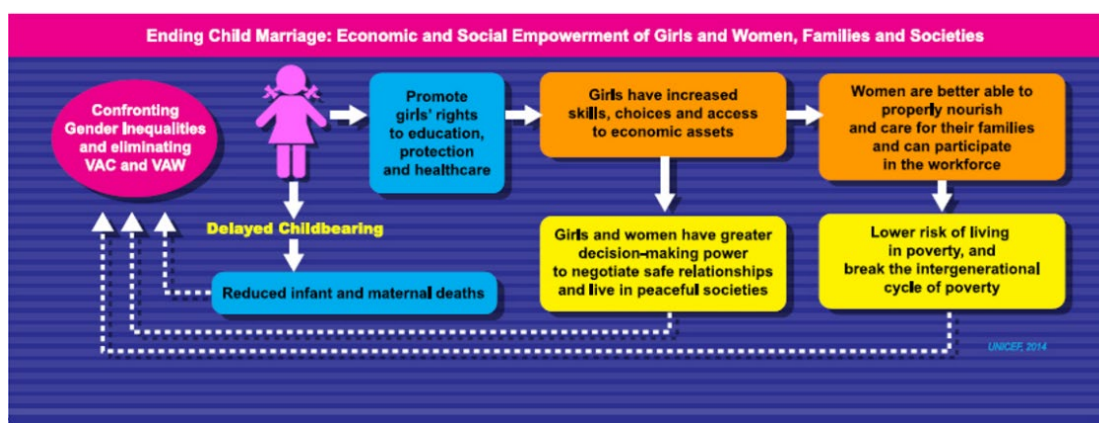


Figure 5: Social and Economic Impacts of Eliminating Child Marriage (96).

Dewi and Dartanto (2019) conducted a study to explore the relationship between natural disasters and the probability of girls entering a child marriage. The study revealed that there were 40,157 women in Indonesia married between 2008-2013, of which 4,832 were child marriages. The authors then considered this against village-level census data on the number of natural disasters within this same time period. Through a regression model, the authors found a positive association between natural disasters and the probability of girls entering a child marriage. The authors also found higher poverty rates relative to other villages in the same district increased the probability of girls becoming child brides. The study found that the existence of an early warning system for natural disasters significantly reduced the probability of girls becoming a child bride by 2.9 percentage points. Access to secondary schooling reduced the probability of a girl becoming a child bride by 1.3 percent and the availability of a skills training institute reduced it by 0.5 percent (97).

To quantify the impacts of child marriage, studies have examined its impact on future earnings and productivity within a country, such as the study done by the World Bank and International Center for Research on Women (86). While the model focuses on measuring the impact on future earnings and productivity, the study highlights links between educational attainment, fertility, and child marriage as aspects of NELD that could be used for future model development (as seen in Figure 6). Specifically, they posited that child marriage can curtail women's earnings and productivity through its impact on higher fertility and lower educational attainment. This can have intergenerational impacts of the welfare on the household.



Figure 6: The World Bank's Conceptual Framework on the Economic Impacts of Child Marriage (86) .



While not in the Pacific region, data from Bangladesh shows an association between climate events and child marriage. Bangladesh has one of the highest rates of child marriage in the world, with 51 percent of girls being married by 18 and 15 percent married by 15 (17).

A 2020 study that analysed rainfall data and the Demographic Health Survey from 1999 to 2014 found that a higher number of dry months elevated the risk of child marriage in rural areas (98). This trend was observed within the first 12 months after the drought began, but not 1-3 years after the drought, indicating that child marriage may be used as an immediate response to cope with extreme climate events due to short-term income shocks. While this study did not link extreme temperatures with increased child marriages, a separate study found an association in Bangladesh's coastal regions. In years with 30 days or more of extreme heat, girls aged 11-14 were twice as likely, and girls aged 15-17 were 30 percent more likely to marry, compared with baseline years (98).

The methodology of analysing rainfall data and demographic survey data on child marriages could be replicated in the Pacific islands to identify whether child marriages increased after flooding or droughts.

### 3.5 Education

Studies exploring climate change impacts on education have defined the scope of education outcomes as 'academic attainment and achievement', measured by test scores, school access, attendance and completion rates (99). Areas earmarked for future research include the development of social skills, self-confidence and emotional wellbeing. The Pacific Education Ministers Conference in 2023 has also prioritised areas such as strengthening climate change resilience and promoting gender responsive policies in education (100).

There is a paucity of available literature in this space. Some recent research is available on education related NELD for children and young adults, particularly girls and young women (101) (102) (103). However, the literature is largely not specific to the Pacific islands.

Prentice et al. (2024) have examined how climate change is affecting children's educational outcomes worldwide in two ways: firstly by reviewing and synthesising literature on climate change stressors and education outcomes across a range of disciplines, and secondly by formulating a conceptual framework that outlines pathways and processes linking climate change stressors and education outcomes (99).

#### 3.5.1 Impact on educational outcomes

Pacific countries are at the epicentre of immediate and physical disruption to education, given the greater frequency and intensity of extreme weather events. However, the literature tends to be qualitative in nature and focuses on economic loss and damage, including school infrastructure destruction (104). For example, between 50 to 90 percent of 6,000 school buildings across Samoa, Tonga, and Vanuatu were assessed as possibly unable to withstand a strong cyclone (18). This was evidenced in 2020, when a cyclone in Vanuatu destroyed and damaged 885 schools (105).

The knock-on effects of school infrastructure vulnerability or the use of schools as evacuation centres is where the impact of NELD may begin, as prolonged school closures can disrupt a child's education (18). As has been previously explored in section 3.3 of this Review, climate change induced disasters or the long-term impacts of climate change, expose vulnerable populations such as women and girls to displacement. Disruption to the schooling of displaced persons can have a significant impact on academic attainment and achievement. Girls are

often the first to be removed from school when finances are limited, or they may remain in school but are heavily burdened by household chores (106).

As previously explored in section 3.2.2, a connection exists between prenatal exposure to climate events, and psychiatric and attention deficit disorders (10). Without early intervention, attention deficit disorders can have a profound impact on children's educational and social development. This shows that the current 'hidden crisis', in which approximately 40 million children a year have their education interrupted by climate related events, is far more wide-ranging (107).

The Malala Fund's Girls' Education and Climate Challenges Index (GECCI) ranks jurisdictions through comparative analysis of gender disparities in education with climate vulnerability and resilience (99). This composite index underscores the disproportionate impacts of climate change on girls' education, with Pacific countries faring particularly poorly. The Solomon Islands ranks 26<sup>th</sup>, Kiribati 41<sup>st</sup>, The Federated States of Micronesia 51<sup>st</sup>, and Vanuatu 71<sup>st</sup>, out of 77 at-risk nations (19). Climate-related events were estimated to have prevented at least four million girls worldwide from completing education in 2021 alone (19). If this trend continues, by 2025, climate-related events would impede 12.5 million girls from completing their education (19).

For each additional year of education that girls acquire, countries' resilience to climate disasters tangibly increases (19). Although not accounting for every variable between jurisdictions, the finding suggests investment in girls' access to, and completion of education, is a cost-effective strategy for building individual and community resilience and adaptive capacity (108).

The impact of education for girls and women is evident when considering that nations who have invested in girls' education and have high female education rates have lower deaths from droughts and floods, compared to countries that have invested less (85). Studies estimate that increased investment in girls' education in lower income countries between 1960 and 2003 could have resulted in the rescue of 465 million people from injuries, shielded 667 million people from droughts, and prevented 60,000 deaths caused by floods (85).

### 3.5.2 Quantifying the impact

Minimal information is available on the quantification of NELD as it relates to education outcomes. Despite this, the Wodon et al. (2018) study on the economic cost related to not educating girls could be useful for conceptualising the nature of the impacts in a future costing models. The six domains of impacts on girls' education included: earnings and standard of living; child marriage and early childbearing; fertility and population growth; health, nutrition and wellbeing; agency and decision-making; and social capital and institutions (109).

## 3.6 Livelihoods

Livelihoods can be defined as how members of a household earn income and resources for subsistence. A livelihood is sustainable when it enables households to recover from shocks, including climate or economic shocks (110). Both the immediate and long-term effects of climate change have the potential to create NELD in Pacific islands, especially relating to livelihoods through increased unpaid working hours and exposure to exploitation and forced labour. The disaster and slow-onset effects of climate change create a loss of biodiversity, soil erosion, and destruction of crops and infrastructure (explored in previous sections). As such, sectors like agriculture, fishing, and tourism become less viable sources of livelihood and support to individuals and communities. The literature indicates that the NELD experienced

because of climate change distinctly affects the livelihoods of girls, young women, and gender diverse youth in the Pacific in numerous ways (24).

### 3.6.1 Impact on livelihoods through unpaid labour and increased workload

Across the Pacific islands declining resource yields from soil degradation, variable rainfall patterns, and the impacts of disasters significantly affects the amount of work required to produce yields consistent with previous seasons (111). Bradshaw and Fordham (2013) found that the increase in the number of hours in the working day for women and girls may be the biggest impact on these groups from climate change (112). Women across the Pacific reported that reduced crop yields were a direct result of climate change, and caused an increase in hours worked both paid and unpaid across their job, family, and community (111) (112).

The literature finds that a disproportionate share of unpaid labour falls to women which is exacerbated both during climate disasters and by the long-term impacts of climate change. When the impacts of climate change manifest, especially in the case of natural disasters, women are forced to redirect their time towards unpaid work, including restoring homes, childcare, and fetching water (20). In climate induced disaster events such as drought or flooding, children, especially girls, spend more time fetching wood or water as local resources become scarcer or contaminated (113). As a result more time and effort is dedicated to unpaid labour and taken away from other areas of life.

After Cyclone Pam, 3,600 female microentrepreneurs lost 39 days of paid working days each in the immediate phase following the disaster because their time was redirected to unpaid labour, mostly care work (20). In cases of longer-term climate change impacts such as increased and extreme temperatures, women need to work longer to achieve the same outcome (20). Increased heat and extreme temperatures increase the difficulty of tasks undertaken outside or inside with no air-conditioning. When including unpaid labour in this estimation of loss, women's losses increase by 260 percent compared with men's, which only increase by 76 percent (21).

### 3.6.2 Impact on forced labour and modern slavery in climate vulnerable sectors

Agriculture and fishing are the most vulnerable sectors to climate induced loss and the impacts of climate change. Both sectors are relied upon by women for income and subsistence (114). Both disaster and slow-onset effects of climate change have the potential to exacerbate existing vulnerabilities, leading to forced labour and modern slavery. This is particularly prevalent in vulnerable sectors which are experiencing detrimental impacts on yields due to climate change (76). Across the globe, there are many examples of women and girls being forced into child slavery following disaster events (76). Similarly, when livelihoods become less viable due to slow-onset climate disasters families may choose to borrow money to make ends meet, creating a chain of exploitation, debt bondage, and modern slavery (76). Children and women working informally in the agriculture and fishing industries are particularly vulnerable to these impacts, experiencing several layers of vulnerabilities, exposing them to trafficking and labour exploitation (76).

Women contribute significantly to these sectors, often in informal ways. According to official data, across 13 Pacific countries, 27,500 women were formally engaged in agricultural, forestry or fishery work, which is approximately 30 percent of the formal sector (76). However, most contributions made by women to the sector are informal and not recognised in this statistic. Similarly, while very few quantifiable statistics exist for children and young people involved in agriculture, it is known that climate change acts as a threat multiplier for child labour

especially in agriculture where 70 percent of child labour is located (22). These losses are created by climate change and felt most in these sectors that disproportionately affect women and children, increasing their vulnerability to exploitation, forced labour, and modern slavery.

### 3.6.3 Case study: Alona Ward, PNG's agriculture sector

PNG's climate vulnerable agriculture sector demonstrates the distinct NELD experienced by women in the Pacific islands, especially in rural and remote areas. The majority of the PNG population is dependent on agriculture, both industrial and subsistence for their livelihoods. The Western Highlands, an area severely impacted by droughts, has experienced an amplified impact on women who are central to food production and food supply for the household (115). During the 2015-2016 El Nino-induced drought, the community faced severe repercussions including food shortages and the collapse of agricultural productivity (115). Female agricultural workers reported an increased burden of work due to reduced soil fertility, erosion, and reduced yields. This contributed to both reduced income and food insecurity (111).

During this time, women were expected to continue food production with limited resources and had to find alternative means to procure water and food for household consumption. Their paid and unpaid daily tasks became more arduous, involving long walks to collect water, switching to more drought resistant crops, and more effectively utilising food preservation efforts to ensure sustainable availability of food (115).

### 3.6.4 Quantifying the impact

There is currently limited modelling of the NELD experienced by young women, girls, and gender diverse people in the Pacific, especially relating to livelihoods where economic impacts are often modelled. There are a few key data sources which may be useful in quantifying the impact of both the increase in unpaid labour, labour exploitation, and modern slavery.

The Atlantic Council's Adrienne Arsht Rockefeller Foundation Resilience Centre used the Global Climate and Earth System models of the Climate Model Intercomparison Project 6 and the simple Wet Bulb Globe Temperature (sWBGT) model to predict the long term (20+ year) extreme heat forecast (21). The article looked at losses in paid work using workability functions to relate productivity loss to sWBGT levels. National level occupational sector data was used to estimate the distribution of working hours by sector and gender. The methodology further quantifies unpaid labour, including household and care work, splitting these activities by gender across different work environments (21). For the Pacific islands, current and potential future damage to livelihoods from climate change could be quantified provided that relevant data is available.

To measure women's unpaid workdays lost to climate disasters, a Post-Disaster Needs Assessment could be used (54). This assessment details workdays lost in the formal and informal sectors, which can be broken down by gender, while anecdotal evidence could illustrate the reallocation of efforts due to these losses (54). More research will be needed to quantify the impact of climate change on the prevalence of modern slavery and forced labour in the Pacific islands.

## 4. Conclusion

This literature review has examined the relevant information and data on climate change-related NELD for young women, girls and gender-diverse people in the Pacific. Implementation of its recommendations could position the Australian Government to support the Pacific to address gender-based vulnerabilities over the short, medium and long term.

Several other priorities may be identified if existing research gaps can be filled. Many of these gaps relate to adequate localisation of global studies, and the need for comprehensive quantitative assessments that could underpin policy and program development and evaluation.

Table 2 below summarises the existing data in each research area and suggests potential areas for future research to address these gaps.

*Table 1: Potential areas of focus for future research on women, girls and gender diverse people in the Pacific*

Theme	Existing data	Potential areas of focus for future research
<b>Health</b>	<ul style="list-style-type: none"> <li>Increased impact of vector-born disease e.g. zika and dengue for children, women and pregnant women;</li> <li>Connection between heat exposure from climate change and non-communicable diseases such as cardiovascular, respiratory, morbidity, mortality;</li> <li>Contextual vulnerability to food and water insecurity due to gendered power, roles and responsibilities;</li> <li>High temperatures, droughts, inadequate drinking water impacting prevalence of malnutrition and stunting in target cohort; and</li> <li>Links between resource scarcity and sexually transmitted infections.</li> </ul>	<ul style="list-style-type: none"> <li>Localising research to the Pacific on: <ul style="list-style-type: none"> <li>links between resource scarcity and sexually transmitted diseases to the Pacific islands, including consideration of most impactful interventions in disaster response to address it;</li> <li>links between climate change and water and food insecurity for target cohort; and</li> </ul> </li> <li>Longitudinal research into climate change and non-communicable diseases for target cohort.</li> </ul>
<b>Mental health and wellbeing</b>	<ul style="list-style-type: none"> <li>Observed mental health impacts of anxiety, depression, stress, and loss and grief from climate events;</li> <li>Linkage between climate disasters and post-traumatic stress disorder (PTSD), attachment and sleep disorders, and depression and anxiety in children; and</li> <li>Connection between climate change and intergenerational impacts on mental health;</li> </ul>	<ul style="list-style-type: none"> <li>Longitudinal research into mental health effects of climate change for target cohort in the Pacific.</li> </ul>
<b>Displacement and mobility</b>	<ul style="list-style-type: none"> <li>Localised data of climate induced displacement; and</li> <li>Connection between health, hygiene, education, human trafficking and gender-based violence risks for target cohort.</li> </ul>	<ul style="list-style-type: none"> <li>Localising research to the Pacific on: <ul style="list-style-type: none"> <li>gender specific data for internal and external displacement including permanent and temporary displacement; and</li> </ul> </li> </ul>

Theme	Existing data	Potential areas of focus for future research
		<ul style="list-style-type: none"> <li>• human trafficking and climate-induced displacement.</li> </ul>
<b>Child early and forced marriage and gender-based violence</b>	<ul style="list-style-type: none"> <li>• Connection between climate disasters and the risk of sexual harassment and abuse;</li> <li>• Increased impact of existing inequalities leading to family and gender-based violence; and</li> <li>• Links found between slow-onset climate change and loss of access to education and the rates of child marriage.</li> </ul>	<ul style="list-style-type: none"> <li>• Localising the data on climate events (rainfall patterns) and child marriage for target cohort;</li> <li>• Localising research into climate disasters, gender based violence and sexual harassment; and</li> <li>• Linking climate events with child marriage in the Pacific islands.</li> </ul>
<b>Education</b>	<ul style="list-style-type: none"> <li>• Qualitative impacts of climate disasters on education (including access and outcomes) in the Pacific islands;</li> <li>• Quantitative data for the threat level of climate change to education;</li> <li>• Connection between climate disasters and loss of access to education; and</li> <li>• Connection between climate change education and a reduction in the impact of climate change.</li> </ul>	<ul style="list-style-type: none"> <li>• Localised longitudinal research on the impacts of climate change on target cohorts in relation to education outcomes and subsequent long-term impacts (livelihood and mobility).</li> </ul>
<b>Livelihoods</b>	<ul style="list-style-type: none"> <li>• Connection between slow-onset climate events and increased unpaid labour burden on target cohorts; and</li> <li>• Connection between slow onset climate events, climate vulnerable sectors and the increase in modern slavery and labour exploitation.</li> </ul>	<ul style="list-style-type: none"> <li>• Localising evidence and research regarding labour exploitation and modern slavery in climate vulnerable sectors for target cohort; and</li> <li>• Localising the link between climate change and the unpaid labour burden for target cohort.</li> </ul>

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