

Wading Past Assumptions:
Gender Dimensions of Climate Change Adaptation
in Coastal Communities of the Philippines

Kathryn Graziano

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Patrick Christie

Richard Pollnac

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University of Washington

Abstract

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Kathryn Graziano

Chair of the Supervisory Committee:

Patrick Christie, Professor

School of Marine and Environmental Affairs

Climate change is expected to have a broad range of impacts on social and ecological systems. Common discourse asserts that women in developing countries are more vulnerable to climate change than men, and perpetuates assumptions about the role of women in climate change adaptation (CCA). This study examines the gender dimensions of CCA in fishing villages of the Philippines, a country with exceptionally high marine biodiversity supporting dense coastal populations that are highly vulnerable to climate change. The study seeks to 1) Describe gender mainstreaming in Philippine CCA documents 2) Identify and challenge assumptions about women and climate change, 3) Examine men's and women's beliefs, values, perceptions of risks, resource dependency, and awareness associated with climate change and 4) Evaluate the implications of gendered relationships with fisheries and the environment on CCA. Quantitative social surveys were administered randomly to marine resource users in 30 coastal villages within three Philippine provinces (Palawan, Occidental Mindoro, and Batangas). Dependent variables associated with CCA were analyzed relative to gender. In this case, women were less connected to nature, more risk tolerant, and equally inclined to conservation attitudes as men. Women were also equally aware of climate change and more aware of CCA plans, but less likely to participate in outreach activities. The results offer insights that dispel certain generalizations about women and climate change, and present opportunities for improved gender mainstreaming in climate change adaptation.

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Introduction

This study explores the gender dimensions of climate change adaptation in select Filipino coastal municipalities located within Palawan, Occidental Mindoro, and Batangas provinces. The goal is to better understand the gender dimensions of risk perception, climate change awareness, training, and the potential impact of climate change on resource use, in order to improve climate change adaptation (CCA) process and policy. This study contributes to the growing understanding of the unique role of women in climate change adaptation, with specific implications for coastal, fisheries-dependent communities. The objectives of this study are to: 1) Describe gender mainstreaming in Philippine CCA documents 2) Identify and challenge assumptions about women and climate change 3) Examine men's and women's beliefs, values, perceptions of risks, resource dependency, and awareness associated with climate change 4) Evaluate the implications of gendered relationships with fisheries and the environment on CCA. The outcome presents opportunities for improved gender mainstreaming in climate change adaptation.

Climate Change Vulnerability in the Philippines

It is widely accepted that climate change will have a broad range of impacts on social and ecological systems across the world, with particular impact on tropical coastal ecosystems and the fisheries-dependent communities that they support (FAO 2009). Coral reefs and other coastal habitats are sensitive to climate stressors such as warming seas, coral bleaching, and ocean acidification (Daw et al. 2009; Burke et al. 2011), which build upon persistent environmental degradation caused by overfishing and destructive fishing (SCTR 2011). Climate variations that worsen ecological conditions will increase pressure on fisheries and have significant

consequences for the communities, economies, and fisherfolk that depend on them (Daw et al. 2009; Cinner et al. 2012). Furthermore, fisheries production and coastal communities are at risk from flooding and increasingly frequent and intense storms caused by climate change (Mamauag et al. 2013).

The Philippines is an archipelagic country located within the Coral Triangle region, an area known for its exceptionally high marine biodiversity. With 7,100 islands and 35,000 km of coastline, along which 60% of the total population is concentrated, the Philippines has a population highly dependent on healthy marine and coastal resources. Approximately 50 million Filipinos depend on diverse coastal ecosystems for food security, income and livelihoods supported by fisheries production, recreation, protection and other values (SCTR 2011). However, coastal ecosystems are significantly degraded. Natural mangrove cover has declined from 450,000 ha in the early 1900s to 120,000 ha in 1995 (Primavera & Esteban 2008) while coral reefs are under extreme threat primarily from overfishing and destructive fishing (SCTR 2011). Fishers are often cited to be the poorest sector of the population (SCTR 2011), but quantitative evidence to support the purported poverty of fishers is limited (Pollnac, Pomeroy, et al. 2001). However, in 2009, fisherfolk had the highest poverty incidence in the country, at 41.4%, while the national average poverty incidence in the Philippines was 26.5% (NSCB 2012).

According to a recent study, the social and ecological systems in the Philippines are considered “very vulnerable” to climate change as a result of overfishing, weak social and economic indices, high dependence on fisheries, high rates of poverty within the fishery sector, population growth, and poor governance (Mamauag et al. 2013). Vulnerability of fisheries and fishing communities to climate change is a function of exposure, sensitivity to change, and adaptive capacity (Daw et al. 2009), which vary considerably within and between countries and

populations (Cinner et al. 2012). Generally, poorer and less empowered countries and individuals are more vulnerable to climate impacts (Daw et al. 2009).

The Role of Women in Fisheries

Men and women have distinct roles in fisheries, and there is a lack of quantification of the true scale of contribution of women (Harper et al. 2013). In the Coral Triangle Region, fishing is perceived as male-dominated, but many women spend hours gleaning for invertebrates, fruit, and seaweed in near-shore areas. They are integral to pre- and post-harvesting activities such as mending nets, selling fish at market, and determining market prices (Eisma-Osorio et al. 2012). In Central Philippines, Kleiber et al. (2014) found that women accounted for 42% of all fishers, almost all of whom participated in gleaning. Other forms of fishing were only done in the presence of a male relative (Kleiber et al. 2014). Globally, women outnumber men in processing and trading fish (Weeratunge et al. 2010).

Women have unique responsibilities within small-scale fishing villages, as opposed to rural or urban communities. Where men are involved in offshore fishing, women are left responsible for childcare, buying, processing, and selling fish, and managing all household activities while men are away (Pollnac 1988; WorldFish Center 2010). These added land-based responsibilities can give women higher status in fishing villages, compared to non-fishing communities (Pollnac 1988). Women's role in marketing fish, community gathering, and disseminating public information makes them a valuable source of information, knowledge and perceptions of marine resource degradation (Siar 1998; Eisma-Osorio et al. 2012)

Although women formally comprise 46% of the labor force in small-scale capture fisheries among top fish-producing countries, their involvement is often underreported and

undervalued. Including near-shore gleaning, their participation is probably even greater than estimated (WorldFish Center 2010; Weeratunge et al. 2010). The overall contributions of women to household well-being in fishing communities is also often undervalued. Limited access to resources such as aquaculture ponds, technology, education, information and skills, weakens the power of women within the sector (The World Bank 2009). As fisheries yields decline, women take on added responsibilities to supplement income and subsistence needs, including food production and collection of fuelwood and water (Siar 1998; D'Agnes et al. 2005).

Women and Climate Change

Recent analyses have paid significant attention to the gender dimensions of climate change vulnerability and adaptation. The discourse on women and climate change focuses primarily on the distinctive vulnerability of women to climate change impacts, the role of women in climate change response, and how women contribute to climate change policy and adaptation planning (Masika 2002). In general, data show that climate impacts in developing countries may affect men and women differently. While it is suggested that women's assets and well-being tend to be more negatively affected by climate impacts in developing countries, there are exceptions as well as a notable lack of empirical support (Goh 2012). The degree to which gender influences vulnerability, risk exposure and capacity to respond is an ongoing discussion (Masika 2002). Perpetuated generalizations and assumptions that treat women as a homogenous group, especially in terms of poverty and the environment, may be detrimental to effective and equitable CCA (Demetriades & Esplen 2008). Empirical, site-specific data that challenges these assumptions and offers grounded insights may contribute to improving CCA process and policy.

Gender and Climate Change Impact

Vulnerability to climate change impact is a function of exposure to risk, sensitivity to change, and the ability to adapt to changing conditions (Adger et al. 2005). Adaptive capacity depends on wealth, technology, education, information, skills, infrastructure, access to resources, and management capabilities. Individuals and groups that are deficient with regard to these attributes are exposed to greater risk and are less able to adapt, and are therefore more vulnerable to negative impacts of climate change (Masika 2002).

The concept that pre-existing inequalities increase climate change vulnerability forms the foundation of the discussion about women and climate change. In developing countries, prevailing social conditions and gendered divisions tend to provide women with less access to income, assets, resources, technology, training and decision-making power than men (Worldfish Center 2010, Masika 2002, IUCN 2013). These disparities can potentially limit adaptive capacity and expose women to greater risk, making them more vulnerable to the impacts of climate change (FAO 2009). Adaptive capacity is further impaired when these inequalities restrict the involvement and contribution of women to climate change planning and decision-making (Masika 2002, WorldFish Center 2010). As climate change disproportionately affects the most vulnerable groups, pre-existing gender inequalities are expected to worsen (Demetriades & Esplen 2008).

However, claims about women's vulnerability to climate change tend to generalize the complex relationships that define women, poverty and the environment (Demetriades & Esplen 2008). These generalizations include claims that women in developing countries are disproportionately poor, more highly exposed to risks from natural disaster, and more sensitive to the degradation of natural resources. In climate change adaptation, these assertions are

problematic because they lack sufficient quantified support and fail to recognize local context. As a result, they fail to aid practical CCA that reduces vulnerability and builds community resilience (Demetriades & Esplen 2008).

Discussions stating that rural women in developing countries will be the most vulnerable group to climate change are based on assertions that women constitute the ‘poorest of the poor.’ According to theories of vulnerability, poor and marginalized groups will be more severely impacted by climate change (Demetriades & Esplen 2008). In the Philippines, almost 11 million women live in poverty, constituting more than 25 percent of the total population of women (NSCB 2012). However, in the fisheries sector, gendered poverty is better measured by access to food security, nutrition, health and education than by income and employment (Weeratunge et al. 2010). Furthermore, general claims about the vulnerability of women and links to poverty are rarely empirically grounded (Arora-Jonsson 2011).

Natural disasters are thought to impact women and men differently due to unequal exposure to risk and access to opportunities as a result of social norms and constraints. In a study of 141 countries, women were more likely than men to die in natural disasters between 1981 and 2002. Mortality varied based on socioeconomic status (Neumayer & Plümper 2007). Furthermore, social norms often allot women a greater proportion of responsibility to care for the sick, particularly after natural disasters. Increased instances or intensity of climate-related natural disaster would therefore add disproportionately to women’s time burden, reducing their availability to participated in income-generating activities (Demetriades & Esplen 2008).

However, Bradshaw (2010) used the case of Hurricane Mitch in Nicaragua to demonstrate that the impact of natural disaster is predicted by a many variables, not just poverty. In this context, neither men nor women were more likely to die as a result of the hurricane.

Furthermore, commonly cited assertions are not always empirically based in sound evidence (Arora-Jonsson 2011). Therefore, characterizations of women as a uniformly vulnerable group to natural disaster are questionable.

Finally, some also argue that women's reliance on natural resources for livelihoods will make them even more vulnerable to environmental degradation that is exacerbated by climate change (Nelson et al. 2002). Women in the developing world may be the most likely to be affected by increasing environmental degradation and depletion of natural resources because of their involvement in livelihood activities which depend directly on the environment (Brown 2011; Nelson et al. 2002). Therefore, environmental degradation that is intensified by climate change impacts can directly increase women's workload and vulnerability by decreasing access to scarce natural resources (Nelson et al. 2002).

However, women throughout the world are certainly not a homogenous group (Demetriades & Espen 2008). Generalizations and assumptions that do not consider specific contexts that affect climate change impacts on women can have unintended and detrimental implications for policy and adaptation strategies (Arora-Jonsson 2011). As climate change affects vulnerability, well-being, and assets of communities, it is necessary to understand the progression of impacts and responses that operate within specific contexts (Goh 2012). Gender-disaggregated data is needed to improve assessment of actual climate change coping strategies, to target women's needs and perspectives for outreach and communication, and to support the contribution of women's knowledge systems to climate change adaptation (Lambrou & Piana 2006).

Gender and Climate Change Adaptation

Climate change adaptation is the way in which societies, organizations and individuals react to climate change by adjusting behavior according to assessment and anticipation of future climatic conditions. Potential adaptation actions include building adaptive capacity through education and information, protecting property or land, increasing awareness of impacts, maintaining well-being, sustaining economic growth, or taking advantage of new opportunities. Climate change adaptation plans are tools intended to increase resilience by reducing vulnerability of social and ecological systems to the impacts of climate change. While some actions successfully improve resilience by certain standards at multiple scales, actions also hold potential for adaptation with unintended and potentially negative consequences (Adger et al. 2005). Although some studies of adaptation to climate change are robust, practical application to vulnerability reduction is limited (Smit & Wandel 2006).

Successful adaptive response to climate change is limited by values, perceptions, processes, motivations and power structures within society (Adger et al. 2005). Each of these variables can be in some way shaped or affected by gender dynamics and social norms. Therefore, understanding and including gender considerations in climate change adaptation design, decision-making and execution can both improve overall adaptive capacity (Masika 2002). This section reviews the ways in which beliefs, perception of risk, awareness of impacts, and participation in decision-making relate to gender dimensions of adaptation action.

Environmental Attitudes

In some cases, adaptation planning relies on generalizations and assumptions about women's "environmental virtuousness" and "closeness to nature," and accordingly prescribes roles for women that add responsibility without reaping rewards (Masika 2002; Arora-Jonsson

2011). Some conservation and development projects rely on women for unpaid labor, based on the assumption that women are “closer to nature” (Nelson et al. 2002) without taking into account women’s true needs and interests (Arora-Jonsson 2011).

Risk Perception

Perception of environmental risk is a determining factor in motivating action in the face of climate change (Adger et al. 2009; Grothmann & Patt 2005; Lata & Nunn 2011). Climate change adaptation action can be limited by various conditions, including perceptions that the risk is not enough to justify action (Adger et al. 2005) and that abilities are insufficient to address the issue (Grothmann & Patt 2005). Climate change response and adaptation are increasingly addressed within frameworks of risk and risk perception (Lata & Nunn 2011).

Individual risk perception is determined by personal experiences, values and beliefs more than by scientific realities (Price et al. 2014). Perceived risk to climate change and natural hazards is influenced by socio-economic, demographic and cognitive variables such as personal beliefs and values (Brody et al. 2008; Tam & McDaniels 2013). In one municipality of Central Philippines, perceived risk was positively related to resource dependency, but negatively related to distance from the coastline (Combest-Friedman et al. 2012). Proximity to the coast also increased perception of risk in the U.S. (O’Connor et al. 1999). Tam & McDaniels (2013) found that emotions of fear and anger are associated with high perception of risk in terms of adaptation options. However, in tropical coastal areas, there is limited information on households’ perceived risk to coastal hazards (Combest-Friedman et al. 2012).

Women and men have dissimilar attitudes, interests and preferences (Bord & O’Connor 1997), which impact environmental risk perception and predict behavioral responses (O’Connor et al. 1999). Women are more likely than men to rate ecological and climate change risk as more

serious, and are more likely to take action to address the problem. In this sense, men are considered to be more risk tolerant and less likely to act voluntarily to abate risk (Bord & O'Connor 1997). However, Combest-Friedman et al. (2012) found male urban laborers in one municipality of the Philippines to be significantly more likely to feel at risk to multiple (two or three) hazards, as opposed to women who were more likely to perceive only one hazard.

Climate Change Awareness

Adaptation action in developing countries is also influenced by climate change awareness (Lata & Nunn 2011). Effective communication of climate change information is increasingly recognized as a way to improve awareness and understanding; lack of awareness can act as a barrier or limit to adaptation (Moser & Ekstrom 2010). Awareness-raising is intended to empower stakeholders and community leaders to make informed decisions about climate change by engaging communities and individuals in adaptation planning (Lata & Nunn 2011).

Climate change awareness can be linked to many variables. In one municipality of the Philippines, Combest-Friedman et al. (2012) found that climate change awareness was most strongly predicted by respondents' level of education, where higher levels of education corresponded with greater climate change awareness. In the Philippines, a higher percentage of women than men complete secondary education or higher (UN Women 2011). In a study of fishing communities in Central Philippines, females completed on average 4 to 6 years of primary education, which was approximately equal to years of education completed by men. The women in fishing villages had similar levels of education to rural women, but less education than women in urban areas (Siason et al. 2000).

Access to climate change information and awareness may also be limited by level of participation in community meetings and training. The participation of women in community

meetings and trainings is constrained by the time burden of domestic and other activities.

Women are also rarely targeted for technical fisheries assistance, training, and extension. In the Central Philippines, however, women attended community meetings more regularly than men and often represented their husbands in fisher organizations (Siason 2000). Therefore, the extent to which women have access to educational resources, training and community meetings is variable. Inclusion in training, education, and meetings has implications for climate change awareness, ability to adapt, and power in decision making.

Climate Change Policy and Decision-Making

Assumptions about women's vulnerability and environmental virtuousness are often echoed in policy statements and government documents. In some cases, these assertions deflect attention from gender power imbalances in institutional climate change decision making (Arora-Jonsson 2011). In other cases, international adaptation policy, such as REDD+ (Reducing Emissions from Deforestation and Forest Degradation, plus conservation and sustainable forest management) which limits access to forest resources, may adversely affect women by not considering their specific resource needs (Brown 2011). Government policies and development programs aimed at climate change adaptation can risk furthering gender inequalities, unless responses are gender-aware (Nelson et al. 2002).

Women and men have different responsibilities, knowledge, and needs in relation with the environment and natural resources (IUCN 2013). Women have thus far been underrepresented in climate change decision making at all levels of governance, primarily due to unequal access to education, training, technology, financial and management capacity (Hemmati & Röhr 2009; Skutsch 2001). Although recent international climate change conferences showed

modest increase in inclusion of women and gender perspectives, there is still a conspicuous lack of gender issues in climate negotiations, mechanisms, instruments and measures (Hemmati & Röhr 2009). Lack of access to power and climate change decision-making mechanisms reduces capacity to adapt (The World Bank 2009). Policy that ensures gender equitable outcomes and the inclusion of women in climate change adaptation (CCA) decision- making is essential to build resilient fishing communities (WorldFish Center 2010).

“Gender Mainstreaming” can be defined as incorporating gender considerations at all levels of government or organization operations including the development process, policy making, budgetary planning, and evaluation (Bennett 2005). While many institutions have been committing to ‘gender mainstreaming’ in CCA, this does not necessarily translate into addressing gender aspects at either national or international levels (Hemmati & Röhr 2009; Brown 2011). Also, gender mainstreaming policy can be superseded by local context (Clabots 2013). Effective gender mainstreaming must not rely on the previously described assumptions of the vulnerability and pro-environmental responsibility of women with regard to climate change (IUCN 2013; Masika 2002), but must address gender inequality and give women a voice in climate change decision making (Masika 2002).

Inclusion in decision-making has implications for women’s ability to adapt to climate change. The Philippines has scored relatively highly on global indices of gender, and about 20 percent of parliamentary seats are held by females (UN Women 2011). The IUCN Gender and Environment Index Ranked the Philippines as a ‘moderate performer.’ The Philippines had the highest performance regionally on women legislators, managers, and senior officials and for the gender-based rights and participation category (IUCN 2013).

At the community-level, female involvement in decision-making is limited. Some women with higher-income status may serve as *barangay* (village) captains, but they are more likely to act as secretaries or treasurers, and generally defer decisions to men who are seen as more decisive leaders (Siason 2000).

Women's participation in natural resource decision-making may be barred by common challenges stemming from cultural, political, and economic factors. However, the experience of women in natural resource management cannot be generalized (UNEP et al. 2013). Women may be excluded from coastal resource management decisions at the household, community, regional and national level (WorldFish Center 2010). In fisheries, women may lack access to fisheries resources and assets due to customary beliefs, norms, and unfavorable regulatory structures (Weeratunge et al. 2010); in the Pacific, lack of recognition of women's contribution to fisheries results in limited participation in all levels of decision-making (Harper et al. 2013). Women's involvement in community-based coastal resource management in the Philippines is not well-documented (Siason 2000), but membership in formal fisheries associations and cooperatives is more common among men than women in Asian-Pacific fisheries (Weeratunge et al. 2010). In the Central Philippines, however, women attended community meetings more regularly than men and often represented their husbands in fisher organizations (Siason 2000). In some cases in the Philippines, women's participation in marine protected area management and decision-making is restricted by lack of information, location, timing, lack of formal invitation, and childcare responsibilities (Clabots 2013). The participation of women in fisheries assessments or meetings does not guarantee that they will be empowered in management decisions (Kleiber et al. 2014).

Gender Mainstreaming in Climate Change Policy

Recent studies have called for a better understanding of how women and men are impacted by climate change, cope with climate change, and perceive risk, as a way to design gender equitable adaptation strategies that address the potentially unequal impacts of climate change on vulnerable groups (Goh 2012; WorldFish Center 2010; Masika 2002). This section reviews how gender components have been included in climate change documents.

Gender Mainstreaming in Philippines Climate Change Documents

Gender components have been included in the language of climate change documents at the Philippines national government level. The Climate Change Act of 2009 (RA 9729) states that local government units (LGUs) are responsible for planning and implementing their own Local Climate Change Action Plans, while collaborating with other LGUs, coordinating vulnerability assessments with private entities, and building capacity for local adaptation planning, implementation and monitoring. RA 9729 states, “It shall also be the policy of the State to incorporate a *gender-sensitive*, pro-children and pro-poor perspective in all climate change and renewable energy efforts, plans and programs.”

Under the same act, the Philippines Climate Change Commission (CCC) was formed to coordinate, monitor, and evaluate all government climate change programs and action plans. The Philippines National Climate Change Action Plan (NCCAP) was released by the CCC in 2011, with the ultimate goal to “build the adaptive capacities of women and men in their communities, increase the resilience of vulnerable sectors and natural ecosystems to climate change, and optimize mitigation opportunities towards *gender-responsive* and rights-based sustainable development.” Among the priorities of the NCCAP are knowledge and capacity

development, including enhanced knowledge of the science of climate change, disaster risk reduction and enhanced capacity for CCA at the LGU and community level, and established gendered climate change knowledge management accessible to all sectors at the national and local levels. The NCCAP includes indicators to monitor annual implementation status, some of which include “gender” components. It also recognizes that many priorities crosscut with gender and development sectors. The NCCAP includes a section on ‘gender mainstreaming,’ to “ensure that the concerns and experiences of women and men are an integral dimension of the design, implementation, monitoring and evaluation of policies and programs so that women and men benefit equally and inequality is not perpetuated” (Climate Change Commission 2011).

The Coral Triangle Initiative

The Coral Triangle Initiative (CTI) is a formal agreement between the Philippines, Indonesia, Malaysia, Solomon Islands, Papua New Guinea and Timor Leste (referred to as the CT6) to pursue improved regional marine governance and conservation in the Coral Triangle Region. The CTI was officially formed in May 2009, and is supported in part by the US Government through the US CTI Support Program (USCTI). USCTI includes the Agency for International Development (USAID), the National Atmospheric and Oceanic Administration (NOAA), and Department of State (DOS), which together have committed more than \$40 million to assist the CT6 from 2009-2013. This support is channeled as technical and financial assistance through a 5-year project known as the Coral Triangle Support Partnership (CTSP). In the Philippines, CTSP is headed by World Wildlife Fund, with project sites in the province of Palawan; and Conservation International, with project sites in the provinces of Batangas and Occidental Mindoro. Both non-governmental organizations (NGOs) work on CTI-related

national and regional issues through their offices in Manila. At the site level, these NGOs work primarily with local government units, municipalities, and national government offices to achieve CTI goals. Climate change adaptation is a pillar of the CTI, forming one of the five primary goals of the initiative: (1) Priority seascapes designated and effectively managed (2) Ecosystem approach to fisheries management and other marine resources fully applied (3) Marine protected areas established and effectively managed (4) climate change adaptation measures achieved, and (5) Threatened species status improving.

Gender Mainstreaming in USCTI Climate Change Adaptation

The USCTI was also involved in local climate change vulnerability assessment and adaptation planning in the region, including the Philippines. The LEAP Guide (CCA for Coral Triangle Communities: A Guide for Vulnerability Assessment and Local Early Action Planning) focuses on planned adaptation at the local scale to minimize CC impacts and increase social and ecological resilience. It strives to catalyze planned adaption within ongoing development and to align adaptation with community goals and objectives. LEAP is designed to help national and local governments, NGOs, and other groups working with communities identify adaptation actions to reduce the vulnerability of social, economic and natural resources. According to monitoring indicators, CCA planning teams should represent a balance of gender and social groups in the community; stakeholder outreach should include both men and women. Telling the “climate story” asks for input from all members of the community about differential impacts of climate change. Multiple parts of LEAP emphasize the importance of asking stakeholders from various groups for input (USCTI 2013).

Research Questions

This study looks at how gender influences climate change risk perception, awareness, and adaptation in sites across three provinces of the Philippines. As a country within the Coral Triangle Region, with populations that are highly dependent on diverse marine resources and vulnerable to climate change impacts, the findings can be particularly informative. It is also an area of interest based on involvement in the Coral Triangle Initiative, offering perspective on the climate change adaptation portion of CTI goals. Based on current literature concerning women and climate change, women's current status in the Philippines, and the prevalence of gender mainstreaming in CCA documents in the Philippines, it is hypothesized that (1) women will feel more connected to nature and demonstrate pro-environmental attitudes, (2) women will be more sensitive to risks associated with climate change, (3) women will be more likely to report degradation of coastal resources and changes in weather patterns, (4) women will be just as likely as men to participate in climate change awareness training and public outreach activities, and (5) men and women will be equally aware of climate change, and women will be more aware of adaptation plans.

Data and Methods

Study Site and Sample

This research was carried out as part of a larger US CTI Learning Project (LP) data collection process. The LP examined lessons learned, results, and outcomes of the USCTI. The LP team conducted community level surveys in the Philippines, Indonesia, Solomon Islands and Timor Leste. This study uses only the data collected in the Philippines, which includes 30 coastal villages within 13 municipalities and three provinces (Table 1). Within this sample, 20 randomly

selected “project” villages fall within municipalities where CTSP (WWF or CI) had worked towards CTI goals in cooperation with local governments and partners supported through USCTI. 10 coastal villages were chosen randomly within “control” municipalities, which were chosen based on proximity and comparability to project municipalities. All data collection occurred in the provinces of Palawan, Occidental Mindoro and Batangas, the latter two of which comprise the “Verde Island Passage” region (Figure 1).

In each site, at least 30 marine resource users were randomly sampled, along with purposive sampling of at least one village official and conservation leader. The individual resource user is the primary unit of analysis for this study. Field survey data was collected by a team of enumerators between July and September 2013.

Table 1: Study sites

PROVINCE	MUNICIPALITY	VILLAGE
Palawan	Roxas (<i>control</i>)	Salvacion Caramay
	San Vicente (<i>control</i>)	Binga Kemden San Isidro
	Dumaran (<i>project</i>)	San Juan Bacao
	Araceli (<i>project</i>)	Tinintinan Lumacad Osmeña
	Taytay (<i>project</i>)	Calawag Debanan Dipla Old Guinlo San Jose
Occidental Mindoro	Paluan (<i>control</i>)	Tubili Lumangbayan
	Nasugbu (<i>control</i>)	Wawa
	Lubang (<i>project</i>)	Vigo Binakas Bagong Sikat Tangal-Tumibo Ninikat ng Pag-asa
	Looc (<i>project</i>)	Bulacan

		Talaotao Bonbon
Batangas	San Juan (<i>project</i>)	Laiya-Aplaya
	Lobo (<i>control</i>)	Solog
	Calatagan (<i>project</i>)	Balibago
	Abra de Ilog (<i>control</i>)	Wawa

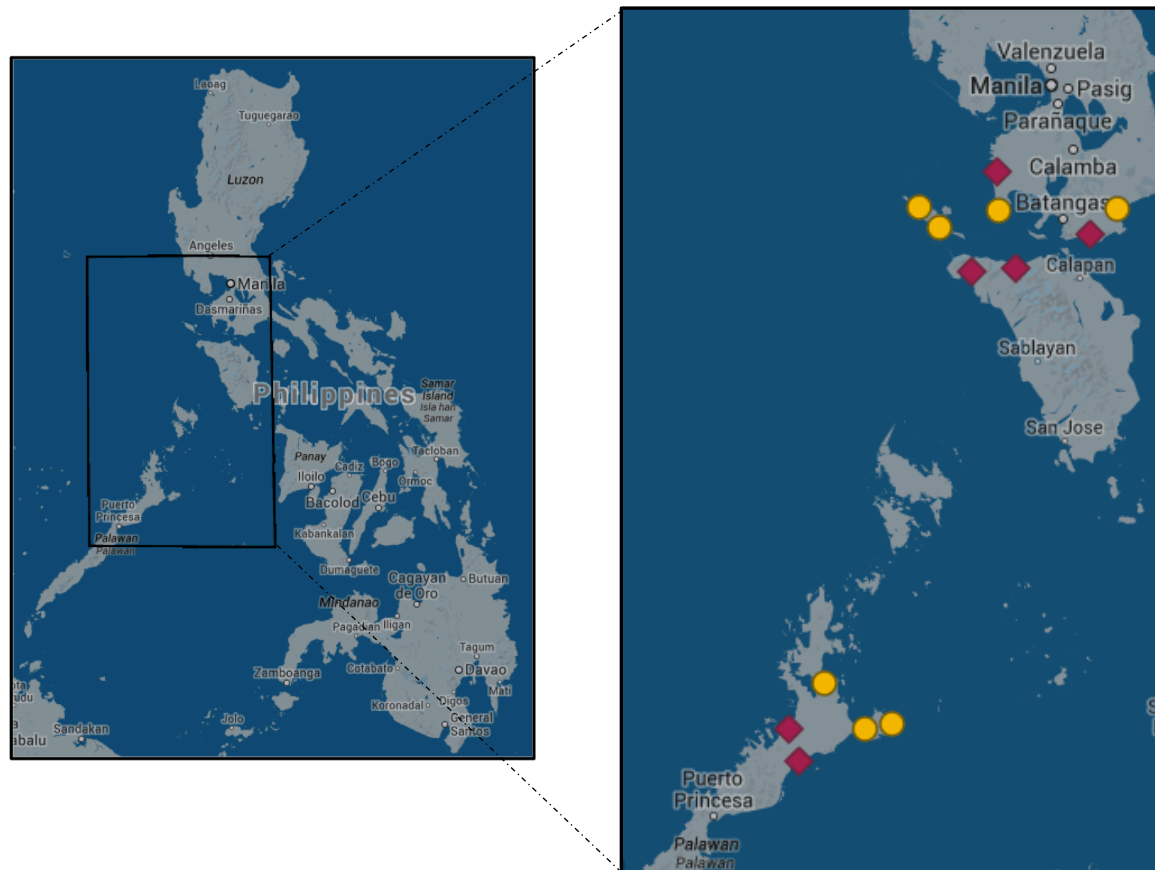


Figure 1: Map of Project municipalities (orange circles) and Control municipalities (red diamonds) within Palawan and the Verde Island Passage in the Philippines.

Survey Design

Social surveys included a variety of questions about perceptions and practices of coastal resource management including climate change, marine protected areas, and fisheries management. Survey and interview questions were informed by document analysis and adapted

from previous studies in the Philippines (Christie et al. 2009; Combest-Friedman et al. 2012; Pollnac & Crawford 2000), all referred to below.

Analytical Methods

Data were analyzed using standard statistical software (SPSS). The dependent variables measuring asset risk perception, livelihood risk perception, appreciation of coastal resources, climate change awareness, observation of climate changes, coastal resource conditions, participation in public outreach activities and mangrove planting, conservation beliefs, closeness to nature, and awareness/adoption of climate change adaptation plans were analyzed relative to gender, among other variables known to influence the dependent variables such as education and occupation (see review above).

These questions were selected out of a larger set of survey questions administered to resource users in each village. They were chosen based on applicability to stated research questions and hypotheses. The questions in the following section measure closeness to nature, relationships with the environment and specific resources uses, risk perception, change awareness and observation, and awareness of existing CCA plans.

Measurement of Dependent Variable Indicators

Closeness to nature

Because positive environmental behaviors tend to entail personal sacrifice for long-term environmental or collective benefit, values that promote social or group benefit are found to motivate environmental behavior more than values that support individual self-benefit (Price et al. 2014). However, individuals who include “nature” in their representation of self are more inclined to pro-environmental attitudes (Davis et al. 2009). Therefore, environmental behaviors

may be linked to the extent to which nature is included in concepts of self (Price et al. 2014). The diagram (Fig. 2) used to determine overlap of self and nature, in this case the marine environment, was adapted from a diagram developed and used previously by Davis et al. (2009).

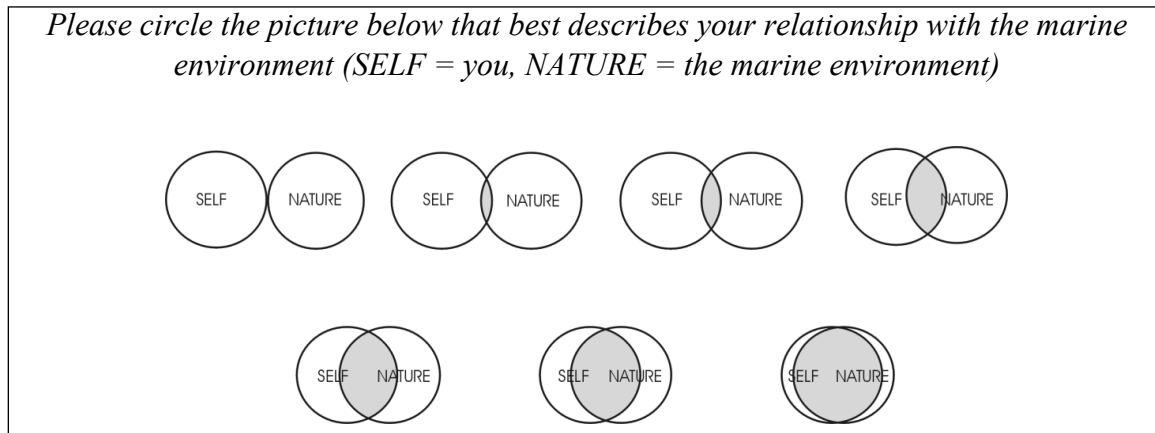


Figure 2 Diagram and instructions used in Resource User survey to identify connection to the marine environment, measured as the inclusion of the ‘marine environment’ in concepts of ‘self.’ The first picture represents no overlap, and the last represents almost complete overlap between self and the marine environment.

Conservation Beliefs

To determine whether gender has an impact on conservation beliefs, the nine following statements were read to respondents, who then determined their degree of agreement according to the following options:

Agree strongly Agree Unsure Disagree Disagree strongly

Answers were ranked from 1 to 5, where 1 implied a negative or ‘incorrect’ conservation believe, and 5 implied a positive or ‘correct’ conservation belief. The conservation belief scale is a sum of the responses to each statement. This scale has been used previously in Indonesia to determine conservation beliefs (Pollnac & Crawford 2000).

1. *We have to take care of the land and the sea or it will not provide for us in the future.*
2. *Fishing would be better if we cleared the coral where the fish hide from us.*
3. *If our community works together we will be able to protect our resources.*
4. *Farming in the village can have an effect on the fish.*
5. *If we throw our garbage on the beach, the ocean takes it away and it causes no harm.*
6. *We do not have to worry about the air and the sea, God will take care of it for us.*
7. *Unless mangroves are protected we will not have any small fish to catch.*
8. *There are so many fish in the ocean that no matter how many we catch, there will always be enough for our needs.*
9. *Human activities do not influence the number of fish in the ocean.*

Risk Perception:

As a way of measuring whether respondents felt that their assets (i.e. house, boat, crops, livestock, land) or livelihoods (i.e. occupation) were at risk, they were asked these two questions:

(1) Do you feel that your assets (house, boat, crops, livestock, land) are presently at risk to the following events:

(2) Do you feel that your livelihood/occupation are presently at risk to the following events:

followed by a list of potential climate change events: *Flooding, coastal erosion, ocean tides, coral bleaching, and overfishing.*

For each event, respondents selected either “yes” or “no.” The climate change hazards (flooding, coastal erosion, ocean tides, coral bleaching) were chosen based on the selection process of Combest-Friedman et al. (2012), which selected hazards based on projected regional climate impacts, initial climate projections for the Philippines, and consideration of relevance to fisherfolk, conservation, CCA planning, and integrated coastal management. “Overfishing” was added as a supplemental hazard to better understand compounded risks of local resource pressure and climate change.

Coastal Resource Conditions

Respondent perceptions of recent changes in ecosystem conditions were gathered using the follow measures, in which changes in coral and mangrove conditions were ranked on a scale from 1 to 5. These questions have been successfully used with other studies in the Philippines (Christie et al. 2009; Pollnac et al. 2001). Fishers are acutely aware of variable environmental conditions and coastal inhabitants act based on perceptions of environmental change (Pollnac 1988).

In the last five years, have coral reef conditions:

1) gotten much worse, 2) a little worse, 3) not changed, 4) improved a little or 5) improved a lot?

In the last five years, have mangrove conditions:

1) gotten much worse, 2) a little worse, 3) not changed, 4) improved a little or 5) Improved a lot?

Coastal Ecosystem Resource Benefits:

To measure how individual resource users valued the benefits of coral reefs and mangrove ecosystems, the following open-ended questions were asked. Each answer mentioned by respondents was circled, while answers that fell outside of given categories were recorded but not analyzed in this study. These questions were selected to reflect resource uses and dependency of respondents.

What value do coral reefs have for you and your community?

- a) Fish nurseries/ supporting fisheries*
- b) Building material*
- c) Protection from waves*
- d) Tourism*
- e) Natural habitat*

What value do mangroves have for you and your community?

- a) Fish nurseries/ supporting fisheries*
- b) Firewood*
- c) Building material*
- d) Protection from flooding and other natural disaster*
- e) Tourism*
- f) Natural habitat*

Climate Change Awareness

To determine climate change awareness, respondents were asked the following question, and responded either yes or no:

Have you heard of climate change or global warming?

Observation of Climate Changes

To determine awareness/observation of changes in weather patterns in his/her village, respondents were asked the following open-ended question. Observed weather changes were circled as they were mentioned.

What changes in weather have you observed in your village over the past thirty years?

- (a) Rainfall*
- (b) Coral Bleaching*
- (c) Temperature*
- (d) Storms/Cyclones*
- (e) Wind*
- (f) Waves*

Participation in public outreach activities

Have you participated in activities that raise public awareness about the condition of the ocean and/or climate change? (i.e., media campaigns, videos, presentations)? (yes or no).

Participation/ awareness of mangrove planting

Is there a mangrove planting program in this area? (yes or no)

Have you been involved in mangrove planting projects? (yes or no ~ Only asked if respondent is aware of mangrove planting program).

Awareness and adoption of individual, community, and municipal CCA plans

Do you, your community, or your municipal government have a plan to cope with climate change events (i.e. flooding, coastal erosion, etc.)?

For each decision-making level (individual, community, and municipal), respondents answer “yes,” “no,” or “don’t know.” At the individual level, a positive answer assumes that a person has adopted an individual plan to cope with climate change. At the community and municipal governance levels, a positive response assumes that a person is aware of a community or municipal CCA plan. At these levels, “don’t know” or “no” answers both imply that the person is unaware of community or municipal plans.

Results and Discussion

Connections with the Marine Environment

While both men and women felt highly connected to the marine environment, women actually felt significantly less connected than men (Mann Whitney U: 93320.5, $p=.009$, $n=918$). The “connection to nature” question asked respondents to circle diagrams with varying degrees of overlap between “self” and “nature,” in which nature was described as the marine environment (Fig. 2 in methods). On a scale of 1-7, where 1 is minimal overlap between self and the marine environment and 7 is the almost complete overlap, women on average scored a 5.91 and men scored 6.19. While the difference in means is not very large, this finding does contradict common assertions that women are “closer to nature” (Arora-Jonsson 2011). This may be explained by the divisions of labor by gender within fishing communities, as discussed below.

Conservation Beliefs

Measurement of “conservation mindedness” using the scale described above found that women did not differ from men with regard to positive conservation attitudes and beliefs concerning marine resources ($p=.548$, $df=767$, $t=0.6$). This goes against the common assumption that women are more ‘virtuous,’ or have more positive environment attitudes than men, and are therefore more inclined or suited to participate in climate change mitigation and adaptation efforts (Arora-Jonsson 2011).

Perceptions of Risk and Environmental Degradation

Men within the study sites were found to be significantly more likely than women to feel that both their assets and livelihoods or occupations are at risk to impacts associated with climate change and coastal resource degradation. In particular, men were significantly more likely than women to feel that their assets (house, property, etc.) are at risk due to coral bleaching and overfishing. Men were also significantly more likely than women to feel that their livelihoods or occupations are at risk to coral bleaching and overfishing. However, gender had no influence on whether individuals felt at risk due to flooding, coastal erosion, or ocean tides (Table 2).

Interestingly, women and men were equally likely to report changes within the past 5 years in conditions of coral reefs ($U: 4280$, $p=.22$), mangroves ($U:5263.5$, $p=.369$) and fisheries ($U: 5633.5$, $p=.832$). So, even though men felt at risk to overfishing, women were just as likely to report deteriorating conditions of fisheries and coral reefs.

Table 2: Influence of gender on perception of asset and livelihood risks.

Asset Risk	% Men	% Women	Chi Square	df	p-value	n	Phi
Coral Bleaching	72.3	62.7	8.712	1	0.003	858	-0.101
Overfishing	70.7	59.4	12.073	1	0.001	882	-0.117
Flooding	71.8	69.6	0.492	1	0.492	907	-0.023
Coastal Erosion	74.9	75.6	0.057	1	0.811	903	0.008
Ocean Tides	81.1	79.9	0.213	1	0.671	913	-0.015
Livelihood Risk							
Coral Bleaching	88.4	81.6	8.039	1	0.005	878	-0.096
Overfishing	81.9	75.3	5.555	1	0.036	894	-0.079
Flooding	89.0	87.0	0.887	1	0.346	913	-0.031
Coastal Erosion	81.5	81.0	0.040	1	0.841	905	-0.007
Ocean Tides	87.5	86.2	0.309	1	0.578	914	-0.018

These results contradict commonly cited findings that women are more sensitive than men to ecological risk. Bord & O'Connor (1997) found that women evaluate the risk of climate change as more serious, and are more likely to take action to address the problem. In this sense, men are considered to be more risk tolerant and less likely to act voluntarily to abate risk related to climate change. However, Weiner et al. (2013) found that in environmentally stressed communities, the gender differences converge and both genders demonstrate similar levels of tolerance to risk. Furthermore, Combest-Friedman et al. (2012) found that male urban laborers in one site in the Philippines were more likely to feel at risk to multiple hazards, while women were more likely to perceive only one hazard to assets and livelihoods. In this case, the heightened sensitivity of males to risk could again be explained by gender differences in livelihoods and resource dependency in Filipino coastal communities, as discussed below.

Perceived Benefits of Coastal Ecosystems

Women were significantly more likely than men to list “firewood” and “building materials” as a benefit of mangroves in their community. On the other hand, men were significantly more likely than women to cite mangroves as being beneficial to the community as

nurseries for fisheries (Table 3). This is logical, since women tend to be more commonly involved in gathering mangrove wood (Siason 1996), and men are more likely to identify as fisherfolk (Table 3). Similarly, men are more likely than women to say that coral reefs benefit the community as fish nurseries and for tourism (Table 3). Yet again, this finding brings attention to the different ways men and women interact with the marine environment on a daily basis, which will be discussed in detail below.

Table 3: Percentages of men and women that reported certain benefits of mangrove and coral reef ecosystems.

Mangrove Benefits	% Men	% Women	Chi-Square	Df	p-value	n
Firewood	9.9	14.5	4.250	1	0.039	852
Building Materials	18.3	23.5	3.331	1	0.042*	852
Fish Nurseries	50.1	42.3	4.989	1	0.026	852
Coral Reef Benefits						
Fish Nurseries	74.0	59.6	19.67	1	<.001	852
Tourism	83.3	16.7	8.73	1	.003	852

* One-tailed test, based on expectation that women would value mangroves as building materials due to traditional role of gathering wood.

Mangrove planting and restoration is commonly included in CCA planning strategies, partially because of the protection they provide from flooding, erosion, and sea level rise. Women and men are equally likely to be aware of mangrove planting projects (Chi Square: .006, df=1, p=.936, n=878) and to participate in them (Chi Square: .000, df=1, p=.990, n=374). 37.7% (both men and women) have participated in mangrove planting. While some studies report that women are less likely to have participated in trainings and community meetings due to time burdens, this is consistent with Siason's (2006) observation that women were more likely to attend community meetings in one case in the Philippines.

Some studies have found that assumptions about women's connection to nature gives women added responsibility in climate change mitigation projects such as tree planting, adding

responsibility to already burdened schedules without necessarily empowering women in climate change decision making (Arora-Jonsson 2011). These results show that women and men in study sites are equally sharing the responsibility (or burden) of mangrove planting, and also that women are not being excluded from mangrove planting projects, which are often in conjunction with awareness-raising activities.

However, only 20.9% of all respondents listed “protection” as a value of mangroves, and even fewer (3.9%) listed this as a value of coral reefs (Figure 3). In both cases, gender did not influence whether an individual valued mangroves and coral reefs for protection (Mangroves: Chi Square: 1.089, df=1, p=.297, n=852; Coral Reefs: Chi Square: .378, df=1, p=.539, n=851). It also demonstrates that perceived values of mangroves and coral reefs are less likely to be gendered if the value extends beyond directly supporting livelihoods.

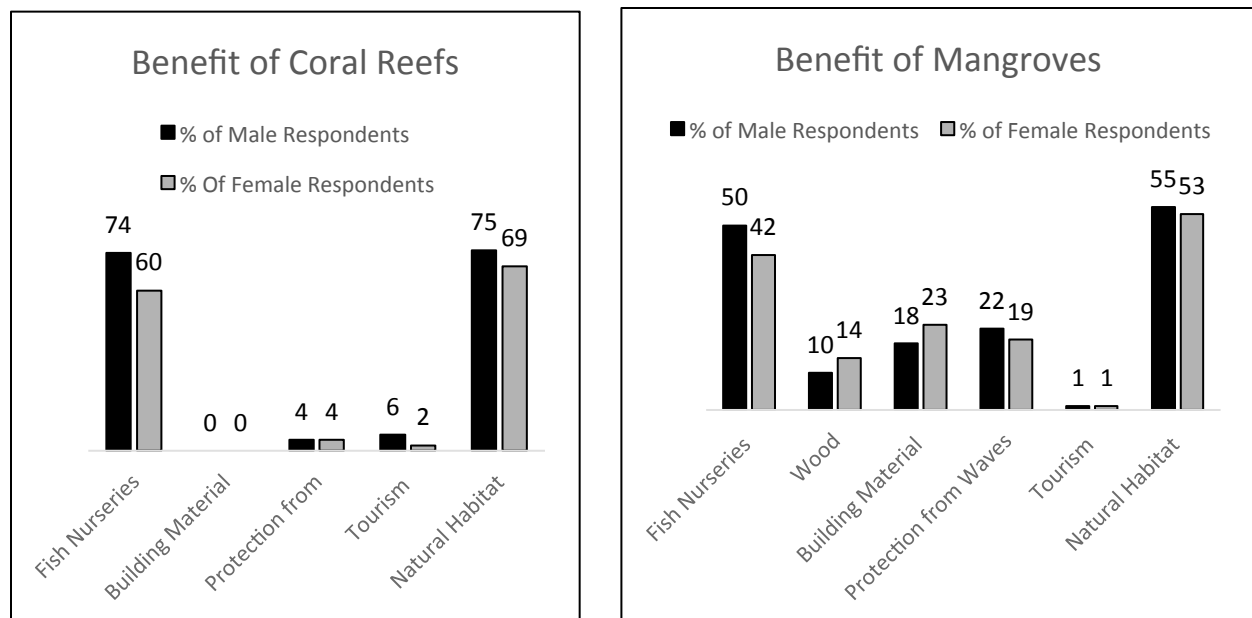


Figure 3: Percentages of men and women that reported receiving certain benefits from coral reef and mangrove ecosystems.

Although the women in our sample did not feel significantly more connected to nature or environmentally conscious, our results demonstrated that women are more likely than men to

report changes in certain weather patterns within the last 30 years. In particular, women are statistically significantly more likely to note changes in temperature patterns and rainfall patterns (Table 4). Observation of changes or impacts associated with climate change is one motivator of climate change adaptation and action. Although women are statistically more likely to report changes in some weather patterns, the practical significance as it relates to motivation for CCA may be limited.

Table 4: Percentages of men and women that reported changes in each weather pattern type within the past 30 years.

	% Men	% Women	Chi-Square	df	p-value	n
Temperature	33.1	40.9	5.704	1	0.017	898
Rainfall	24.2	32.5	7.564	1	0.006	897
Storms	31.9	37.5	2.952	1	0.086	897

Gender Roles and Relationships to the Marine Environment

The finding that men in the study sites have a slightly higher connection than women to the marine environment goes against assumptions about women being “closer to nature.” Similarly, men and women were equally likely to have positive conservation beliefs, contradicting the concept of women as environmentally virtuous. Furthermore, results show that men within these coastal communities had a higher sensitivity to risk from overfishing and coral bleaching. This is unexpected, in light of studies reporting that women are generally less tolerant to environmental risk (Bord & O’Connor 1997).

However, these relationships can be explained by the context-specific ways in which men and women relate to marine and coastal resources. Both the heightened sensitivity of males to risk and greater connection to the marine environment can be explained by gender differences in livelihoods and resource dependency in Filipino coastal communities. Women in the Philippines

are more heavily involved in pre- and post-harvest activities as well as gleaning in near-shore areas (Eisma-Osorio et al. 2012). While men in small-scale fisheries spend more time fishing offshore, women take on added responsibilities of managing household activities (Pollnac 1988; Siason 2000). In this way, the dependence of women on the marine environment would be less direct than men in the same community.

The distinct gender division of roles is corroborated by our results, which show that men were significantly more likely than women to identify as fisherfolk and as fisher/farmers. Women were significantly more likely than men to identify as gleaners, farmers, and seaweed farmers (Table 5). Among women, the most common occupation was ‘gleaner,’ followed by ‘housewife’ and ‘fisherfolk’ (Figure 4), when each respondent was free to report multiple occupations (i.e., occupations are not exclusive).

Table 5: Chi square results demonstrating the percentages of men and women involved in occupations where there was a significant difference between genders.

Occupation	% Male	% Female	Chi-Square	df	p-value
Fisherfolk	66.9	30.1	120.59	1	< .001
Fisher/Farmer	23.3	9.2	30.634	1	< .001
Gleaning	3.9	36.7	166.486	1	< .001
Farmer	3.9	9.0	10.222	1	.001
Seaweed Farmer	3.1	6.9	6.80	1	.009

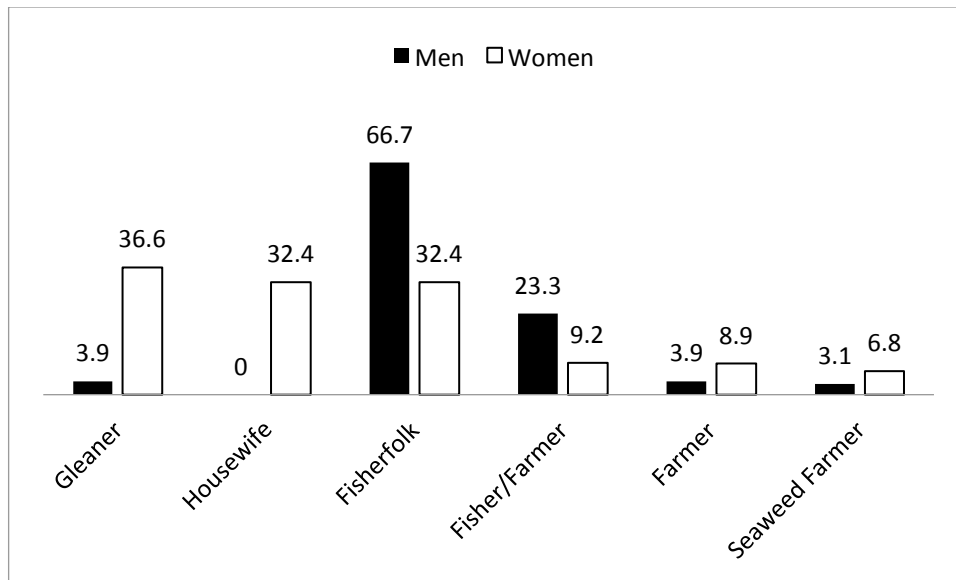


Figure 4: The six most common livelihoods reported by women, and the percentages of men and women who reported each one.

The relatively high involvement of men in fishing, compared with women's greater role in household responsibilities and gleaning, reflects a difference in the way men and women interact with the marine environment on a daily basis. This relationship can help to explain the reported perception of risk. Men, who are more directly and exclusively active in fishing activity, would logically perceive a direct reliance on coastal resources for livelihoods and to maintain assets. Coral bleaching and overfishing are both specific to fisheries, while other impacts such as flooding, erosion, and encroaching tides are less likely to have a direct impact on fish catch. Men and women were likely to perceive equally the risk that these three other factors pose to both assets and livelihoods.

This finding is supported by Combest-Friedman et al. (2012), who found that differences in resource dependency can affect risk perception. Fishing households in one municipality of the Philippines were more likely to feel that livelihoods were at risk to impacts of climate change (flooding, coastal erosion, and sea level rise) than urban households, reinforcing the positive

relationships between resource dependency and livelihood risk that has been found in other studies.

The idea that gendered livelihood differences underlie the disparity in risk perception between men and women is supported by further examining the relationship between occupation and risk perception within the study sample. Individuals who identified as fisherfolk were significantly more likely to feel that their assets are at risk to coral bleaching, overfishing and ocean tides. Similarly, fisherfolk were more likely to feel that their livelihoods were at risk to coral bleaching, overfishing and ocean tides. For both livelihoods and assets, identifying as fisherfolk had no significant influence on perceptions of risk to both erosion and flooding (Table 6). This demonstrates the clear link between livelihoods and perceptions of risks related to resource health. Compounded with the recognition that men and women have distinct roles in small-scale fisheries, it demonstrates a context-specific rationale for the gendered differences in risk perception.

The different ways in which men and women value the benefits received from coastal resources also reflects gender-divided roles. In this case, women are more likely to note the benefits gained from the uses of mangroves that they directly relate to on a daily basis (fuelwood and building materials), while men mainly refer to benefits of mangroves as nurseries for fisheries. Again, dissimilar benefits that men and women receive from coastal resources demonstrate the different ways in which men and women interact with the environment, and therefore have implications for how climate change adaptation will impact them.

Table 6: Chi Square results showing the percentages of fisherfolk and non-fisherfolk who felt their assets and livelihoods were at risk due to certain threats.

Asset Risk	% Fisherfolk	% Non-Fisherfolk	Chi Square	df	P-value	n	Phi
Coral Bleaching	75.8%	60.8%	22.306	1	<.001	861	0.161
Overfishing	74.9%	56.7%	32.779	1	<.001	886	0.192
Flooding	70.9%	71.2%	0.014	1	.907	911	-.004
Coastal Erosion	75.7%	74.4%	.633	1	.633	907	.016
Ocean Tides	85.6%	75.7%	14.614	1	<.001	917	.126
Livelihood Risk							
Coral Bleaching	91.9%	79.0%	30.143	1	<.001	881	0.185
Overfishing	86.5	71.5	30.905	1	<.001	898	0.186
Flooding	88.2%	88.5%	0.028	1	.868	917	-.005
Coastal Erosion	81.1%	81.7%	0.056	1	0.814	909	0.008
Ocean Tides	92.0	82.0	20.471	1	<.001	918	0.149

Climate Change Training and Awareness

Awareness of climate change impacts is considered to be an important element of adaptive capacity and an enabler of climate change adaptation. Public outreach and education activities are common components of climate change adaptation toolkits that seek to improve local adaptive capacity through knowledge and awareness (Lata and Nunn 2012).

Our data show that men (14.7%) are statistically significantly more likely than women (9.3%) to have participated in public awareness activities related to the ocean and climate change (Chi square: 6.027, df=1, p=.014, n=913). However, when the sites were split into CTSP project and control sites, this difference was only true for control sites (Chi Square: 6.081, df=1, p=.014, n=320), where only 9.2% of women attended compared to 19.9% of men. In CTSP project sites, there was no significant difference between genders in attendance to public awareness activities (Chi Square: .663, df=1, p=.415, p=593), where 11.4% of men attended compared to 9.3% of women. This would indicate that the CTSP partners, CI and WWF, were effective in reaching out to both men and women for public awareness activities to ensure equal participation. It may suggest that CTSP public awareness activities were both intentionally and successfully gender

inclusive. However, in both project and control sites, 9.3% of women attended trainings while control sites demonstrated a difference because of higher percentage of attendance from by males. It is unclear why there is less male attendance in project sites.

Even though men throughout all sites were significantly more likely to participate in public awareness activities, they were not significantly more likely to be aware of climate change (Chi Square: 2.406, $df=1$, $p=.121$, $n=917$). In fact, in CTSP project sites, women were significantly more likely than men to be aware of climate change (Chi Square: 7.5, $df=1$, $p=.006$, $n=594$, 55.5% of men, in contrast to 66.5% of women). In control sites, there is no statistically significant difference, but it tends towards men being more likely to be aware of climate change. (Chi square: 1.8, $df=1$, $p=.179$, $n=323$, 59.6% of men, 51.8% of women). Climate change awareness overall was not statistically significantly different between project sites and control sites (Chi Square: .586, $df=1$, $p=.444$, $n=895$, 59.7% awareness in Project sites versus 57.1% in control sites), implying that CTSP activity did not necessarily have an impact on increasing overall climate change awareness in the Philippines.

Furthermore, in all sites, there is no gender difference in participation in Climate Change trainings (Chi Square: .110, $df=1$, $p=.740$, $n=917$). This is somewhat surprising, based on assertions that women are less likely to be involved in technical extension in fisheries (Siason 2000).

Climate Change Adaptation Plans

Women were statistically significantly more likely than men to be aware of a municipal CCA plan (96.7% of women, versus 93.8% of men, Chi Square: 2.848, $df=1$, $p=.045$ (one-tailed), $\Phi=.067$). Women are also significantly more likely than men to be aware of a community CCA plan (90.8% of women, versus 86.1% of men, Chi Square: 3.175, $df=1$, $p=.038$,

Phi=.072 (one tailed)). Men and women were equally likely to have adopted an individual plan to cope with the impacts of climate change (61.4% of men, 61.0% of women, Chi Square: 0.277, df=1, p=0.599, Phi=0.018, n=869).

These findings support the hypothesis that women would be more aware of climate change adaptation plans. Although some sources report that women do not have time to attend meetings, women in fishing communities spend more time devoted to managing the household activities while men fish offshore for long periods of time (Pollnac 1988). It is logical then that they would be more involved in community activities. This is supported by one study suggesting that women are more likely to attend community meetings in the Philippines (Siason 2000). Awareness of a municipal plan could also be linked to the marketing of fish in municipal markets, which is primarily the job of women while men are responsible for offshore fishing. Therefore, in a fishing village women may be more likely to have access to information disseminated in town and municipal centers. In fact, individuals residing in villages that market marine resource products at the municipal level are significantly more likely to be aware of a municipal CCA plan ($p=.026$, $n=29$). This would imply that marketing fish is somehow connected to awareness of CCA plans, which has implications for women because of their dominant role in fish markets.

Conclusions and Recommendations

Implications of Environmental Beliefs for Climate Change Adaptation

Certain climate change adaptation strategies appeal to assumptions about women's connections to nature and conservation beliefs. Generalizations such as these risk ignoring women's actual needs and interests. In some cases, assumptions about positive relationships with

nature and conservation attitudes contribute to policies that increase the responsibility of women in environmental initiatives without corresponding rewards (Arora-Jonsson 2011; Brown 2011).

Within the context of these coastal villages of the Philippines, assumptions that women would be more connected to nature and have more positive conservation beliefs were not supported by observations. In fact, female informants were less likely to feel connected to the marine environment. The findings from this study bring to light data that goes against common discourse about women's inherent closeness to nature and conservation mindedness. Presuming that women are more inclined to include "self" in their conceptions of the marine environment, and therefore support more 'selfless' conservation attitudes, could lead to CCA that ignores important contextual realities. Therefore, it is important to recognize specific contexts that challenge these assumptions, and to incorporate valid information about women's needs, beliefs, attitudes, and contextual relationship with natural marine and coastal resources in "gender mainstreaming" of national, municipal, and local CCA plans.

Tree planting is an adaptation and conservation activity that has been found to disproportionately rely on the labor of women based on an impression of their inherent 'conservation-mindedness' (Brown 2011). However, in these sites, men and women were equally likely to participate in mangrove planting. This contradicts other findings that conservation initiatives rely heavily on women's participation. It also has positive implications for the equal inclusion of women in climate change awareness and training, since mangrove planting is often offered in conjunction with outreach and planning activities.

Resource Dependency and Sensitivity to Risk

Perceptions of risk and resource dependency are both foundational to arguments about women and climate change impacts. In coastal communities in the Philippines, men and women

alike are heavily dependent on natural resources (SCTR 2011). However, there were distinct gendered differences in perceptions of risks that threaten fishery resources. Specifically, men were more sensitive to risks to both assets and livelihoods due to overfishing and coral bleaching. These results can be largely explained by the roles that women have in these fishing communities of the Philippines, and how women interact with the marine environment on a daily basis. Therefore, it is important to recognize that gendered roles impact how women relate to marine resources, differences in specific types of resource dependency, and how climate change adaptation must consider these roles.

Women's relatively high tolerance for environmental risk challenges assumptions about women's vulnerability and heightened dependency on increasingly degraded natural resources. The argument that climate change will exacerbate vulnerability of women and increase pre-existing inequalities is partially based on claims that women in developing countries are more reliant than men on natural resources for livelihoods and well-being, and that increasing environmental degradation due to climate change will disproportionately increase women's workload and vulnerability (Brown 2011; Nelson et al. 2002). In our sample, women are less likely to identify as fisherfolk and are less sensitive to climate risks that are specific to fishery production (coral bleaching, overfishing). Rather than generalize that women are more dependent on natural resources, it is important to establish which resources women actually rely upon, and how they utilize them. Special attention must be paid to avoid the generalizations about vulnerability and resource dependency that often inform gender mainstreaming in CCA strategies.

The different ways in which men and women value mangroves could have implications in climate change adaptation policies that prohibit mangrove deforestation. While men's value of

mangroves is enhanced by preservation, women may be disadvantaged by no longer having access to mangroves to extract wood for cooking and building. In the Philippines, cutting of mangroves is common despite being illegal (Primavera & Esteban 2008). CCA policy or toolkits that prohibit mangrove cutting should target women in outreach and education to build awareness of the importance of mangroves as nurseries that support gleaning. Also, women who depend on extractive uses of mangroves may benefit from targeted alternative livelihoods, or even alternative sources of firewood, in response to restrictions to mangrove extraction.

Furthermore, risk perception is an important factor for motivating climate change adaptation (Adger et al. 2009; Grothmann & Patt 2005) and women are often thought to be more likely to accept climate change adaptation plans because they are less tolerant of environmental risk (Bord & O'Connor 1997; O'Connor et al. 1999). This study demonstrated that women surveyed generally felt less risk (were more tolerant) than men, which has important implications for adoption of CCA plans. This finding is corroborated by findings from Combest-Friedman et al. (2012) that men perceived more hazards to assets and livelihoods than women did.

Each of these findings about risk perception and gendered relationships with the marine environment reiterate the pitfalls of relying on assumptions or generalizations as the basis of women's involvement and expected responses to CCA. It also demonstrates the potential for maladaptation from CCA that mainstreams gender without explicit recognition of context.

Climate Change and Adaptation Plan Awareness

Public outreach and education activities are common components of climate change adaptation toolkits that seek to improve local adaptive capacity through knowledge and awareness (Lata and Nunn 2012). In CTSP Project sites, women and men were equally likely to

attend public outreach activities related to climate change and the marine environment, while in Control sites men were more likely to attend. Women were also more likely to be aware of climate change in project sites. This may signal an effective, targeted approach to involving women in climate change awareness activities in CTSP project sites.

Throughout all study sites, men and women were equally likely to attend public outreach activities. Despite equal participation, women were overall more likely than men to be aware of both community and municipal CCA plans. This awareness could be linked to the daily responsibilities of women in fishing communities, where women may be more involved in land-based activities while men take on offshore fishing responsibilities. The relationship between marketing fish at municipal levels and corresponding awareness of CCA plans suggests that some communication and learning about CCA may occur through the fish marketing process. However, this is just one of many factors that may play into the dynamics of CCA planning. A better understanding of how information about CCA plans is conveyed, and the multiple avenues that groups receive information, would be beneficial. And while awareness does not necessarily imply influence in the process, women's heightened awareness of CCA plans has interesting implications for their involvement in CCA planning processes.

Gender Mainstreaming

Philippines national policy documents include language and indicators that support and emphasize the targeted inclusion of women in climate change adaptation outreach and planning. CCA vulnerability assessment and planning documents produced by USCTI and implemented through CTSP also include provisions for gender mainstreaming. This is an important progress and is significant as a step forward for considerations of gender in CCA. However, language about gender inclusion does not imply action. Further research into the inclusion of women as

climate change decision makers at the local, national, and regional level in the Philippines would offer valuable insight.

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