

Risks, Vulnerabilities and Adaptations: Exploring the Impact of Salinity Intrusion on Women in Coastal Bangladesh

Shahana Afrin Dina¹, Dilafroze Khanam², Mohammad Mufajjal Sarwar³

Abstract

The article sheds light on the salinity-induced risks and vulnerabilities of women and adolescent girls living in coastal areas of Bangladesh. Moreover, it critically analyzes the adaptation actions of coastal women and teenage girls to salinity intrusion and connects the concepts to climate governance. The paper uses secondary textual analysis as its methodology, eco-feminism, and political ecology theory as the theoretical framework and thematic analysis strategy for secondary data analysis. The article incorporates Alston's idea of radical adaptation to suggest placing gender equality as the core component of risk and vulnerability assessment of salinity intrusion, GO- NGO adaptation policies, and practices against salinization. Furthermore, this paper suggests taking context-specific and gendering-specific adaptation policies to increase the resilience power of coastal saline-prone marginal women and adolescent girls.

Key terms: Salinity, risk, vulnerability, adaptation, gender roles, climate governance.

Introduction

Salinity intrusion is a bitter truth and harsh reality for coastal women in Bangladesh. The direct risks and vulnerabilities of salinity connected with coastal women are intensified when socio-political, economic and religious issues are blended with them. So, there exists a strong bond among gender, socio-economical, environmental, and sustainability issues. To make the coastal marginalized women's voices louder, we have to bring gender issues to the discussion of salinity intrusion,

-
1. Lecturer, Department of Science and Humanities, Bangabandhu Sheikh Mujibur Rahman Aviation and Aerospace University, Bangladesh.
 2. Associate Professor, Department of Sociology, University of Barishal.
 3. Assistant Professor, Department of English, Barishal Govt. Women's College, Barishal.

DOI:

adaptation policies and actions, risk, vulnerability, mitigation, and resilience analysis. This paper efforts to present a critical analysis of the risks, vulnerabilities, and adaptation actions taken by the coastal women, GO, and NGOs to mitigate climate uncertainties.

What is meant by salinity? Why and how is salinity intrusion increasing in Coastal Bangladesh? Salinity intrusion in Bangladesh is two-dimensional- soil and water salinity. Salinity means the saltiness of coastal soil as well as water, simply stated as the extreme quantity of salt or sodium the coastal soil and water contains. The process of salinity intrusion emerges from natural calamities like cyclones, tornadoes, storm surges, and tidal inundation, the coast's topographical location, excessive groundwater abstraction, and most importantly, sea level rise (Gobeshona, n.d.; Sarwar, 2005; Rahman et al., 2019). Salinity irretrievably contaminates waterways, aquifers, and soils (Williams, 2001; Ketabchi, 2016, cited in Rahman et al., 2019). Bangladesh's natural disaster negatively affects the coastal ecology (Saroar, 2015; Alston, 2015) and the social environment (Khanam, 2019).

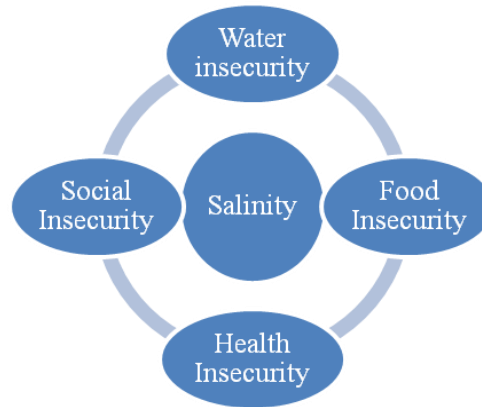
Background of The Study

Bangladesh stands at the seventh position among countries having the most risk of extreme weather conditions and the threats of climate-related natural tragedies (Global Climate Risk Index, 2020) and the report also shows that Bangladesh remains in third position among other countries that are most hit by various natural disasters yearly. Moreover, Bangladesh has 715 km long coastal areas comprising 19 districts and 31.8 million inhabitants (BBS, 2010), and the area is considered the most climate-vulnerable part of the country (Kabir et al., 2016). In coastal areas, especially Sea Level Rise (SLR), risks like soil erosion, reduced agricultural production, salinity intrusion, floods, destruction of traditional fish sources, loss of biodiversity, etc., are widespread (Sarwar, 2005). In several reports, the Intergovernmental Panel on Climate Change (IPCC) warned that the coastal zone of Bangladesh would experience numerous SLR-induced challenges, including salinity intrusion (IPCC, 2001, 2007, cited in Saroar, 2015).

In coastal regions of Bangladesh, rapid increases in areas contaminated by salt have been a significant problem, influenced by both climatic factors, such as geography and land formation, and non-climatic factors, like shrimp farming. These issues have created substantial obstacles for communities dependent on natural resources, threatening their overall well-being and way of life (Saroar, 2015). According to Khanam (2019), the influence of saline water pervades the daily existence of every individual in these areas. Furthermore, salinity disrupts the fulfillment of fundamental human needs including food, housing, clothing, health, and

education, essentially affecting every aspect of the coastal populations' lives and means of survival (Rahman, 2009). Salinity in these coastal areas leads to various forms of instability, encompassing water, food, health and sanitation, and societal challenges.

Figure 1: Nexus Among the Insecurities Created by The Salinity Intrusion (Source: Khanam and Dina, 2020)



Water insecurity forces the coastline people to suffer extremely from the non-saline drinking water crisis (Dasgupta, 2017), so they have to purchase drinking water that increases their poverty (Bagri, 2017). Moreover, salinity negatively affects the coastal people's food security (Ahsan, 2010; Alston, 2015) and creates various health complexities (Scheelbeek et al., 2017; Nahian et al., 2018), especially for women. Again, most social insecurities are related to coastal women as salinity has gender dimensions where women are the key vulnerable section of the problem (Rahman, 2009; Alstone, 2015). Furthermore, salinity-induced coastal women's vulnerability includes work burdens, malnutrition, health and hygiene crisis, sexual harassment, domestic violence, mental stress, disease burden, the victim of child marriage, low educational attainment, and wage discrimination (Khanam & Dina, 2020; Zaman, 2017; Habiba et al., 2014; WaterAid UK, n.d.; Alston, 2015; Rahman, 2009).

Moreover, the women living in the coastal areas are the most climate-vulnerable populace of the country (Alston, 2015) but GO and NGOs do not have any specific adaptation policies for them. However, most of the studies related to salinity intrusion explored the vulnerabilities of coastal women in terms of their health and water crisis issues as well as adaptation techniques. No study makes the nexus between risks, vulnerability, and adaptation techniques of coastal women to salinity intrusion and relates climate governance with it. So, this study is a

significant and unique one to show the holistic picture of salinity intrusion and gender issues in coastal areas of Bangladesh.

Aims of the Study

The study sets out with a comprehensive three-pronged objective: Initially, to evaluate the threat that coastal women face from the encroachment of salt into soil and water sources, a phenomenon exacerbated by climate change. The second aim focuses on delineating the specific vulnerabilities and repercussions that salinity intrusion has on the socio-economic stability and well-being of women in the coastal regions of Bangladesh. Lastly, the research intends to map out and analyze the array of adaptation strategies that these women, along with government and non-government organizations, have developed and implemented to counteract and mitigate the adverse effects of salinity intrusion, with the ultimate goal of securing their livelihoods and enhancing their resilience.

Research Questions

- i). What are the primary risks and vulnerabilities faced by coastal women due to salinity intrusion, and what adaptation strategies do they employ to mitigate these challenges?
- ii). What social protection policies do governments and NGOs implement to address climate change risks and vulnerabilities for coastal women, how are these policies linked to climate governance, what drives these risks and vulnerabilities, and how do these factors shape adaptation actions?

Structure of the Paper

The first part of the paper shows the present salinity situation in Bangladesh, a brief presentation of the case, the aim of the study, related concepts and theories, and methodological considerations. In the second part of the paper, the authors analyze the risks and vulnerabilities of coastal women due to salinity intrusion and their current adaptation strategies. In the final part, authors relate the third aim of this paper to the concept of climate governance and show how climate governance is related to it. Moreover, the paper also presents a critical analysis of the key causes of salinity-induced risks and vulnerabilities of coastal women with a special focus on the structural drivers as well as institutional attempts of those risks and vulnerabilities. Again, a brief critical discussion on the adaptation policies and coastal women's position on those policies with a distinctive focus on Enarson's view of the feminist political ecology approach also reveals here. Finally, the paper concludes by accepting Alston's concept of "radical adaptation" and narrowing

down the concept to put gender equality at the focus of risk and vulnerability assessment and adaptation strategies of salinity intrusion.

Methodology

The paper is developed by using 'secondary data analyses' of several books and book chapters, research reports as well as journal articles as the source of my secondary data. For example, the Global Climate Risk Index, the 2020 WaterAid Bangladesh End-line study report on Climate Resilience 2014, UNICEF's report on better access to safe drinking water 2013, the report of UNDP, The Asia Foundation's report on a situation analysis of climate change adaptation initiatives in Bangladesh 2012, etc. were analyzed to identify the risks and vulnerabilities as well as to bridge the gaps between existing adaptation strategies and the current condition of coastal Bangladesh.

Theoretical Concepts

For this paper, the authors analyze the concept of risk, vulnerability, and adaptation through the gender lens to comprehend the current situation of coastal women regarding climate change. Here gender refers to the social processes, practices, and relations that form our identity as men or women at a certain time or place. Enarson (2012) notes that gender is an indication of differences and inequalities; gender is also relational; it is constructed by society, it exists at individual as well as institutional levels, and also gender is protected through our social practices.

In the context of climate change, risk is identified as the potential for significant losses - affecting lives, health, livelihoods, assets, and services - that a community or society may face within a specific future timeframe (UNISDR, 2009). It's noted that disaster risk disproportionately affects those who are poorest and most marginalized within a community (UNDP, n.d.). Research indicates that women and girls are especially vulnerable to risks associated with climate-related disasters, facing higher instances of death, illness, and economic losses to their means of subsistence (UNDP, n.d.). For instance, during the catastrophic cyclone and flood that hit Bangladesh in 1991, the mortality rate among women was nearly five times higher than that of men (Rohr, 2005). Additionally, it has been found that women and children are fourteen times more likely to die in a disaster compared to men (UNDP, n.d.).

Moreover, vulnerability, as defined by Engle (2011), is the state of being prone to damage or harm, or alternatively, it represents one's ability to foresee, endure, resist, and bounce back from the effects of a natural disaster (Kelly & Adger, 2009). In essence, vulnerability signifies the collective factors that result in an insufficient capacity to effectively respond to climate change-related incidents. Within the sphere of climate

change, those most at risk are identified by various markers of socio-economic disadvantage including gender, poverty, lack of education, reduced access to services, limited employment opportunities, among others (Alston, 2015). Consequently, in scenarios of disaster, the vulnerabilities of women are exacerbated by prevailing gender disparities, such as restricted rights to land and resources, minimal involvement in decision-making, constrained mobility, absence of income opportunities, the weight of traditional gender roles, and policies that overlook gender-specific needs (Alston, 2015).

In addition, the concept of adaptation refers to “the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (UNISDR, 2009, p: 4). Simply, adaptive capacity means the ability of people or communities to cope with the adversities of hazards at hand. Studies have shown that the poor and women have the less adaptive capacity, so they are less likely to survive and recuperate from disaster events (UNDP, n. d). Disaster mortality rates are much higher among women and girls than men due to gendered differences in capability to cope with climate events as well as insufficient access to early warnings and disaster information (Rohr, 2005; UNDP, n. d). For example, women accounted for 91 percent of fatalities caused by the 1991 cyclone in Bangladesh (UNDP, n. d).

So, to understand the greater risk, vulnerabilities, and adaptive capacity of women regarding climate change, feminist analysis is a key requirement. For example, questions like why and how are women more vulnerable to climate risk? What are the dynamics that contour their responses to climate change as well as to the adaptation strategies? How does the socio-cultural context of women, poverty, and family structures influence their capability to respond to climate change challenges with adaptation? For this paper, eco-feminist theory is used because the approach argues that women’s activities have been overlooked for their non-monetary nature in capitalist society. Moreover, the authors also want to focus on feminist political ecology theory because the approach puts women at the center of environmental issues and adaptive activities.

Eco-feminists argue that women have a close relationship with nature than men, and that view links the concept of “dominance of nature” to the concept of “dominance of women” (Alston, 2015, p.18). Eco-feminist Shiva (1993) shows that the oppression of women is interlinked with nature, claiming that the subsistence activities of women are ignored due to their non-monetary nature in a capitalist society. So, eco-feminism views a nexus among patriarchy, capitalism, and colonialism, and they

are the oppressive factors in the case of women's subordination. Moreover, Shiva (1995) argues that rural women are the key contributors to life as well as they are the rightful conservers of their nature. Besides, women have a greater inclination to care for nature than men because women's survival techniques as the key food producers depend on it (Sandilands, 2008); as Shiva (2009, p.19) said, "from seed to table, the food chain is gendered." Furthermore, women are the main gatherers of drinking water, food, fuel, and fodder that are threatened by climate change and women are very poorly represented in conservation projects (Resurreccion, 2013). However, evidence shows that "women are more likely to perform effectively and efficiently in natural resource management by preserving biodiversity, reducing greenhouse gas emission, and increasing food production than men and helps to reduce vulnerability owing to climate change" (Corcoran- Nantes and Roy, 2018, p.165). So, the failure to integrate women's experiences and knowledge into natural resource management has directed toward environmental degradation and loss of biodiversity.

In addition, feminist political ecology suggests placing women at the center of environmental issues such as food and water security, adaptation and resilient strategies as well as environmental sustainability because evidence shows that across the world women protest against various environmental challenges. Moreover, feminist political ecology claims that gender discrimination, environmental degradation, disaster risk, and vulnerability are interconnected, where ignoring the gender risks will extend the environmental degradation and reduce the adaptive capacities (Enarson, 2012). So, it is evident that gendered analysis of climate change challenges is a critical need to ensure the survival of people under environmental threats across the globe.

Analysis of the Secondary Data

a). Risk Analysis

Climate change-induced sea level rise creates salinity impacts in coastal areas in three ways like i). Salinizing surface water ii). Salinizing groundwater, and iii). Salinizing soil (Huq et al., 1998), and these three-dimensional negative impacts risk the coastal people conjointly and severely. In a broad sense, salinity intrusion creates a risk to coastal women in three ways-

i). Water Risk

Currently, 1.4 million people living along the coast are facing a severe shortage of potable water and irrigation water during the dry season each year, and projections indicate that by future dates, 3.2 million of the

poorest coastal inhabitants will be severely impacted by increasing water salinity (Dasgupta, 2017). Due to the salinity in groundwater, over 70% of coastal residents rely on collecting water from ponds for drinking and domestic purposes (Bagri, 2017). The primary responsibility for fetching this water falls on women and adolescent girls in these households, highlighting a clear gender disparity. For instance, UNICEF (2013) reports that 89.6% of coastal women are tasked with water collection for their families, compared to only 4.6% of men. Consequently, women and girls often have to travel 3-7 kilometers every day to secure drinking water for their families (Alston, 2015). Additionally, the challenge of water insecurity compels coastal communities to purchase drinking water, with about 10% of their income going towards this necessity (Bagri, 2017). This expenditure exacerbates poverty among coastal populations, with women indirectly bearing the brunt of these adverse conditions.

ii). Risk on Coastal Food Security

Salinity reduces coastal agricultural production as saline-infested cultivated coastal land area increases gradually (Faruque & Ali, 2005). Salinity imposes direct risk on coastal people's food security by four ways-

Decreasing Agronomic Production

Alston (2015) illustrates how salinization significantly deteriorates the soil quality in coastal regions, leading to a reduction in agricultural yields by two to threefold. Additionally, according to Ali (2005, as cited by Sarwar, 2005), there was a 69 percent decrease in rice production in the coastal districts between 1985 and 2003.

Losing Homestead Forests and Vegetation

Plantation of homestead forests, such as fruit and non-fruit trees, as well as vegetables, are a common practice in rural Bangladesh. Rural inhabitants depend on homestead fruit trees and vegetation to meet their nutritive essentials. However, fruit trees and vegetable gardens are not grown up in coastal districts (Nahian et al., 2013; Alston, 2015; Saroar, 2015), and these traditional sources of nourishment are devastated entirely by salinity.

Crisis of Livestock's Food Supply

Salinity in both soil and water leads to a reduction in available grazing areas and hay production for livestock in coastal regions. Alam et al. (2017) have found that every year, coastal districts lose 200 hectares of land previously used for growing fodder crops. As a result, livestock in these areas face significant challenges in finding sufficient food (Alston,

2015). Furthermore, Nahian et al. (2013) have documented that the salinity levels negatively impact the practice of poultry farming in these coastal districts. These conditions collectively jeopardize the food security of people living in coastal communities.

Reduction of Fish Production

Salinity abolishes the conventional fish stocks in coastal areas, which are a crucial source of protein for women and children living there. Research indicates that the combination of water salinity and cyclones plays a significant role in depleting these traditional fish populations throughout the coastal regions (Alam et al., 2017). Additionally, a separate study found that 17% of families in two coastal sub-districts reported a lack of fish in nearby rivers (Maumita et al., 2015). Consequently, the depletion of fish resources threatens the dietary and nutritional well-being of coastal communities, particularly affecting women and children.

iii). Health Risk

Salinization elevates health risks in two primary ways: first, by increasing the incidence of diseases among coastal women and girls, and second, by heightening the likelihood of mental stress. Research highlights that women and children face the most significant health dangers among all groups in coastal areas (Zaman, 2017). For instance, the habitual consumption of saline water is closely linked to a higher incidence of blood pressure issues (both prehypertension and hypertension), with women experiencing a 31% greater risk of hypertension compared to men (Nahian et al., 2018). Furthermore, coastal pregnant women are five times more likely to suffer from (pre-) eclampsia—a condition characterized by high blood pressure during and after pregnancy—compared to those who consume non-saline water during pregnancy (Vineis et al., 2011). Additionally, they face an increased risk of miscarriage, maternal morbidity, and mortality (WaterAid Bangladesh, 2014).

Furthermore, research indicates that women and girls are primarily affected by reproductive health issues during menstruation and serious skin conditions (Ahmed et al., 2008; Sharmin and Islam, 2013). Additionally, Gobeshona (n.d., p.3) outlines a concise list of the prevalent health risks faced by women and girls in coastal regions by penning- “Early or delayed menarche, infertility or compromised fertility, inability to carry a baby to term, pregnancy compromise, birth defects, congenital abnormalities, and low birth weight babies, premature delivery, leucorrhoea, Pelvic Inflammatory Disease (PID), Urinary Tract Infection (UTI), abdominal discomfort, obese, disabled childbirth, sexual uninteresting (sexual problem).” So, evidence shows that illness is

prevalent among coastal women. However, the existing patriarchal social norms also increase the risk by limiting women's medical treatment facilities as in the rural areas; women are not allowed to go outside (even to visit a doctor) unaccompanied (Zaman, 2017).

Salinity poses significant challenges to the menstrual health and hygiene of women and girls in coastal areas. According to research, 92.8 percent of women and girls in these regions report adverse effects on their menstrual health and hygiene due to salinity, leading to a range of serious health issues such as rashes, fungal infections, itching in sensitive areas, increased sweating in hot climates, discomfort, and urinary tract infections (Khanam and Dina, 2020). Additionally, the intake of salty river water significantly contributes to the suffering of coastal women and girls from gynecological problems (Zaman, 2017; Khanam and Dina, 2020). Zaman (2017) found that 66 percent of coastal women experience gynecological issues as a result of consuming saline water.

Moreover, coastal regions, women and girls are also experiencing malnutrition, a condition closely tied to the decline in food availability due to reduced agricultural output. Alston (2015) points out that in situations of food scarcity, female family members (such as wives, mothers-in-law, and daughters) often consume less food than other relatives. Thus, the food shortages caused by salinity lead to heightened malnutrition risks for these women and girls.

Additionally, salinity contributes to significant mental stress for coastal women through two primary mechanisms: firstly, the responsibility of securing fresh drinking water often falls on women, who must travel long distances to collect it. This task frequently requires them to leave their children unattended at home, escalating their anxiety and mental strain (Rahman, 2009). Secondly, the skin conditions resulting from salinity exposure further aggravate their psychological distress. Shohel et al. (2011) found that 32 percent of participants in their study reported mental health issues linked to their skin diseases.

Vulnerability Analysis

The vulnerabilities of coastal women can be categorized into four distinct categories that fit under the umbrella term social vulnerability such as- i) vulnerability related to social protection, ii) vulnerability related to marriage and family, iii) financial vulnerability, and iv) vulnerability related to education and work security.

i). Vulnerability Related to Social Protection

Social protection addresses two critical issues—sexual harassment and domestic violence. Research indicates that coastal women and girls face

sexual harassment and assault when they go to distant places to collect water (Habiba et al., 2014). Furthermore, those employed in shrimp farming, a key source of income in coastal areas, experience harassment and abuse from their employers (Rahman, 2010).

In addition, the intrusion of salinity into coastal areas is also linked to an increase in domestic violence against women. The necessity for coastal women to allocate three to four hours daily for the collection of fresh drinking water (Ahmed et al., 2009) forces them to neglect household duties or educational pursuits to deal with the effects of salinity (WaterAid UK, n.d.). Additionally, salinity leads to added responsibilities like gathering fuel and fodder (Ahmed et al., 2008), further straining their ability to fulfill domestic roles. As a result, their inability to meet household expectations often leads to domestic violence from their spouses (Alston, 2015).

ii). Vulnerability Related to Marriage and Family

Salinity severely impacts coastal marriage and family structure, increasing coastal women's vulnerability and marginalizing them among marginalized people. For example, salinity creates marriage insecurity among coastal men and women; however, women are the key victim (Khanam, 2019). Khanam (2019, p. 57) shows that 91.82% of girls from a coastal district claim that "saline water-induced skin problems are responsible for their marriage insecurity." Moreover, Water Aid Bangladesh (2007 cited in Rahman, 2009 p.11) also supports the findings saying that "the skin of the adolescent girls becomes rough and unattractive due to the use of saline water. Men from outside the area do not show their interest in marrying these young girls". Besides, evidence also shows that salinity accelerates the coastal dowry rate that victimizes women miserably (Khanam, 2019).

Besides, Salinity contributes to the prevalence of child marriage among girls in coastal areas. Alston (2015) reveals that the typical age at which girls in these regions get married ranges from 12 to 17 years, with 58 percent of parents opting to take their daughters out of school in favor of early marriage. Moreover, the issue of salinity has led to an increase in households led by females (Khanam et al., 2021; Alston, 2015), which are particularly susceptible to various challenges (Alston, 2015). According to Khanam et al. (2021), unemployment driven by salinity forces men from coastal areas to migrate to nearby cities in search of work during times of scarcity. These men often end up forming new families in the cities, marrying local women and abandoning their original families in the coastal villages. As a result, these families become led by women, placing them in highly precarious conditions.

iii). Financial Vulnerability

Salinity increases financial vulnerability among coastal people in two ways, increasing poverty as well as unemployment, and in both cases, women are the direct victim. The World Bank (2015) shows that higher salinization creates a higher dependency ratio and poverty incidence than in non-saline areas by saying that “when salinity and other factors exist in most harmful levels, the poverty of coastal people rises from 8% to 56%”. In addition, Johnson (2016) shows that salinity is the key driver of poverty in the coastal Satkhira and Khulna districts. Moreover, evidence shows that the disease burden discussed earlier increases the poverty of coastal people in two ways- a) by increasing the medical care expenditure and b) by making coastal people incapable of working (Zaman, 2017). Furthermore, water and soil salinity compel coastal people to buy non-saline drinking water and fruits, vegetables, fish, meat, and other agricultural products that increase their life-leading costs and intensify poverty (Zaman, 2017).

Besides, salinity intrusion also creates unemployment problems for coastal people, both males, and females. Khan and Azad (2014) show that 52 percent of coastal inhabitants argued that salinity is the key source of joblessness. More than 50 percent of inhabitants are compelled to change their job frequently and continuously search for alternative jobs because of salinization. These poverty and unemployment tendencies among coastal males increase their dowry demand and increase domestic violence; in both cases, women are the key victims.

iv). Vulnerability Related to Education and Work Security

Vulnerabilities related to education and employment for women in coastal areas fall into three main categories: a) limited access to education, b) the heavy responsibility of household duties, and c) unequal pay. Research indicates that salinity significantly impacts the education levels of women and girls in coastal regions. Specifically, families often have to pull their daughters out of school to assist in fetching fresh water from remote locations, a task that has become increasingly challenging due to salinity (Zaman, 2017; Water Aid Bangladesh, 2018; Sharmin & Islam, 2013).

Moreover, salinity significantly increases the workload associated with the domestic responsibilities of women in coastal areas. According to Water Aid Bangladesh (2007, as cited by Rahman, 2009), it is common for women and adolescent girls in each family to be tasked with fetching fresh drinking water from far-off locations, a chore that can consume three to four hours each day. As a result, these women and girls find themselves lacking the time and energy needed for other household

activities, including looking after elders and children, cooking, bathing, and laundry.

Besides, women working as day laborers in shrimp farms in coastal areas experience unequal pay. Islam (2016) has documented that wage disparity between male and female workers in these regions is both prevalent and socially accepted. For instance, within the aquaculture sector, women earn a daily wage of BDT 240, while men receive BDT 300. This discrepancy is widely recognized and rationalized by the community as simply how things operate locally (Islam, 2016, p.16). Furthermore, female laborers face the risk of losing their jobs if they challenge or speak out against this unequal wage system (Islam, 2016).

c). Adaptation Analysis

Adaptation to salinization is a central goal for coastal development, and coastal inhabitants are often creative in adapting to emerging salinity (Rahman et al., 2019). To deal with water insecurity induced by salinity, coastal people depend on pond water (Alston, 2015) and pond-sand filter (PSF) technology that removes physical impurities (Saroar, 2015). The local NGOs help the community by installing PSF near the bank of ponds where the coastal people save rainwater throughout the rainy seasons to supply drinking water (Saroar, 2015). Besides, solar desalination-managed aquifer recharge and community-managed ponds are also contributing to adapting to water scarcity (Rahman et al., 2019). Moreover, to cope with water insecurity, women drink less water and also give training to their children to drink less water than the daily requirement. However, it causes serious health complications for the children and the women themselves (Alston, 2015).

To cope with reduced agricultural production, coastal people try to change the types of crops (except rice, they try to grow sunflower, beans, watermelon, sesame, etc.), change production techniques (planting vegetables in plastic drums, buckets, canes, plastic bottles, etc.), introduce new crops and technologies (saline tolerant rice varieties, heavier reliance on pesticides and fertilizers, rainwater harvesting) and sourcing household income from diverse activities (Alston, 2015; Saroar, 2015; Rahman et al. 2019). Moreover, to cope with salinity, many rice farmers shift to saline/ brackish shrimp farming cultivation (Saroar, 2015).

In addition to adapting to fuel scarcity, coastal women always search for alternative sources. Alston (2015) shows that 73 percent of coastal women claim the need to find new and alternative fuel sources, and also increasing the time to search for fuel is another strategy. Moreover, to adapt to poverty and unemployment problems, coastal inhabitants depend on microcredit schemes to develop alternative livelihood strategies

(Alston, 2015). Several NGOs are giving microcredit to the coastal women as they are the only eligible person to take the loan and try to do income-generating activities along with their husbands.

Moreover, women and girls are also going to garment factories (one of Bangladesh's most flourishing sectors) to engage in income-generating activities (Alston, 2015). Besides, women also engage in crafting, tailoring, and other activities that can be done close to their homes while attending to household chores (Neelormi, 2010). Women work in coastal shrimp farms as algae cleaners, catch shrimp larvae from the nearest rivers, do crab-fattening activities, and gather mussels, clams, and oysters (Rahman, 2009).

Coastal people also survive with salinity by adopting an out-migration strategy or salinization-induced migration (Rahman et al. 2019). The coastal male members go to other cities in search of work, mainly as day laborers in brickfields, rickshaw pullers, etc. (Alston, 2015). Though out-migration increases the vulnerability of coastal women and the female-headed family, they have no other options without adopting the strategy. Moreover, to cope with the problem of marriage insecurity of coastal girls, parents prefer to withdraw their girl child from academic activities and marry off them at an early age (Khanam, 2019).

Climate Governance: How Is Governance Related to The Paper?

The third objective of my paper is to pinpoint the coastal women's adaptation strategies and GO and NGO's adaptive actions against salinity intrusion that contribute to protecting their lives and livelihoods in some way. For this paper, GO adaptive actions means existing social protection or safety-net policies such as Test Relief (TR), Vulnerable- Group Development (VGD), and Food for Work (FFW) to respond to the antagonistic influences of disasters (Coirolo et al., 2013) as well as NGO's actions comprises mainly the microfinance related works. Evidence shows that the mentioned actions are enduring in the coastal districts corresponding to other parts of the country from both the GO and NGOs. However, Coirolo et al. (2013) show that the mentioned policies and actions have failed to escalate the coastal women's resilience and cover the severity of the coastal disaster impacts. The coastal districts have unique geographical characteristics as well as consist of most climate change-vulnerable areas (Kabir et al., 2016). Most significantly, coastal women are considered the most climate-victim inhabitants of the country (Alston, 2015). So, GOB should introduce context-specific attempts (social protection and social safety-net policies) to address the need of the coastal residents, especially the women, and girls, to enhance their resilience power. Evidence shows that "social-

ecological-technological systems" (Egerer et al. 2021, p.1) change can boost climate resilience if we concentrate on "Context-dependent adaptation" (Egerer et al. 2021, p.6) because, in this case, the native communities can tailor the system allowing to their context as well as by filtering through their local knowledge. In the mentioned framework, social system change includes mainly governance initiatives that showcase and experiment with sustainable solutions, more importantly, social networks, as well as knowledge exchange (Egerer et al. 2021).

Furthermore, "the Resilient City Planning Framework" proposed by Jabareen (2012, p.223) involves the concept of "urban governance" by claiming that native authorities from all countries can contribute significantly in the case of mitigation and adaptation to climate change challenges. Consequently, governance should improve indigenous capacity by producing knowledge, delivering required resources, providing institutional support, and allowing more local autonomy (Jabareen, 2012). As climate change injustice happens along with intersectionalities such as ethnicity, class, gender, and race, climate governance should pay extra attention to locally located practices that are connected to biodiversity, social action, and also public goods (Gillard, 2016) rather than conventional planning tactics and prioritizing stakeholder's expectations (Jabareen, 2012). The suggestions are also noteworthy in the sustainable development of coastal areas as well as the coastal women as here climate governance is not focused effectively and efficiently by the GO and NGOs policymakers to mitigate intersectional climate vulnerabilities along with active climate adaptation for the coastal belt of Bangladesh.

Discussions

Salinity can be termed a wicked problem because so many issues are interlinked with salinity intrusion that it has no straightforward solution. The coastal districts of Bangladesh are suffering and possibly to suffer most from salinity intrusion in the future, and women and girls are at the forefront of those sufferings as well as the noteworthy players against the battle of salinity.

a). Discussion on Risk and Vulnerabilities

i). Structural Drivers

Women's gender roles, existing social structures, and the country's cultural context are the main structural drivers of coastal women's vulnerability. For example, women are the key responsible person of the family's well-being; they are the last and feeble consumers of food and water; they are heading their households while the male members

migrate to the cities; they are struggling against the existing customs that disgrace them, they are the key victim of domestic violence, child marriage, dowry, and low educational attainment. Moreover, coastal women are also vulnerable to food and water insecurity, work burdens including care tasks, and, most significant, disease burdens both for themselves and their family members.

The root cause of women's vulnerability is their subordinated social status in our society and family, and salinity increases their subordination most compared to women from other parts of the country. For example, domestic violence, child marriage, and dowry are related to our patriarchal social structure and our mindset of men's privilege and women's disempowerment. And salinity increases the mentioned vulnerabilities by creating marriage insecurity, skin and gynecological health complexities, work burden, low educational attainment, and increased unemployment. Moreover, the patriarchal social structure restrains women from land and property rights, rights of productive assets, equal distribution of resources, and water and food security. Besides, coastal women exist at the bottom of the power ladder as they are marginal among the marginalized section. These kinds of inequality lead to environmental degradation (Jabareen, 2013), like salinity intrusion, and it can be said that the more equivalent distribution of power and resources can be the key element to change the fate of the marginalized coastal women.

The patriarchal structure, religious misconceptions, and lack of technical knowledge on climate change turn coastal women's vulnerability into the most severe and unacceptable form. For example, Alston (2015) shows that the coastal rural imams (religious leaders) believe that climate change is a curse created by women as they go out of their houses and engage themselves in academic and income-generating activities. These kinds of dominance, misconceptions, and lack of awareness also increase women's vulnerability and risk several times.

Moreover, our socialization process also contributes to increasing the risk and vulnerabilities of coastal women. For example, UNICEF (2013) reports that only 4.6 percent of men bring water for their families, but 89.6 percent of women do the same job; however, men know that fetching water is a very laborious, time-consuming, and hard task. Many men restrain themselves from water fetching because they are socialized by knowing that it is a female task and it is humiliating and demeaning to do the female task. These social norms and values also increase the risk and vulnerabilities of coastal women.

Evidence shows that the risk and impacts of salinity intrusion are unevenly distributed and socially discriminated (Alston, 2015; Rahman,

2009), and it seems that resilience resources are also unequally distributed. Moreover, negative consequences of salinity have different effects on intersectionality, like gender, religious identity, class, etc. For example, coastal Muslim women have restrictions on their movement (like they cannot visit the doctor or go outside the home without any male escort), but women from other religions do not have such obligations. So, intersectionality is one of the key elements related to coastal women's risk and vulnerability to salinity.

ii). Institutional Attempts

To mitigate the risk and vulnerability of salinity, the GO and NGOs have no gender-specific and context-specific attempts and policies that turn coastal women more marginalized. Also, at the policy level, the country has inadequate local knowledge, has no policy to develop local expertise, and often they ignore the native projections and analyses (for example, ignoring the expert and public opinion Bangladesh government is constructing a giant power station in a coastal district that is very close to world's largest mangrove forest 'Sundarban,' a UNESCO world heritage site).

iii). Discussion on Adaptation Activities

Adaptation strategies require more intensive and focused attention from the policymakers to the social as well as gendered elements of the concerned societies and communities. The social realities of Bangladesh include gender disparities in all aspects of life, such as access to media and technology, politics, power relations, norms, values, religious beliefs, governance, and institutions that determine and increase the risk and vulnerability of women, especially marginalized rural women. So, to enhance the adaptive capacity of women, we have to be more gender-sensitive (The Asia Foundation, 2012) and gender inclusive. More concretely, we have to put women and girls in the center of the adaptive activities, as Enarson (2012) suggested, from a feminist political ecology perspective. The paper agrees entirely with Enarson's (2012) view that gender disparities, environmental degradation, and women's increased risk and vulnerabilities are so closely linked that if we ignore gender risk, it will perpetuate environmental degradation as well as reduce our adaptive capacity. For example, if we fail to recognize this association, in that case, the coastal women will continue to eat and drink less and train their children to survive by drinking less. However, it has severe health effects and will continue to drop the coastal girls from academic activities. Practices like child marriage, dowry, domestic violence, marriage insecurity, malnourishment, and other health crises will continue generation after generation.

Conclusion

In Bangladesh, our social structure, as well as the gendered division of labor, highly contributes to placing women behind men in various respects, like access to education, resources, information, and social, economic, and environmental activities that consequently impede women's sustainable development. For this reason, we should pay more focus to Alston's (2015, p.174) concept of "radical adaptation" developed from Ferree's (2012 cited in Alston, 2015) concept of "radical realism." The concept allows us to put gender equality as well as human rights into the adaptation policies and practices in a transparent and obligatory way for designing any action and strategy to assist the victim community (Alston, 2015). The paper wants to narrow down the concept and say that the concept of gender equality should be centralized in the risk and vulnerability assessment, adaptation strategies as well as climate governance of salinity intrusion. Also, without doing so, we cannot break the salinity trap and cannot assist marginal women in changing their misery and ill fate.

Suggestions for A Further Study

This initial investigation highlights the conditions of women and adolescent girls in Bangladesh's coastal districts, where salinity from climate change poses severe challenges. It finds that these communities, especially women and girls, are among the nation's most disadvantaged, struggling without sustainable livelihoods. This research opens avenues for more detailed investigations into the dire circumstances faced by coastal women and girls, including an in-depth examination of the various social issues touched upon briefly here.

References

- Alston, M. (2015). *Women and Climate Change in Bangladesh*. Routledge.
- Ahsan, M. (2010). *Saline Soils of Bangladesh*. Soil Resource Development Institute (SRDI), SRMAF Project, Ministry of Agriculture. Retrieved from http://srdi.portal.gov.bd/sites/default/files/files/srdi.portal.gov.bd/publications/bc598e7a_df21_49ee_882e_0302c974015f/Soil%20salinity%20report-Nov%202010.pdf
- Alam, M. Z., et al. (2017). Effect of Salinity Intrusion on Food Crops, Livestock, and Fish Species at Kalapara Coastal Belt in Bangladesh. *Journal of Food Quality*, 2017, 1-24. <https://doi.org/10.1155/2017/2045157>
- Ahmed, A. U., et al. (2008). *Climate Change, Gender and Vulnerable Groups in Bangladesh*. Climate Change Cell, DoE, MoEF; Component 4b, CDMF, MoFDM. Retrieved from <https://core.ac.uk/download/pdf/48024281.pdf>

- Bangladesh Bureau of Statistics (BBS). (2010). *Population Census 2010: Preliminary report*, BBS.
- Bagri, N. T. (2017, April 27). Bangladesh's water crisis: A story of gender. *Aljazeera*. Retrieved from <https://www.aljazeera.com/features/2017/4/25/bangladeshs-water-crisis-a-story-of-gender>
- Coirolo, C., et.al. (2013). Climate Change and Social Protection in Bangladesh: Are Existing Programmes Able to Address the Impacts of Climate Change? *Development Policy Review*, 31 (S2), 074–090.
- Corcoran- Nantes, Y., & Roy, S. (2018). Gender, Climate Change, and Sustainable Development in Bangladesh. In J. McIntyre-Mills et al. (Eds.), *Balancing Individualism and Collectivism* (pp. 163- 179). Springer. DOI 10.1007/978-3-319-58014-2_8.
- Dasgupta, S. (2017, March 10). Climate change drives up river salinity in Bangladesh. *The Third Pole. Net*. Retrieved from <https://www.thethirdpole.net/en/2017/03/10/climate-change-drives-up-river-salinity-in-bangladesh/>
- Engle, N. L. (2011). Adaptive capacity and its assessment. *Global Environmental Change*, 21(2011), 647-656.
- Enarson, E. (2012). *Women Confronting Natural Disaster: From vulnerability to resilience*. Lynne Reinner Publishers.
- Egerer, M., et al. (2021). Urban change as an untapped opportunity for climate adaptation. *npj Urban Sustainability 2021*, 1- 10. Retrieved from <https://doi.org/10.1038/s42949-021-00024-y>.
- Faruque, H. S. M., & Ali, M. L. (2005). Climate change and water resources management in Bangladesh. In M. M. Q. Mirza & Q. K. Ahmad (Eds.), *Climate Change and water resources in South Asia* (pp. 231-254). CRC Press, USA.
- Global Climate Risk Index. (2020). *Who Suffers Most from Extreme Weather Events? Weather-Related Loss Events in 2018 and 1999 to 2018*. Briefing Paper. GERMANWATCH. Retrieved from https://www.germanwatch.org/sites/default/files/20-2-01e%20Global%20Climate%20Risk%20Index%202020_14.pdf
- Gobeshona. (n. d.). *Impact of salinity on women reproductive health in saline prone Rampal Upazila Bagerhat*. Gobeshona. Retrieved from <http://gobeshona.net/wp-content/uploads/2015/01/Impact-of-Salinity-on-Women-Reproductive-Health-in-Saline-Prone-Rampal-Upazila-of-Bagerhat-Bangladesh.pdf>
- Gillard, R., et al. (2016). Transformational responses to climate change: beyond a systems perspective of social change in mitigation and adaptation. *Wiley Interdisciplinary Reviews: Climate Change*, 7(2), 251-265.
- Huq, S., et al. (1998). *Vulnerability and adaptation to climate change for Bangladesh*. Springer, USA.
- Habiba, U. et al. (2014). "Salinity-Induced Livelihood Stress in Coastal Region of Bangladesh". In *Water Insecurity: A Social Dilemma (Community*,

- Environment and Disaster Risk Management*) (pp. 139-165). Emerald Group Publishing Limited, Bingley. [https://doi.org/10.1108/S2040-7262\(2013\)0000013013](https://doi.org/10.1108/S2040-7262(2013)0000013013)
- Islam, M. S. (2016). *Gender and Water Poverty: Salinity in Rampal and Saronkhola, Bagerhat*. The Embassy of the Kingdom of the Netherlands and The Gender and Water Alliance. Retrieved from <http://genderandwater.org/en/bangladesh/gwapb-products/knowledge-development/research-report/gender-and-water-poverty-salinity-in-rampal-and-saronkhola-bagerhat>
- Jabareen, Y. (2012). Planning the resilient city: Concepts and strategies for coping with climate change and environmental risk. *Cities*, 31 (2013), 220–229. <http://dx.doi.org/10.1016/j.cities.2012.05.004>
- Johnson, F. A., et al. (2016). Is shrimp farming a successful adaptation to salinity intrusion? A geospatial associative analysis of poverty in the populous Ganges- Brahmaputra- Meghna Delata of Bangladesh. *Sustain Science* (11), 423-439. DOI 10.1007/s11625-016-0356-6
- Khan, M. M. & Azad, M. A. K. (2014). The nexus between local politics and salinity intrusion in coastal area Bangladesh: Unveiling the development myth. *Global Journal of Sociology* 4(2), 29-40.
- Kelly, P. M. & Adger, W. N. (2009). Theory and practice in assessing vulnerability to climate change and facilitating adaptation. *Climate Change* 47, 325-352.
- Khanam, D., & Dina, S. A. (2020). Water Salinity, Menstrual Health and Human Rights of Coastal Adolescent Girls of Bangladesh: A Story of Misery. *Jus Humanis Journal of International Human Rights Law: Health and Human Rights, Lund, Sweden*, (3), 69-75.
- Khanam, D. (2019). Climate Change Induced Water Salinity. Women and Marriage Insecurity: A Case Study of Bangladesh. *Jus Humanis Journal of International Human Rights Law: Climate Change and Human Rights, Lund, Sweden*, (2), 55-58.
- Khanam, D., et al. (2021). How does climate change induced salinity force the coastal people of Bangladesh to migrate and how does the migration process violate Human Rights? *Jus Humanis Journal of International Human Rights Law: Migration and Human Rights, Lund, Sweden*, (4), 68-75.
- Kabir, R., et al. (2016). Climate Change Impact: The Experience of the Coastal Areas of Bangladesh Affected by Cyclones Sidr and Aila. *Journal of Environmental and Public Health*, (2016), 1-9. <https://doi.org/10.1155/2016/9654753>
- Moumita, C., et al. (2015). Nutritional Status of Women Living at South-west Coastal Belt of Satkhira Bangladesh. *Journal of Environmental Science and Natural Resources*, 8(2), 41-46.
- Nahian, M., A., et al. (2013, March 9-13). *Women In A Changing Climate – An Analysis Of Gender Dimension Of Vulnerability In Coastal Bangladesh*, 4th International Conference on Water & Flood

- Management (ICWFM-2013), Dhaka, Bangladesh. Retrieved from <https://www.researchgate.net/publication/303666926>
- Nahian, M. A., et al. (2018). Drinking water salinity associated health crisis in coastal Bangladesh. *Elementa: Science of the Anthropocene*, 6 (1), 1-15.
- Neelormi, S. (2010). Addressing gender issues in adaptation. In A. U. Ahmed (Ed.). *Reducing Vulnerability to Climate Change: The pioneering example of community- based adaptation* (pp. 111-127). Dhaka: Centre for Global Change and CARE Bangladesh.
- Röhr, U. (2005). Gender and Climate Change - a Forgotten Issue? *Tiempo: Climate Change Newsletter*. Retrieved from http://tiempo.sei-international.org/newswatch/xp_comment050711.htm
- Rahman, M. A. (2010). Salt is Bitter: Salinity and Livelihood in a Bangladesh Village. *The International Journal of Interdisciplinary Social Sciences*, 5(7), 317-330.
- Rahman, M. M. et al. (2019). Salinization in large river deltas: Drivers, impacts and socio-hydrological feedbacks, *Water Security*, 6 (2019), 1-8.
- Rahman, M. A. (2009). *Salt is killing us: Salinity and livelihood in a Bangladesh village* [Master's thesis in Development Studies, Lund University]. Sweden.
- Resurreccion, B. P. (2013). Persistent women and environment linkages in climate change and sustainable development agendas. *Women's Stud Int Forum* 40, 33-43.
- Saroar, M. (2015). Adaptation Strategies against Salinity-Induced Vulnerability in Coastal Bangladesh. In W. Leal Filho (ed.), *Handbook of Climate Change Adaptation* (pp. 1443-1467). Verlag Berlin Heidelberg: Springer. DOI 10.1007/978-3-642-38670-1_48
- Scheelbeek, P. F. D. et al. (2017). Drinking Water Salinity and Raised Blood Pressure: Evidence from a Cohort Study in Coastal Bangladesh. *Environmental Health Perspectives*, 125(5), 1- 8. <https://doi.org/10.1289/EHP659>
- Shiva, V. (1993). The Chipko women's concept of freedom. In Mies. M and Shiva, V. (Ed.). *Ecofeminism*. (pp. 246-250). London: Zed Books.
- Sandilands, C. M. (2008). Eco/Feminism on the Edge. *Int Fem J Polit*, 10(3), 305-313.
- Shiva, V. (1995). *Staying alive: women, ecology, and survival in India*. Kali for Women.
- Shiva, V. (2009). Women and the gendered politics of food. *Philos Top*, 37(2), 17- 32.
- Shohel, T. A., et al. (2011). Effects of water salinity on degrading health status of the women in South Western rural Bangladesh. *Journal of Sociological Research Development*, 8(6), 1136-1142.
- Sarwar, G.M. (2005). *Impacts of sea level rise on the coastal Zone of Bangladesh* [Master's thesis, Masters Programme in Environmental Science, Lund University]. Sweden.

- Sharmin, Z. & Islam, M. S. (2013). *Consequences of Climate Change and Gender Vulnerability: Bangladesh Perspective*. USA: Bangladesh Development Research Center (BDRC). Retrieved from http://www.bangladeshstudies.org/files/WPS_no16.pdf
- The Asia Foundation. (2012). *A situation analysis of climate change mitigation initiatives in Bangladesh*. The Asia Foundation.
- UNISDR. (2009). *Terminology on Disaster Risk Reduction. United Nations International Strategy for Disaster Reduction (UNISDR)*. Geneva: Switzerland.
- UNDP. (n. d). *Gender and climate change Asia and the Pacific: Gender and disaster risk reduction*, Policy brief, Global Gender and climate alliance. <https://www.undp.org › Gender and Environment>.
- UNICEF. (2013). *Better Access to Safe Drinking Water: Quality, equitable access and sustainability*. <https://www.unicef.org/bangladesh/en/better-access-safe-drinking-water>
- Vineis, P., et al. (2011). Climate change impacts on water salinity and health. *Journal of Epidemiology and Global Health*, 1(1), 5-10.
- WaterAid UK. (n. d.). *Why are girls and women worst affected by a lack of clean water*. <https://www.wateraid.org/uk/the-crisis/tackling-inequality/girls-and-women>
- WaterAid Bangladesh. (2014). *Climate resilience WASH Programming in Coastal Areas of Bangladesh: An Endline Survey*, Water Aid. https://www.wateraid.org/bd/sites/g/files/jkxooof236/files/climate-resilience-wash-programming-in-coastal-areas-of-bangladesh-an-endline-study_0.pdf
- World Bank. (2015, 7 February). *Salinity Intrusion in a Changing Climate Scenario Will Hit Coastal Bangladesh Hard* <https://www.worldbank.org/en/news/feature/2015/02/17/salinity-intrusion-in-changing-climate-scenario-will-hit-coastal-bangladesh-hard>
- Zaman, F. (2017). Impact of Salinity on Poor Coastal People's Health: Evidence from two coastal villages in Bangladesh. *Journal of the Asiatic Society of Bangladesh (Hum.)*, 62(1), 1-14.