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The Environmental Impacts of Rohingya Forced Migration on Host Communities in Bangladesh

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Abstract

This paper aims to shed light on the environmental impacts of the Rohingya people's forced migration to Bangladesh. For decades, the Rohingya population has endured systematic persecution by the state agencies of Myanmar. During the 2017 influx, nearly one million Rohingya refugees sought refuge in Bangladesh, making it one of the most rapid mass migrations in the world. Nevertheless, the Rohingya crisis remains unresolved, and Bangladesh is shouldering the burden of providing shelter to many refugees within its territory. This paper employed qualitative methodologies by analyzing diverse literature sources, including scholarly articles, reports from governmental and international organizations, relevant books, and news articles, to assess environmental degradation due to the Rohingya influx. This paper uses the Rapid Environmental Impact Assessment (REIA) framework, previously implied in the UNDP and UN Women Bangladesh (2018) report, to identify the environmental consequences. Further, Homer-Dixon's theory of environmental scarcity and violent conflict was analyzed to understand the relationship between environmental impacts from Rohingya refugees and rising conflict among the local host communities of Cox's Bazar in Bangladesh. The findings indicate that regions with decreased forest cover due to camping activities are experiencing soil erosion, adverse health impacts, and sanitation issues. The refugee influx has strained its limited environmental resources, disturbed natural habitats, created environmental resource scarcity, and created potential conflict with the host communities. Both the locals and the Rohingya are marginalized. Hence, it is imperative to analyze the environmental consequences of the refugee crisis, which give rise to conflicts and related issues concerning natural resources in host communities, prior to formulating refugee policies.

Keywords: Environmental Impacts, Rohingya, Forced Migration, Natural Resources, Conflict, Host Community, Bangladesh, Myanmar, Refugee.

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List of Acronyms

ARSA	Arakan Rohingya Salvation Army
BBS	Bangladesh Bureau of Statistics
GoB	Government of Bangladesh
GoM	Government of Myanmar
GDP	Gross Domestic Product
HRW	Human Rights Watch
ICJ	International Court of Justice
ICC	International Criminal Court
ICG	International Crisis Group
ILO	International Labour Organization
INGO	International Non-Governmental Organization
IOM	International Organization for Migration
ISCG	Inter Sector Coordination Group
MoU	Memorandum of Understanding
NGO	Non-Governmental Organization
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
RRC	Office of the Refugee and Repatriation Commissioner
TWS	Teknaf Wildlife Sanctuary
UN	United Nations
UNDP	United Nations Development Program
UNHCR	United Nations High Commissioner for Refugees
UNFPA	United Nations Population Fund
WFP	World Food Programme

Chapter 1: Introduction

With its own experience of the liberation war and genocide of 1971, Bangladesh provided refuge to over one million persecuted Rohingyas following the 2017 influx (UNHCR, 2022). 2024 marks the seventh year since the last group of Rohingya people were forcibly displaced from Myanmar to Bangladesh (IOM, 2024). The Rohingya people have migrated to Bangladesh multiple times, specifically in 1978, 1991–92, 2012, 2016, and 2017, due to their proximity to Bangladesh and shared communal identity were the main driving forces behind this movement. (Uddin, 2020; UNHCR, 2019; Lewis, 2018; Ahmed, 2010; Roy Chowdhury, 2020; Ullah & Chattoraj, 2018, 2022). Bangladesh has designated more than 6500 acres of land in the Ukhiya and Teknaf subdistricts of Cox's Bazar for the purpose of settling them (Inter Sector Coordination Group [ISCG] et al., 2019). The arrival of the Rohingya significantly altered the demographics of the Teknaf and Ukhiya sub-districts in Cox's Bazar district; the Rohingya population is now three times that of the locals, making the locals feel like a minority in their own country. (Habib, 2021; Yasmin & Akther, 2019). The United Nations High Commissioner for Refugees (UNHCR) stated in 2016 that the extensive degradation and depletion of environmental and natural resources pose a severe threat to the livelihood and well-being of both host and refugee communities (UNHCR, 2017).

This paper argues that the Rohingya people's forced migration to Bangladesh accelerates environmental deterioration and resource scarcity, which is further complicated by escalating disputes between refugees and host communities regarding natural resources. Environmental hazards such as the destruction of forests, the deterioration of habitats, and the contamination of the environment heighten the probability of disputes and conflicts between refugees and host communities. The current scenario poses concerns about the surrounding environment and the stability and welfare of refugees and host communities, emphasizing the urgent need for sustainable methods to tackle environmental deterioration and conflict.

This study employed qualitative descriptive research methodology to evaluate the environmental consequences of the Rohingya refugee influx. The analysis involved examining a wide range of literature sources, such as scholarly articles, reports from governmental and international organizations, relevant books, and news articles. This paper uses the Rapid Environmental Impact

Assessment (REIA) framework, previously utilized in the UNDP and UN Women Bangladesh (2018) report, to determine the environmental consequences. In order to comprehend the connection between the environmental effects of Rohingya refugees and the escalating conflict among the local host communities of Cox's Bazar in Bangladesh, Homer-Dixon's theory of environmental scarcity and violent conflict was further examined.

The scholarly discourse on the impact of the refugee crisis on Bangladesh's environment and natural resources necessitates reassessment. Hence, by shedding light on the increased susceptibility and possible links between environmental degradation and social conflict and violence, this paper advances knowledge of the challenges the host community faces due to environmental hazards related to the Rohingya crisis. It presents findings that indicate a significant decline in forest coverage, resulting in a decrease in the number of subfunctions that contribute to ecosystem services over a four-year period from 2017 to 2021 (Sarkar et al., 2023). The study aims to assist policymakers by emphasizing the importance of sustainable forest resource management in developing countries such as Bangladesh, where marginalized communities rely heavily on forests for survival. Furthermore, the study brings attention to the social conflicts that may occur between the Rohingya and host communities in the study region. This paper proposes that it is essential to tackle resource conflicts between refugees and host communities, as well as address natural resource-related issues, prior to the development of any refugee policy. Future policies should consider the environmental impacts of migration on nearby ecosystems and take proactive measures to address any potential social conflict that may arise.

Significance of the Study

Refugees, like any other type of international migrants, contribute to resource competition by increasing the utilization of environmental assets such as water, grazing areas, forests, and firewood (Swain, 1996). Under-resourced developing nations often need help in effectively addressing the economic, environmental, socio-cultural, safety, and security concerns that arise from hosting refugees (UNHCR, 2017). The local population adopts a defensive mentality in response to the scarcity of resources, organizing into groups to defend their common interests and pressure migrants to leave (Swain, 1996). The local populace might perceive the refugees as a possible threat, according to Laurence et al. (2019).

In the context of Bangladesh, the environmental consequences and rivalry over natural resources have a socio-economic effect that can limit peace and unity in society, ultimately leading to a deterioration in the relationship between the local community and refugees (Berry, 2008). The host communities' residential satisfaction dropped to 30.17% in the vicinity of the camps; they are dissatisfied with how crowded, polluted, unsafe, and insecure their neighbourhood and society have become, as well as how public services have become less of a quality (Biswas et al., 2021). Hence, forced migration arises not solely from conflict but also engenders conflict between refugees and host communities.

Research Question

The study intends to identify the significant environmental consequences of relocation, evaluate the drivers of conflicts over natural resources, and propose sustainable methods to reduce environmental degradation and increase regional social cohesion. The sudden establishment of refugee camps in an area can lead to land degradation, clearing of forest vegetation, conversion of agricultural land to habitat, collection of firewood, surface and groundwater depletion, fishing and hunting, and a sense of perpetual loss among the host community as well as among the refugees (Martin, 2005). This paper seeks to contribute by thoroughly examining the aforementioned subject matter and delving into a research question: **What are the main environmental consequences arising from the forced migration of Rohingya refugees to Bangladesh amidst rising conflict over natural resources?**

Outline of the Research Paper

The research paper comprises eight chapters organized in a coherent sequence. The introduction, found in Chapter 1, discusses the importance of the study and the research question. Chapter 2 is the context, which offers background on the Rohingya crisis, host communities in Bangladesh, the status of the Rohingya, and the government response in Bangladesh. Chapter 3 reviews earlier literature on Bangladesh as a climate victim and research on the environmental impacts of forced migration on host communities. Chapter 4 discusses the theoretical and conceptual framework of the study. Chapter 5 illustrates the research question and methodology of the research paper. Chapter 6 assesses the findings of the environmental impacts of Rohingya refugees on the host

communities of Bangladesh. Chapter 7 discusses the study's limitations, theoretical and practical implications, and contributions. Followed by Chapter 8 recommendations and conclusion.

Chapter 2: Context

Historical Background

The term "Rohingya" is a Muslim Arakanese appellation originating from Rohang, the former designation for Rakhine State (Ullah, 2016). Milton et al. (2017) assert that the Muslim sailors hailing from Arab nations were the initial Rohingya people, existing between the years 788 and 819 AD. Hein (2018) argues that the Burmans gained control of Arakan in the 11th century, following the initial establishment of Indian settlers, and reclaimed it in 1238. While the pro-Rohingya front claims the Rohingya community has been present in Myanmar since the ninth century, there are opposing parties who assert that the Rohingya are migrants from the Chittagong region of Bangladesh (Ullah, 2016; Kipgen, 2013). According to Dussich (2018), Rohingyas, comprising Arakani Muslims and Hindus, migrated from Arakan to Chittagong during that period. Subsequently, the Burmans engaged in combat with the Arakanese insurgents and instigated a confrontation with the British. Arakan was placed under British colonial administration in 1825 and remained under colonial authority until 1948 (Hein, 2018; Milton et al., 2017; Dussich, 2018). Hein (2018) examines two historical episodes to comprehend the tension and violence within the Rohingya community in Myanmar. One is the influx of Muslim migrant workers from Bengal into Arakan, which led to a significant rise in the Muslim population in the region, primarily due to their involvement in rice cultivation (Hein, 2018; Dussich, 2018). The second instance concerned the British colonial notion of religion and race (Hein, 2018). According to Howe (2018), religion has substantially impacted the division of communities in Myanmar since the time of British rule. In his work, Hein (2018) elucidates that the British amalgamated individuals of mixed race with their nationality and categorized them according to their religion and race throughout their colonial governance.

In 1942, the Japanese Army successfully occupied a significant portion of Burma, fulfilling their commitment to grant independence to the Burmese people (Ferguson, 2018). During the early years of the Second World War, a violent conflict erupted between the British, who were backing the Rohingya Muslims, and the Japanese, who were supporting Buddhist nationalists (Dussich, 2018). The Rohingya population endured assaults from both the Burma Independent Army and Buddhist Rakhine, leading to the demise of an estimated 100,000 Rohingya individuals. Furthermore, approximately 50,000 Rohingya sought sanctuary in East Bengal (Milton et al., 2017).

Independence of Myanmar

Following its independence from British rule, Burma adopted the Union Citizenship Act in 1948 (Kipgen, 2013) to end the country's ongoing internal conflict by defining which ethnic groups are eligible for citizenship. The legislation granted citizenship to individuals who were either born within the territorial boundaries of Burma or had at least one parent who is a citizen of Myanmar, while explicitly excluding the Rohingya community (Kipgen, 2013). In 1962, the military took over Myanmar following a short period of parliamentary democracy (Howe, 2018). According to Ullah and Chatteraj (2018), the state acknowledged the existence of the Rohingya people and their ethnic identity in the 1950s. Sao Shwe Thaik, as the inaugural president of an autonomous Myanmar, officially proclaimed that the Muslim population residing in the Arakan region was an integral part of Burma (Ullah & Chatteraj, 2018).

The Reason Behind the Conflict in Myanmar

From 1962 onwards, consecutive military regimes initiated campaigns to combat various ethnic militia groups and the general population in the pursuit of state interests (Howe, 2018). According to Ullah (2016), the government under Ne Win intentionally omitted the term 'Rohingya' from the list of the sixth section of the 1982 Law, which states that individuals who were already citizens would retain their citizenship status when the law was implemented. Meanwhile, 'naturalized' citizenship will be granted to individuals who are not current citizens but can provide evidence of residency before the country's independence (Ullah, 2016). Consequently, the state refused to grant them citizenship. The implementation of the new law resulted in the exclusion of qualified citizens belonging to the Rohingya ethnicity, as stated in the 1948 law (Ullah, 2016).

Rohingya Forced Migration in Bangladesh

According to Parnini et al. (2013), the main goal of the operation 'Dragon King or Operation Nagamin' was to exterminate the Mujahid rebels who were fighting for an Islamic state in Northern Rakhine. Tens of thousands of people were killed during the operation, and more than 200,000 were forced to flee to Bangladesh (Parnini et al., 2013; Ullah, 2016; Howe, 2018; Dussich, 2018; Kipgen, 2013). Following the military's implementation of another brutal operation named Pyi Thaya in Northern Rakhine, which also resulted in mass killings, torture, rape, and forced labour, an estimated 250,000 Rohingya refugees fled to Bangladesh in 1991 (Parnini et al., 2013; Dussich, 2018).

Table 1: Myanmar military operations against the Rohingya

Name of operations	Years	Aim/causes	Consequences
Naga Min (Dragon King)	1977–78	Expel Rohingya from Myanmar	Over 200,000–250,000 Rohingya fled into Bangladesh
Pyi Thaya (Prosperous Country)	1991–92	Make the country clean and beautiful	Around 250,000 Rohingya migrated to Bangladesh
“Communal” and military violence	2012	The Rohingya allegedly raped and killed a Buddhist woman	Around 140,000 Rohingyas were restricted into camps for Internally Displaced Persons (IDP)
Operation Clearance	2016–17	Arakan Rohingya Salvation Army (ARSA) attacked a military border post and killed nine police officers (in 2016), and ARSA again attacked the Myanmar border security forces and killed 12 officers (in 2017)	87,000 Rohingya reached Bangladesh in 2016; by 2017, the number exceeded 700,000
Continued military counterinsurgency operations	2018	Restrict the Rohingya’s freedom of movement and services	Around 128,000 Rohingyas were dislodged inside, displaced within Rakhine state and 5 Rohingya were killed by an airstrike.

Source: Dussich, 2018; International Organization for Migration (IOM), 2019; Office for the Coordination of Humanitarian Affairs (OCHA), 2018; Habib, 2021. ¹

¹ See also Habib, M. R. (2021). The “stateless” Rohingya in Bangladesh: Crisis management and policy responses. *Asian Politics and Policy*, 13(4), 577–596. <https://doi-org.proxy.bib.uottawa.ca/10.1111/aspp.12611>

Over the past three decades, a sizable number of Rohingya Muslim refugees have fled violence and persecution between various ethnic and religious groups in Myanmar in search of safety in Bangladesh (Martin et al., 2017). As soon as the military launched what they described as a "clearance operation" on August 25, 2017, approximately a million Rohingya were forced to flee to the neighbouring Bangladeshi city of Cox's Bazar, where they were killed. Houses were set on fire (Dussich, 2018). According to the UNHCR (2021) report, by mid-year 2020, there were an estimated 1.6 million Rohingya who had been forcibly displaced across the region. UNHCR has registered almost one million Rohingya refugees and asylum-seekers, mainly in Bangladesh (860,000), Malaysia (101,000), and India (18,000), as well as smaller numbers in Indonesia, Nepal, Thailand, and other countries. An estimated 600,000 Rohingya continue to remain in Rakhine State, Myanmar, of whom 142,000 are internally displaced (UNHCR, 2021A).

Current Geopolitical Situation

The Rohingya ethnic cleansing and China's global capitalist business plan in Myanmar might be viewed as interconnected phenomena (Yilmaz & Talukder, 2019). The deep seaport at Kyaukpyu in northern Rakhine is an alternative route for importing energy from the Middle East to the Indian Ocean, which allows China to bypass the Malacca Strait and ensure the safe transportation of goods (Zahed, 2022). On the other hand, India has made substantial investments in Rakhine, such as the Sittwe seaport, the Kaladan Multi-Model Transit Transport Project, and the IT education sector (McCartan, 2008; Sidhu, 2020).

Geopolitical and neoliberal motivations, according to Roy Chowdhury (2020), fostered violence in order to drive the Rohingyas from affluent Rakhine during the democratic transition. The Rohingya exodus into Bangladesh has not affected the calm and friendly ties between Bangladesh and Myanmar. Bangladesh relies upon the international community for assistance to address the Rohingya situation because it considers it to be a worldwide humanitarian crisis. Despite viewing its relationship with Bangladesh as a "golden age," India is not assisting in resolving the Rohingya issue to further its geopolitical and strategic objectives in Myanmar (Zahed, 2022).

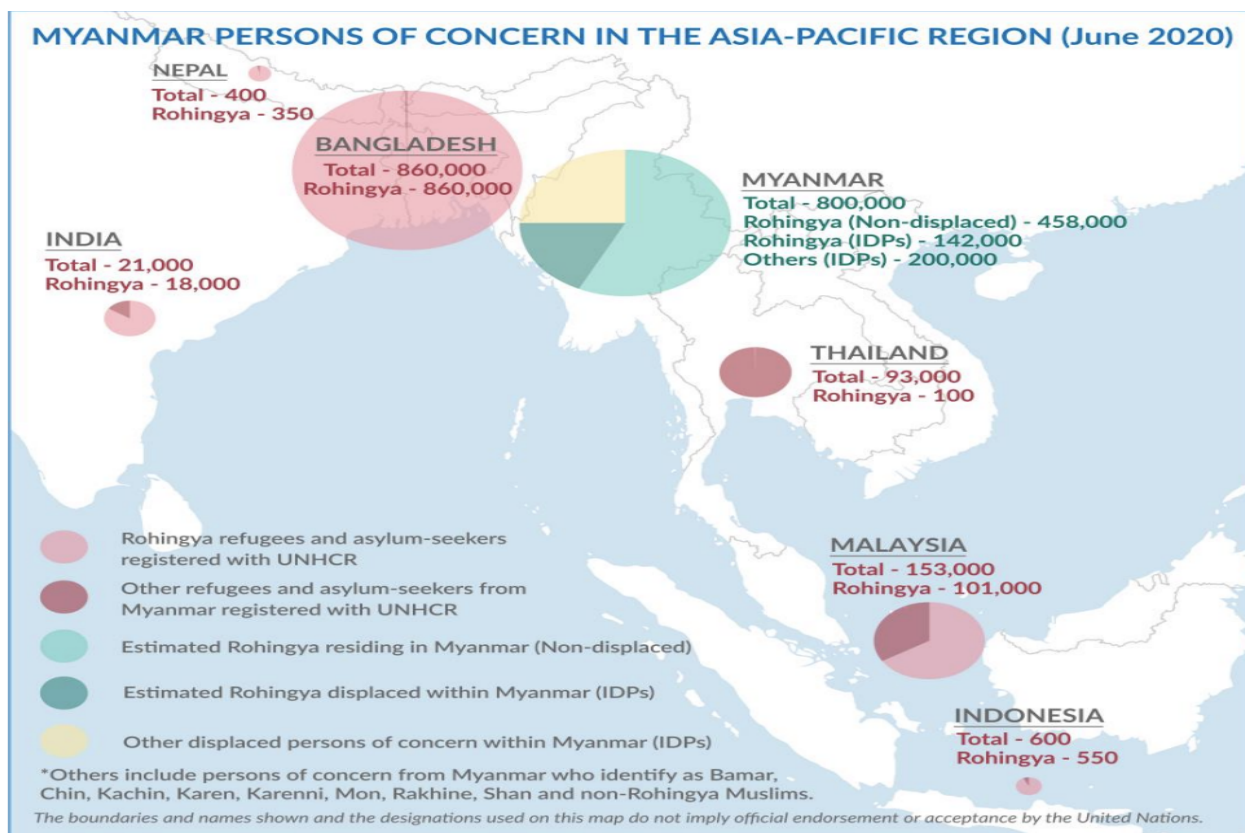


Figure 1: Myanmar Persons of Concern in the Asia Pacific Region. Source: UNHCR (2021)²

China wants to avoid the United States’s Rakhine intervention. Following analysis, China proposed a "three-step plan" to address the Rohingya situation, citing a lack of development and investment in Rakhine (Song, 2018). China then protected Myanmar in the UN Security Council by vetoing every Rohingya and Myanmar resolution in 2017, 2018, and 2021 (Zahed, 2023). Russia, China, India, and the US are highly involved in UN and international Rohingya politics (Karim & Zhang, 2021).

Host Communities in Bangladesh

According to Parinini et al. (2013), between 1991 and 1992, around 250,000 Rohingya refugees escaped from Arakan to Bangladesh due to forced labour, rape, and religious persecution inflicted by the Burmese army. Over 688,000 Rohingya individuals sought refuge by crossing the border

² see,

<https://reporting.unhcr.org/sites/default/files/The%20Displaced%20and%20Stateless%20of%20Myanmar%20in%20the%20Asia-Pacific%20Region%20-%20January%202021.pdf>

into Cox's Bazar district in 2017. Since the beginning of 2017, Bangladesh has worked closely with international humanitarian aid organizations to fulfill its responsibility of providing essential shelter, food, water, and healthcare to 500,000 refugees (Lewis, 2018; Milton et al., 2017).

Rohingya Refugee Camps (Present status)

Cox's Bazar, with its staggering population of nearly one million Rohingya, stands as the largest refugee settlement on earth. According to the government of Bangladesh (IOM, 2024), there are 33 camps where refugees live in highly congested conditions. However, Cox's Bazar, with a population of 2.3 million, is considered one of Bangladesh's most economically disadvantaged districts (UNHCR, 2021a). The influx of Rohingya people has exerted significant strain on the region's already delicate local ecosystems (Hasan et al., 2021). The Rohingya population lives in densely populated refugee camps, making them vulnerable to various environmental hazards such as floods and landslides (ISCG, 2019).

Table 2: Rohingya population in Cox's Bazar by location (January 2018).

Location	Population Pre-25 Aug 2017	Population Post-25 Aug 2017	Total Rohingya Population
Makeshift Settlements			
Kutupalong-Balukhali Expansion	99,705	339,918	439,623
Kutupalong Registered Camp	13,901	11,842	25,743
Nayapara-Leda Makeshift	14,240	9,786	24,026
Nayapara Registered Camp	19,230	15,327	34,557
Shamlapour	8,433	17,893	26,326
New Spontaneous Settlements			
Hakimpara	140	55,041	55,181
Thangkhali	100	29,604	29,704
Unchiprang	–	30,384	30,384
Jamtoli	72	33,226	33,298
Moynarghona	50	21,414	21,464
Chakmarkul	–	10,500	10,500
Host Communities			
Cox's Bazar Sadar	12,485	1,683	14,168
Ramu	1,600	830	2,430
Teknaf	34,437	34,075	68,512
Ukhia	8,125	9,543	17,668
Total Rohingya:	212,518	621,066	833,584

Source: Report on Environmental Impact of Rohingya Influx (UN Development Programme, 2018), 19.

The Status of Rohingya and Government Response of Bangladesh

Bangladesh is not a party to any of the following conventions: the 1951 Convention pertaining to the Status of Refugees and its 1967 Protocol; the 1954 Convention relating to the Status of Stateless Persons; and the 1961 Convention on the Reduction of Statelessness (Prodip, 2017). According to Muhammad (2011), Bangladesh lacks any national legislation or legal frameworks that would formally permit the handling of refugee affairs or safeguard the rights of refugees. The International Organization for Migration (IOM) Bangladesh refers to the Rohingya as "Undocumented and Documented Myanmar Nationals" (IOM, 2017), and the country recognizes them as "Forcibly Displaced Myanmar Nationals (FDMN)" (Human Rights Watch, 2018).

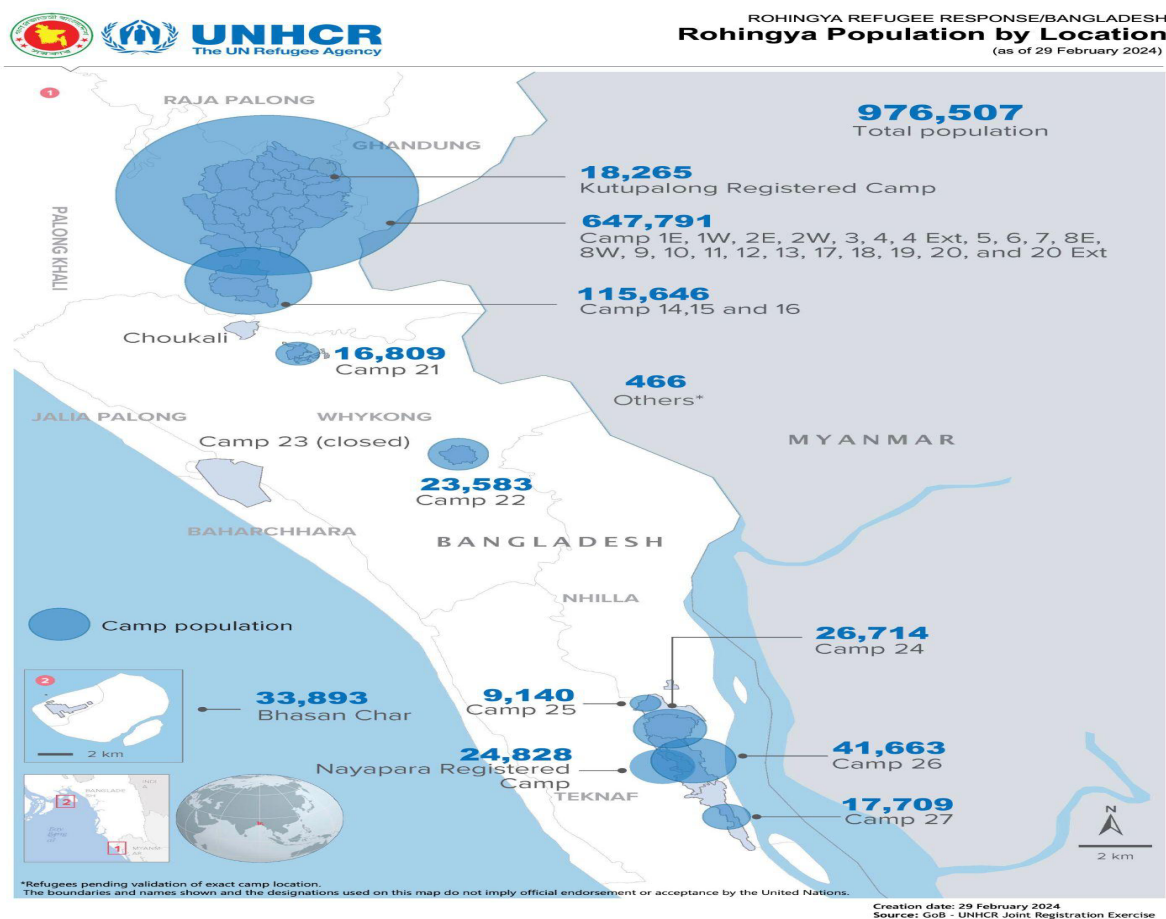


Figure 2: Rohingya Population by Location (UNHCR, 2024). Source³

³ See, Joint Government of Bangladesh - UNHCR Population map as of February 2024
<https://data.unhcr.org/en/country/bgd>

In January 2018, Bangladesh and Myanmar signed another voluntary repatriation deal. Still, it has yet to happen since the Myanmar government refused to provide the Rohingya with their citizenship rights and was unable to guarantee their safety (Dhaka Tribune, 2019). To repatriate 200,000 Rohingya, a diplomatic effort was launched in 2005 in cooperation with the UNHCR and the government of Myanmar. However, the process abruptly stopped because of Myanmar's political unrest and the government's insistence on outstanding participation and response (Ministry of Foreign Affairs, 2014).

Bangladesh is a developing nation home to more than 147 million people living in a minimal area of land, ranking it the seventh most densely populated country in the world (UNHCR, 2007). Bangladesh is consequently cautious about providing non-citizens shelter or establishing circumstances that might draw more asylum seekers within its borders (UNHCR, 2007). The government of Bangladesh reiterated that Rohingya refugees need to return home and refused to provide them with any legal status there. The government of Bangladesh is unwilling to pass legislation or put policies in place on the definition, policies, and security of refugees (Habib, 2021). The government of Bangladesh's Ministry of Disaster Management and Relief (MoDMR) oversees the coordination of activities related to refugees, while the Refugee Relief and Repatriation Commissioner (RRRC), a division of the MoDMR, is in charge of managing camp-level operations through the Camps-in-Charge (CiC) (Habib, 2021).

Chapter 3: Literature Review

This chapter has two sections. First, there is previous literature on Bangladesh as a victim of climate change. The study then examines research on the environmental effects of forced migration in host communities worldwide.

A. Bangladesh as a Climate Victim

Examining Bangladesh's vulnerability to climate change in the context of the Rohingya Crisis' environmental effects on host communities is essential. In the Global Climate Index Report 2020,

Bangladesh ranked seventh among the most climate-vulnerable countries (Eckstein et al., 2019). The increased frequency of tropical storms over the previous ten years and the encroachment of saltwater into the mainland are indications that climate change has already manifested in Bangladesh. This intrusion of saltwater has resulted in the pollution of drinking water and the detriment of agriculture (Minar et al., 2013). Some significant consequences Bangladesh is facing due to climate degradation are described below.

Rise of Sea Level and Salinity: Bangladesh has well-known deltaic floodplains exposed to the Bay of Bengal under notable sea-level rise (SLR) risk, increased by its flat topography and dynamic deltaic morphology (CCC, 2016). Studies have mentioned that only 10% of the land area of Bangladesh is above 1 m mean sea level (Karim & Mimura, 2008), and 28% of the population is under threat of SLR (Ali & Kader, 2015). Rising sea levels will decrease 17% of total and 13% of cultivated land, affecting 35 million people in 19 coastal districts (Rahman, 2010). Approximately 2.8 million hectares of coastal soil have undergone salinization due to excessive extraction of surface water and groundwater for irrigation, as well as the infiltration of seawater (Zaman, 2007).

Riverbank Erosion: A net area of 8,700 hectares of land is lost yearly (Ahmed, 2006). At the time of the monsoon, one-third of the territory, on average, is flooded regularly. Residents have learned to adapt to these climatic issues, but global warming has broken this mature pattern (Poncelet et al., 2010).

Cyclones and Tidal Surges: Bangladesh suffers from frequent storms and cyclones. In November 2007, the cyclone Sidr, classified as a category four cyclone, hit after extensive flooding. This resulted in 3,363 deaths, impacted 10 million individuals, and caused a minimum 13% decrease in crop production (ELIAMEP, 2008). During the ongoing flood recovery, a cyclone named Sidr, with 240 km/h wind speeds, hit the country's coastal region. This cyclone impacted 30 out of 64 districts, affecting the lives and livelihoods of 8.7 million people. Additionally, it caused damage to approximately 1.5 million houses and 4.1 million trees (ELIAMEP, 2008).

Frequent Flooding: Bangladesh's height from sea level and the effects of climate change have made it a flood-prone country. Flash floods are sometimes recognized as applicable to the land, but extreme floods like 1988, 1998, 2004, and 2007 tend to occur between 40 and 50 years. The rising temperature causes them to occur very frequently. Severe floods may cover up to 80% of the country's land (Dewan et al., 2003).

B. Research on the Environmental Impacts of Forced Migration on Host Communities

Environmental preservation, global migration, and human progress are currently the most pressing concerns on the global agenda (Hugo, 2008). The sudden and unanticipated arrival of a significant number of individuals into a limited area already prone to environmental deterioration can result in severe ecological consequences (Stevens, 1993). According to a study by the Wildlife Conservation Union on animal extinction since 1600, habitat loss ranks second after introducing exotic species as a cause of animal extinction (IUCN, 2004). Following the 1994 Rwandan genocide, a large number of refugees migrated to camps in the Kigoma and Kagera regions, which were located close to protected areas (MNRT, 2006). The proximity of a refugee camp to a protected area disrupts the ecosystem by heightening the potential for disease transmission to wildlife (Kalpers, 2001) and interfering with the natural behavioural patterns of wildlife. In addition, populations residing close to natural resources, such as forests and wildlife, typically rely on these resources, legally or illegally, for their sustenance and economic purposes (Kaboggoza, 2000).

UNHCR (2001) states that from 1994 to 1996, 570 square kilometres of forest experienced some form of impact in Tanzania, with 167 square kilometres subjected to severe deforestation due to the refugee crisis. According to a 1994 environmental impact assessment in Zimbabwe, the reintegration of Mozambican refugees into their home country resulted in a 58% reduction in the forest surrounding the refugee camps (UNHCR, 2001). The presence of refugee crises globally has significantly strained water resources in the countries hosting them (Black, 1994; Hoerz, 1995; Jacobsen, 1997). The unforeseen surge in the demand for water in refugee camps and settlements can result in water shortages for both the refugees and the host communities (Jafaar et al., 2019).

Multiple nations have researched the ramifications of the refugee crisis, such as Tanzania (Paskett, 1998), Sudan (World Bank, 2010), and the influx of Iraqi refugees into Jordan in 2003 (Sassoon, 2008). Evidence of decreasing groundwater levels in various aquifers in Lebanon and a reduction in spring flows has been attributed to the refugee crisis (UNDP, 2014). According to Oxfam, in 2011, refugees and internally displaced people (IDPs) were prone to using uncontrolled methods like burning or burying their waste in the absence of a formal or effective waste management strategy.

Chapter 4: Theoretical and Conceptual Framework

Definition of Terms and Concepts

Refugee

Refugees are some of the most vulnerable individuals on the globe, and the 1951 Refugee Convention and its 1967 Protocol serve to safeguard them. For displaced people to live honourably and independently, the Convention specifies the fundamental minimum requirements for treating refugees, including the right to shelter, employment, and education.

According to Article 1 of the Convention, a refugee is someone who: "is outside his or her country of nationality or habitual residence; has a well-founded fear of persecution because of his/her race, religion, nationality, membership in a particular social group or political opinion; and is unable or unwilling to avail himself/herself of the protection of that country, or to return there, for fear of persecution" (UNHCR, 2001).⁴

Article 33 of the 1951 Convention contains the concept of non-refoulement, which states that refugees shouldn't be sent back to a nation where they risk losing their freedom or life. Signatory nations to the 1951 Convention are required to safeguard refugees on their soil and treat them in accordance with internationally accepted norms.

⁴ see also Who can apply for asylum? - UNHCR Cyprus. <https://help.unhcr.org/cyprus/applying-for-asylum/who-can-apply-for-asylum/>

Host Communities

According to Vas Dev (2002, p. 3), a host community is an autonomous country that permits asylum seekers to live there temporarily or permanently, voluntarily or because they cannot take action. Host communities may accept refugees and coexist peacefully, respecting their rights and sharing natural resources, according to the Administration for Refugee and Return Affairs – Ethiopia (ARRA 2011, p. 34). Nonetheless, there are situations where the host community reacts negatively because they are unhappy with how refugees are affecting local economic, social, and political life, security, and safety (Vas Dev, 2002, p. 4).

International Refugee Laws and Principles

As stated in the 1948 UN General Assembly-approved Universal Declaration of Human Rights (UDHR)⁵, "every individual has the entitlement to seek and experience asylum in foreign nations as a means of protection from persecution," according to UN Article 14(1), p. 1. A signatory nation cannot deny entrance to a refugee or make them return to a place where their life or independence is in danger due to their nationality, religion, race, or participation in any particular group, as stated in Article 33 (1) of the 1951 Convention.

National Legal and Administrative Framework

Bangladesh has no standardized procedures for treating refugees that are distinct from other potential entrants (UNHCR, 2007). In Bangladesh, all refugees, except those recognized in the 1992 influx, are therefore officially considered illegal residents in the country (UNHCR, 2007). The Rohingya did not have the same access as citizens to social, economic, and political rights and were not allowed freedom of movement or employment (Imran & Mian, 2014). The existing legislation concerning foreigners, such as the Foreigners Act of 1946, and admission, such as the Control of Entry Act of 1952, does not explicitly include refugees. The government of Bangladesh's Ministry of Food and Disaster Management (MFDM) is responsible for administrating refugee-related affairs and coordinating activities for refugee camps. (UNHCR, 2007).

⁵ see also the unlawful pushback of refugees and asylum seekers at the borders of the European Union -. <https://brokenchalk.org/the-unlawful-pushback-of-refugees-and-asylum-seekers-at-the-borders-of-the-european-union/>

However, specific provisions in the 1972 Constitution of the People's Republic of Bangladesh may be relevant to refugee matters. The obligations stated in the text include supporting oppressed people worldwide who are fighting against imperialism, colonialism, and racism (Article 24(1)(c)); conducting international relations based on current principles and respect (Article 31); ensuring that no person is deprived of life and liberty except in accordance with the law and the principles of the UN Charter (Article 25); protecting all citizens and individuals within Bangladesh (Article 31); and ensuring that no person is deprived of life and liberty except in accordance with the law (Article 32) (UNHCR, 2007).

UNHCR ‘Environmental Guidelines’ (1996)

According to the UNHCR ‘Environmental Guidelines’⁶ (1996), environmental problems associated with refugees usually result from high concentrations that occur rapidly. Without mitigating measures, physical deterioration of the surrounding environment soon occurs, generating other impacts on refugees and local populations.

1. **Natural Resource Deterioration:** Degradation of renewable natural resources such as forests, soils, and water dominates the environmental problems associated with refugees. Contamination of surface and groundwater can occur when sanitary measures are inadequate or through improper application of agrochemicals, leakage of vehicle fuel, etc. In the case of settlement schemes, poor land use practices may further exacerbate land degradation (UNHCR, 1996).
2. **Irreversible Impacts on Natural Resources:** Severe impacts on areas of high environmental value may be related to the area’s high biodiversity, function as a haven for endangered species, or its essential recreation destination. Damage to these natural assets can be irreversible and thus deserves unique prevention or mitigation efforts (UNHCR, 1996).

⁶UNHCR. (1996). Environmental Guidelines: A Handbook for Environmental Management in Refugee Situations. Geneva: UNHCR. <https://www.refworld.org/policy/opguidance/unhcr/1996/en/23894>

3. **Impacts on Health:** A very high percentage of adverse health impacts is related to fecal and chemical contamination of drinking water and ease of disease transmission in overcrowded refugee camps. Dust and smoke, created by burning low-quality fuelwood, heighten the incidence of respiratory disease (UNHCR, 1996).
4. **Impacts on Social Conditions:** The negative consequences of environmental degradation are more likely to affect women and children. Women must spend long hours seeking and carrying wood, activities that put them at increased risk of fatigue and exposure to assault and detract from their child-care, family, and social functions (UNHCR, 1996).
5. **Social Repercussions on the Local Population:** Competition between locals and refugees for scarce resources (fuelwood, fodder, water) can result in conflicts and resentment. In some cases, refugee influx has led to the breakdown of traditional and sustainable local natural resource management systems (UNHCR, 1996).
6. **Economic Impacts:** Deforestation, land degradation, and water resource depletion all carry an economic cost for the local population. So does the reduced availability of fuel, housing materials, medicines, and meat derived from nearby forests. The consequences of environmental degradation in the vicinity of refugee camps may be felt at considerable distances from the camps: soil erosion and resulting sedimentation can shorten the life of reservoirs, and erosion-related floods can destroy local infrastructure (UNHCR, 1996).

Environmental Components and Key Risks Due to Rohingya Influx

According to the UNDP Bangladesh and UN Women Bangladesh (2018), the following vital risks are selected for the Rapid Environmental Impact Assessment (REIA) based on reconnaissance observations and stakeholder feedback.

Table 3: The Rapid Environmental Impact Assessment (REIA) of Rohingya Influx. Source ⁷

Environmental Component	Key Risks/Indicators
Air quality	Impact of cooking on indoor air quality Dust degeneration from road traffic and wind erosion Air pollution from transport
Acoustic Environment	Noise from road transport
Groundwater	Groundwater depletion due to water extraction Groundwater contamination by filtrate from latrines and waste dumps
Surface water	Changes in water hydrology Changes in water quality
Soils and Terrain	Soil removal and erosion Land capability Changes in terrain that may cause land slides
Vegetation	Landscape and vegetation community diversity (land cover classes) Location of rare and threatened plants Abundance and diversity of species (biomass, number of species, degradation)
Wildlife	Habitat availability and fragmentation Abundance and diversity of species Mortality risk
Aquatic biology	Degradation of marine and freshwater ecosystems
Forestry	Extent of natural forest lands and community forests Volume of timber and timber productivity Volume of other non-timber forest products (e.g. bamboo, thatching materials, etc.)
Human health	Risk to human health from activities and living conditions in camps

⁷ Chart source: UNDP and UN Women Bangladesh 2018. Report on Environmental Impact of Rohingya Influx. Dhaka, Bangladesh, p 23. <https://www.undp.org/bangladesh/publications/report-environmental-impact-rohingya-influx>

Gender-based issues	Overcrowding, creating risks for women and girls with regards to their safety, security and vulnerability Unhygienic living conditions inside shelters increasing health risks to women and adolescent girls
Land-use	Protected and environmentally significant areas Agriculture Recreation and tourism Physical cultural resources
Waste management	Impact on human health from sanitation and management of solid waste and chemicals

Theoretical Foundation for Natural Resource Conflict

The abundance and scarcity of resources contribute to violence, inequality, conflict and societal instability (Bayramov, 2018). According to the neo-Malthusian perspective, if the demand of the larger population exceeds the supply of natural resources, population growth is assumed to contribute to decreasing natural resource access, eventually boosting competition over resources and leading to conflicts for survival (Mildner et al., 2011).

Homer-Dixon's Environmental Scarcity and Violent Conflict Theory (1994)

Homer-Dixon's (1994) research argued that resource scarcity can cause three forms of conflict: interstate conflict; group identity conflict, when scarcity leads to migration that causes ethnic conflict and competition with the host community; and insurgency, when scarcity leads to economic deprivation and triggers conflict (Homer-Dixon, 1999; Bayramov, 2018; Mildner et al., 2011). Homer-Dixon and Blitt (1998) contend that in numerous developing nations, sizable populations rely heavily on essential resources that are vital for food production, namely freshwater, cropland, and fisheries. The availability of these resources determines people's well-being, and scarcity of such resources can lead to violent conflict under certain conditions (Gleditsch & Urdal, 2002).

Homer-Dixon (1994) argues that environmental scarcity can contribute to violent conflict through various mechanisms: Homer-Dixon (1994) formulated a theoretical framework based on the examination of 16 cases, asserting that scarcity arises from three primary factors: the deterioration and exhaustion of natural resources like agricultural land, forests, water, and fish

stocks; population growth and elevated living standards, which lead to increased demand; and the uneven distribution of resources. Environmental scarcity is influenced by three primary sources, which frequently interact. These interactions commonly manifest in two distinct patterns: "resource capture" and "ecological marginalization" (Homer-Dixon, 1994).

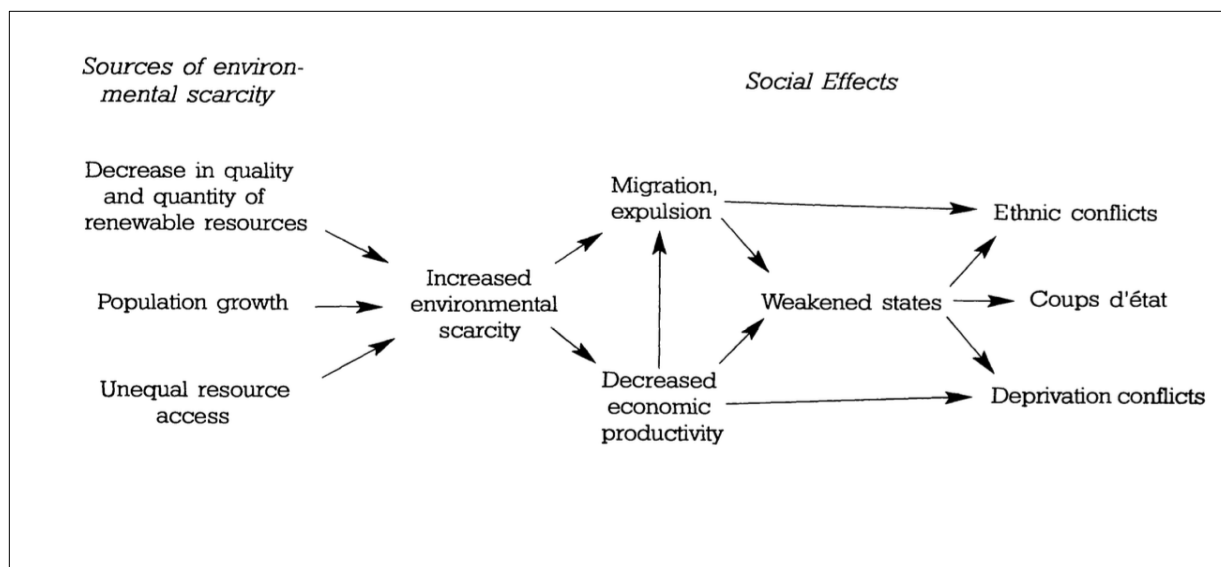


Figure 3: Homer-Dixon's view of the links between these forms of scarcity and armed conflict. Source ⁸

Homer-Dixon and Jessica Blitt (1998) categorize resource scarcity into three primary causes. ⁹

- **Supply-induced scarcity** refers to the condition that arises when natural resources are degraded or depleted. Unsustainable utilization can hinder the regeneration of a resource. (Homer-Dixon and Blitt, 1998).
- **Demand-induced scarcity** is primarily driven by population growth. When the resource base remains constant, the amount of resources available per person decreases as the number of people sharing it increases. (Homer-Dixon and Blitt, 1998).
- **Structural scarcity** pertains to specific groups that are denied equal opportunities to access specific resources. The unequal social distribution of a resource does not necessarily

⁸ Homer-Dixon, T. F. (1994). Environmental Scarcities and Violent Conflict: Evidence from Cases. *International Security*, 19(1), 5–40. <https://doi.org/10.2307/2539147>

⁹ see Thomas F. Homer-Dixon and Jessica Blitt, *Ecoviolence: Links Among Environment, Population and Security* (Lanham, MD: Rowman & Littlefield, 1998). p 6. Accessed from https://www.jstor.org/stable/pdf/24357893.pdf?refreqid=fastly-default%3Ad904eaf2732a559448f749d091082290&ab_segments=&origin=&initiator=&acceptTC=1

indicate a shortage, assuming that it would be distributed equally (Homer-Dixon and Blitt, 1998).

A simplified Figure 4 has been created to illustrate the key components of this relationship and its potential consequences. It provides a clear understanding of the potential environmental impacts of the increase in refugees entering the host country and the potential risk of conflict.

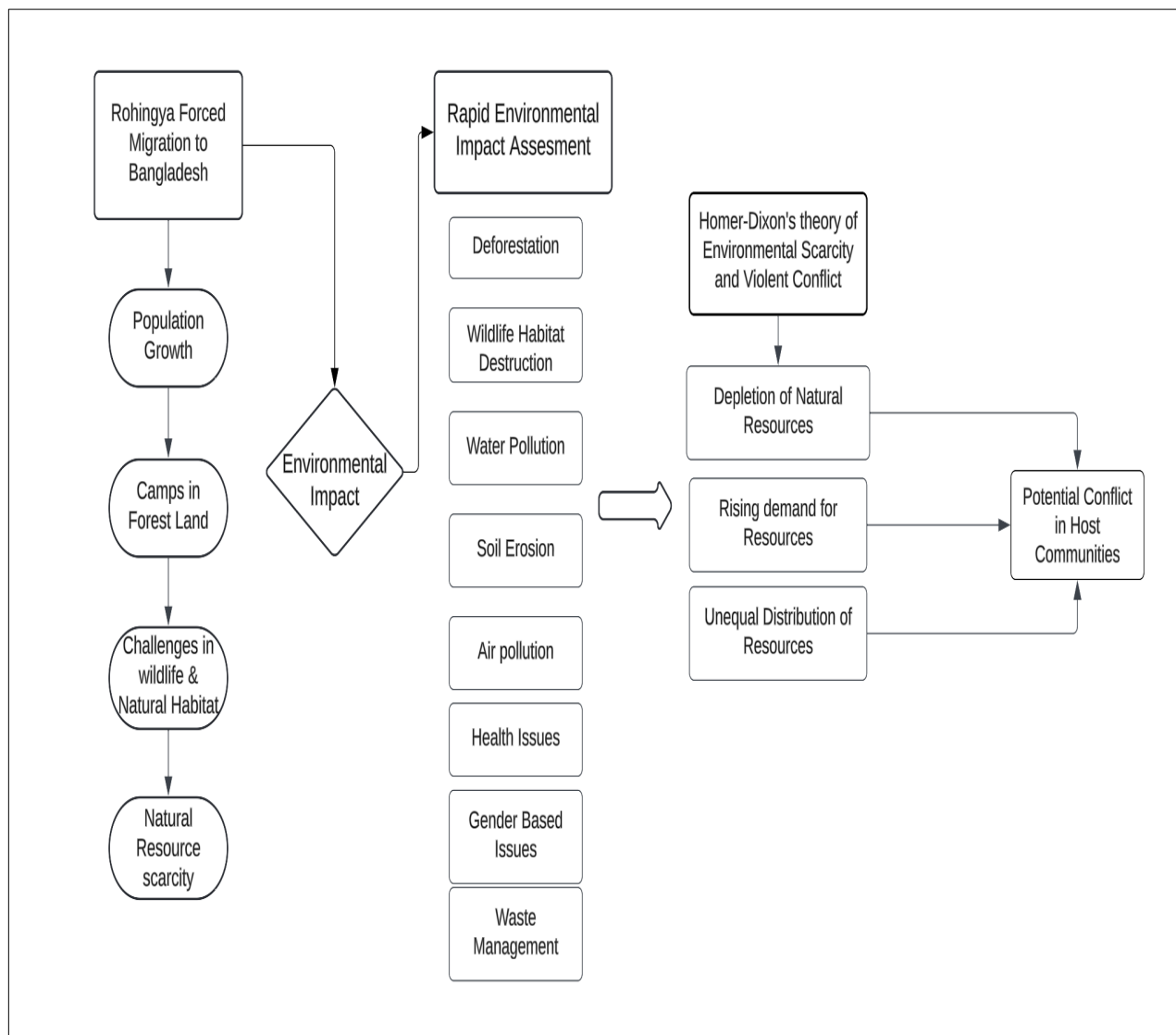


Figure 4: Theoretical and Conceptual Relevance of the Paper. Source: Homer-Dixon (1994); UNDP and UN Women Bangladesh (2018). Rapid Environmental Impact Assessment (REIA) of the Rohingya Influx.

Chapter 5: Methodology

Research Methodology

According to their literature, Creswell et al. (2007) suggest that a qualitative research design is appropriate for a study that heavily relies on prior research. A qualitative descriptive design is suitable as it acknowledges the problem's subjective nature and the participants' diverse experiences. It also presents the findings in a manner that directly reflects or closely resembles the terminology used in the initial research question (Bradshaw et al., 2017). This paper enhances the scholarly literature on the environmental consequences of the Rohingya crisis by analyzing the implications of the significant surge in the refugee crisis during and after August 2017 and its influence on the communities hosting the refugees in Cox's Bazar, Bangladesh. Thus, due to the nature and research question of the study, the qualitative method is applied in this research. This paper uses the Rapid Environmental Impact Assessment (REIA), which the UNDP Bangladesh and UN Women Bangladesh (2018) report applied, to identify the environmental impacts of the Rohingya people's forced migration. This paper employs Homer-Dixon's theory of environmental scarcity and violent conflict to assess the potential risk of conflict.

Data and Ethics

The completion of this graduate program necessitates the submission of a significant research paper as a fundamental prerequisite. Nevertheless, obtaining ethical approval from the Ethics Board is a prerequisite for collecting primary data, and this process typically takes more than six weeks to complete (Office of Research Ethics and Integrity, 2019)¹⁰. According to the university's regulations, the primary research paper must be completed within a single academic term (Academic Regulation C-8, 2023)¹¹. Consequently, the ethics board's approval was not required because all of the data used in this paper came from secondary sources.

Secondary data from peer-reviewed journal articles, books, and reports from international, governmental, and non-governmental organizations, as well as from grey literature, which consists

¹⁰ See <https://www.uottawa.ca/research-innovation/ethics>

¹¹ See <https://www.uottawa.ca/about-us/policies-regulations/academic-regulations>

of specific articles from print and electronic news sources, were gathered for the design and execution of this study. Furthermore, it includes articles published in digital and physical news media sources (Levy & Ellis, 2006). A vast majority of books and journal articles were studied to understand the historical timeframe of the Rohingya influx and the consequences of the environmental implications generated due to the forced displacement of the Rohingya people into Bangladesh. A range of keywords were used to search the databases from Google, Google Scholar, Pubmed, and ReseachGate, including "forced migration of the Rohingya," "history of Rohingya refugees," "the current situation of Rohingyas in Bangladesh," "environmental impacts of Rohingyas in Bangladesh," and "Rohingyas impact on wildlife." Textbooks, other pertinent literature, and peer-reviewed journals and articles were accessed through the University of Ottawa's "Omni Library."

Positionality

Positionality explicitly explains the researcher's position within intersecting and dynamic power relations. It requires attention to broader structures of inequality and how we, as researchers, (re)produce or challenge these structures in our research relationships (Clark-Kazak, 2023). Having been born in Bangladesh, the researcher of the paper has experience working for the government of Bangladesh. Nevertheless, this paper constitutes an autonomous research endeavour that must be completed to satisfy the requirements for graduation in the 'Public and International Affairs' field within the Graduate School of Public and International Affairs (GSPIA). The researcher of this paper is currently on study leave from the government of Bangladesh, and it should be noted that this paper maintains a neutral and independent standpoint, separate from the perspective of the Bangladesh government.

Study Context

More than 1 million Rohingya now live in 33 temporary camps in and within the host communities of Ukhiya and Teknaf, which are the subdistricts of Cox's Bazar District, which is the furthest eastern and southern part of the Chittagong Division (Figure 5) (Ullah & Chatteraj, 2022). The region comprises 2,491.85 square kilometres of predominantly flat coastal land, with large areas of mixed agricultural land and rugged forested hills further inland (Lewis, 2018). Both subdistricts

are socio-economically disadvantaged; 33% of the population lives in poverty (ISCG, 2018). According to a 2014 Bangladesh Bureau of Statistics report, Ukhiya has a local population 207,379, while Teknaf has 264,389 inhabitants. Total residents are now substantially fewer than the number of Rohingya refugees. Local agriculture, forestry, marine and cultivated fisheries, and ecotourism services provide natural resources and ecosystem services essential for human survival (Tallis et al., 2019).

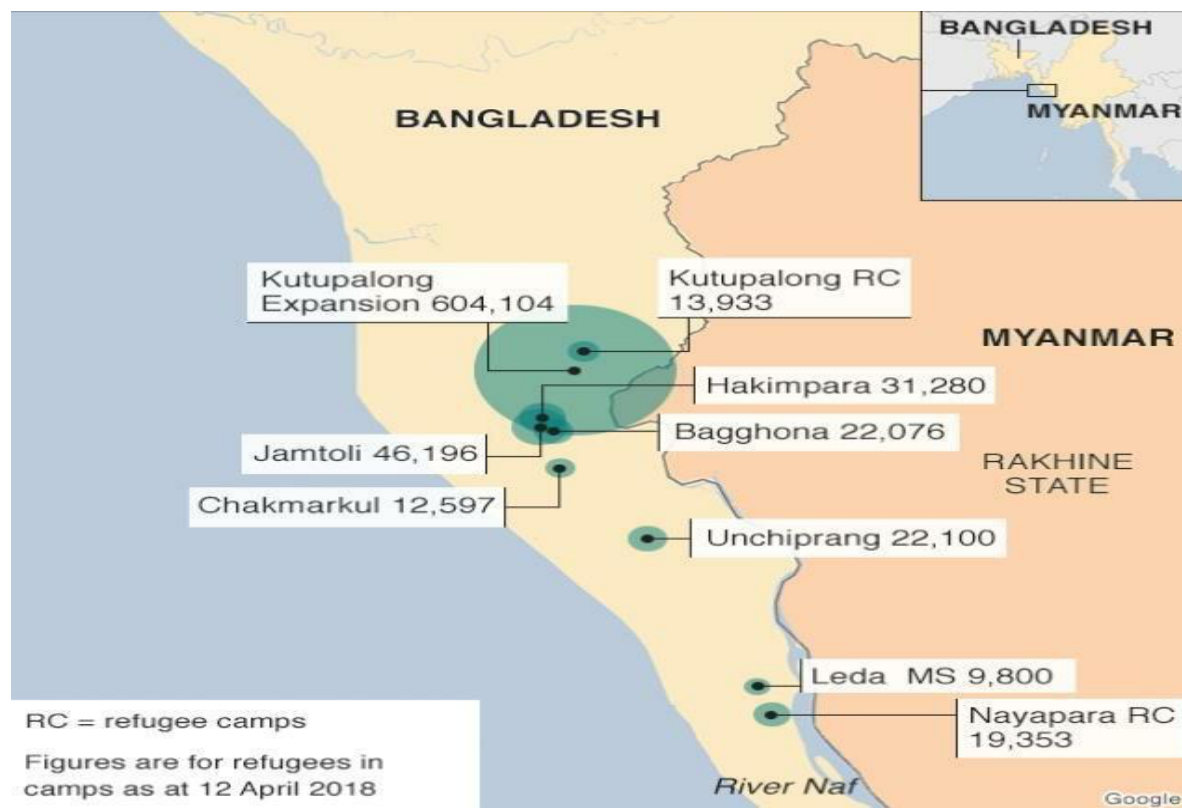


Figure 5: The location of refugee camps in Bangladesh ¹² Source ¹³

According to a previous study, the district has a forest cover exceeding 25%. This includes 11,615 hectares of declared wildlife sanctuaries, such as the Teknaf Wildlife Sanctuary, and an estimated 10,849 hectares of protected forests (Hossen et al., 2019). The forest habitat is home to various plant and animal species, such as birds, monkeys, snakes, and bats. Previous studies reported that

¹² see

https://www.researchgate.net/publication/334169086_Landslide_susceptibility_mapping_of_refugee_camps_in_Bangladesh/figures?lo=1

¹³ see Inter-Sector Coordination Group, from <https://www.bbc.com/news/world-asia-41566561>

the Asian wild elephant is one of this area's most threatened and gravely endangered species (Tallis et al., 2019; Hassan et al., 2018).

Chapter 6: Findings and Analysis

This section discusses the study results from the Rapid Environmental Impact Assessment (REIA) framework point of view and analyses the conflict perspective in relation to Homer-Dixon's theory of environmental scarcity and violence conflict.

Environmental Impacts Due to Rohingya Influx

Cox's Bazar, which hosts over a million Rohingya refugees from neighbouring Myanmar, is one of the most climate-vulnerable and economically disadvantaged regions of Bangladesh (Khan & Dempster, 2019). The locals of Cox's Bazar used to depend exclusively on local agricultural and forest resources for their livelihood, but the arrival of the Rohingya increased the population and destroyed the diversity of natural resources (Habib, 2022). The development of refugee camps, the exploitation of natural resources by the refugees, and the relief efforts of various assistance organizations all harm the host communities' poorer members (Khaled, 2021). The presence of Rohingya refugees in the camps and surrounding areas negatively affects the environment and natural resources due to deforestation, land degradation, water resource depletion, rapid biomass reduction, loss of vegetation and species, damage to wildlife habitats, increased mortality risks of wildlife, levelling of hills, and soil erosion (Hammer & Ahmed, 2020; Khaled, 2021).

The destruction of over 4500 acres of hill lands and forests was needed to provide makeshift dwellings for the Rohingyas (UNDP, 2018), and it is unlikely that these forests will be able to recover within the next two decades (Bussabong Chaijaroenwatana, 2021; Hammer & Ahmed, 2020). In one year, between December 2016 and December 2017, the Kutupalong-Balukhali Rohingya camp, known now as the world's largest refugee camp, extended from 146 hectares to 1365 acres (Hassan et al., 2018). The estimated value of the occupied forest is five billion BDT, although there is limited focus on predicting the short-term and long-term impacts on the environment (Babu, 2020). Furthermore, the Rohingya engage in deforestation to satisfy the demand for 2250 tons of firewood, which is required for cooking (Hammer & Ahmed, 2020). A

UNDP (2018, p. 126) report shows a 3.4 million-litre demand for drinking water and a 13.8 million-litre demand for household water per day in the Rohingya camps in Cox's Bazar. The excessive demand for tube well groundwater has caused the water level in the refugee settlement area to drop, negatively impacting rainfall due to deforestation (UNDP, 2018). Therefore, the Rohingya influx has had a significant impact on local forests and has intensified the natural resource conflict in the Cox's Bazar area (Dekrout, 2018).



Figure 6: The deforestation of the hills to accommodate refugees has increased their susceptibility to landslides. Source ¹⁴

Environmental impact assessment through the key indicators of Rapid Environmental Impact Assessment (REIA)

1. Air quality-

According to the study by UNDP and UN Women (2018), the air quality in the influx area has slightly deteriorated along the roadside areas of the camps because of increased traffic. The inhabitants have reported suffering from the dust generated from the loose soil when strong winds

¹⁴ Image: picture-alliance/AP Photo/M. Swarup. See <https://www.dw.com/en/bangladesh-deforestation-leaves-rohingya-refugees-vulnerable/a-58703683>

blow; severe dust pollution during stormy winds is an issue (UNDP & UN Women, 2018). The indoor air pollution from cooking in the camps is severe and has a significant impact, especially on women and children. Particulate matter, carbon dioxide, sulphur oxides, and CO are all released when firewood is burned, and they are all very harmful (UNDP & UN Women, 2018).

2. Acoustic Environment-

As stated in the report by UNDP and UN Women (2018), the primary source of noise in the camps is the heightened traffic on Cox's Bazar-Teknaf road. The noise generated has a negligible effect on the settlements, as most camps are far from the road. Sound is produced at specific intervals during the distribution of relief materials (UNDP Bangladesh and UN Women, 2018).

3. Groundwater and Surface water-

The declining water level adversely affects refugees' access to water for their livelihoods (Ahmed et al., 2021). Over 5,700 deep tube wells were installed in the camps after the arrival of the Rohingya in 2017 (UNDP, 2018). The water levels in the camp areas decreased by 5–9 meters, as reported. (UNDP, 2020). Due to distance and the number of hours spent waiting in lines, 56 percent of households in the Rohingya refugee camps had difficulty accessing water delivery points (ISCG, 2020). However, a recent water quality analysis reveals that 52% of tube wells still contain detectable levels of E. coli contamination (Akhter et al., 2020). Groundwater contamination from these facilities' leakage, seepage, and overflow is reported (UNDP & UN Women, 2018). The results of groundwater samples from different camps (Kutupalong and Balukhali) for the E. coli test by the Emergency Response Unit of the International Red Cross paint an alarming picture. About 70% of the samples were observed to be heavily polluted.¹⁵

Surface Water- There is a shortage of surface water, the shallow water aquifer is drying up, and the deeper aquifer's water availability is still being determined (UNDP & UN Women, 2018). The

¹⁵ Red Cross. Emergency response unit. Lab report. IFRC ERU M40 lab tests on the water from 135 wells across the Balikahli 02, Hakimpara and Burma Para settlements. 28.9.2017 – 7.11.2017

primary water sources, such as the Naf River and other major channels, are located at a considerable distance and have high levels of salinity and brackishness, particularly in the lower sections of the rivers (UNDP & UN Women, 2018). The shallow water aquifer is drying up, and the deeper aquifer's water availability is still being determined (UNDP & UN Women, 2018). Heavy rainfall pollutes the surface water sources and spreads waterborne diseases, as both communities depend on ponds, canals, small water streams, and the Naf River for their daily activities. Few freshwater sources in the Teknaf area increase tensions (Halim et al., 2021).

4. Soils and Terrain-

The Rohingya, NGOs, and government agencies levelled most of the hills to prepare over 4000 acres of land in Teknaf and Ukhiya to build houses at the camps (Quader et al., 2021). Weak soil structure has accelerated the process of soil erosion, and the topsoil and other loose soils have become highly susceptible to being blown away in rain or stormy winds (UNDP & UN Women, 2018). Levelling the hills has eroded the soil and caused sedimentation and siltation; the eroded soil may hamper stream flow, increase water pollution and water scarcity, and result in the loss of habitats. Vegetation cannot grow on the hills now, and deforestation has exacerbated the risk of landslides and inland floods in the camp areas (Mahmud, 2017; Quader et al., 2021). According to the report by UNDP and UN Women (2018), 50% of the hills in the influx area had been completely denuded. Out of 27.76% of the settlements in the Kutupalong RC and Kutupalong extension campgrounds, 0.35% are at risk of landslides, and 9.61% are at risk of floods (Quader et al., 2021).

5. Vegetation-

Cultivable land was insufficient even before the refugees arrived, agricultural production was low, food prices were high, and the economy was insecure (Khaled, 2021). Most of the large makeshift camps were established in Kutupalong and Balukhali, and other areas in Cox's Bazar, by clearing over 3000 ha in Ukhiya, Whykong, and Teknaf of vegetation and trees and using the timber to build settlements and for fuel wood (Habib, 2022). Between 2017 and 2019, 33 camps were set up; nearly 79.57% of the vegetative cover was lost in the area, and 14% of the vegetative cover in Ukhiya-Teknaf vanished overall, according to satellite-based monitoring results (Karim & Zhang, 2021).

The Bengalis, Rakhaines, Chakmas, and Rohingyas coexist in this region. The primary sources of income for locals were collecting forest resources, fishing, agriculture, business, and daily labour (Mowla & Hossain, 2021). Within six months of the arrival of the Rohingyas in 2017, nearly 100 ha of cropland in Teknaf and Ukhiya were spoiled. Humanitarian agencies have occupied almost 76 ha of arable land (UNDP, 2018) to establish warehouses, branch offices, and relief operations. Imtiaz (2018) reported that the vegetation cover in the Teknaf Upazila and Teknaf Wildlife Sanctuary experienced a reduction of 1284 ha and 103 ha, respectively, in late 2017 (Imtiaz, 2018). In the long term, more than 61% of the plantations and remnants of natural forest may be degraded and converted to shrubland due to the influx (UNDP & UN Women, 2018).

6. Wildlife-

The influx of the Rohingya population has had a substantial impact on the adjacent forests and has heightened the conflicts between humans and wildlife in southeastern Bangladesh (UN Environment, 2018). According to Motaleb and Ahmed (2016), a total of 268 wild elephants that live in Bangladesh, 93 elephants that migrate to Bangladesh, and 96 elephants that are kept in captivity have been documented so far. Because of the massive influx of refugees, elephants are losing their homes, and they are becoming wild and attacking people as the forests are destroyed. 17 Due to the construction of temporary relocation camps in or near wild elephant corridors, there have been multiple conflicts between Rohingya and elephants. The rapid degradation of forested land in these areas will lead to ecological problems and disrupt wildlife habitats (Hasan et al., 2018). Both the host and Rohingya communities are encroaching on the habitat of resident and migratory elephants in the Cox's Bazar Forest Division, which is causing a persistent reduction in their habitat and food availability. The globally endangered Asian elephant (*Elephas maximus*) is 'critically endangered' in Bangladesh. ¹⁶

The 2018 report by UNDP and UN Women highlights the substantial adverse effects of makeshift camps on wildlife. These effects include food shortages, reduced habitats, and disturbances in breeding grounds, impacting various types of wildlife, including those active during the night, twilight, dawn, and daytime. The Teknaf Wildlife Sanctuary covers an area of 11,615 hectares and

¹⁶ see Motaleb MA, Ahmed MS, 2016. Status of Asian Elephants in Bangladesh. IUCN-International Union for Conservation of Nature, Dhaka.

is home to a wide variety of plants and animals. It contains 538 plant and 613 animal species, including Asian elephants (Mannan, 2017). Arboreal species are at high risk of extinction because of the ongoing decrease in natural forest areas (UNDP & UN Women, 2018). The IUCN has already listed the forest species that are threatened in Bangladesh. This covers most species still found in the TWS, the Himchari National Park, and the proposed Inani National Park in Cox's Bazar. Clearing vegetation and degradation of forest land significantly impact landscape diversity, vegetation abundance, and species diversity.¹⁷

7. Aquatic biology-

According to the UN Environment (2018) report, all 21 canals and streams were thoroughly contaminated. Over 100 tons of non-reusable waste, excluding plastics and polythene, are gathered monthly in the camps. Furthermore, the degradation of marine resources, the acoustic environment, and air quality have occurred rapidly and alarmingly, in addition to the decline in local biodiversity (UN Environment, 2018).

8. Forestry-

The 2019 report of the Ministry of Environment, Forest and Climate Change of Bangladesh suggests that a total of 6164.02 acres of reserved forest, consisting of 4136.52 acres of natural forest and 2027.50 acres of planted forest, have been cleared to build Rohingya settlements in Cox's Bazar region. The report also states that the Rohingya refugees have cleared trees on 1837 acres of reserved forest, comprising 580 acres planted and 1257 acres of natural trees, for use in cooking, with a total cost of more than Tk 135 crore.¹⁸

About 92% of the local households in Cox's Bazar rely solely on forest resources for firewood for cooking (UNDP, 2018) and for medicines and food. The Rohingya, particularly women and children, collect fuelwood from the forests and sell it at the local market; only 1% obtain fuelwood from aid agencies, 33% purchase it in local marketplaces, and 65% collect it from the surrounding

¹⁷ IUCN Bangladesh. 2000. The Red Book of Threatened Mammals in Bangladesh. IUCN-The World Conservation Union, Dhaka. IUCN Bangladesh. 2002. Bio- Ecological Zones of Bangladesh. Dhaka, IUCN Bangladesh Country Office.

¹⁸ Assessment of Fuel Wood Supply and Demand in Displacement Settings and Surrounding Areas in Cox's Bazar District (Food and Agricultural Organization of the UN and International Organization for Migration, 2017), 33–5.

forests (IOM, 2017). It is claimed that almost 1.67% of the forest area in Cox’s Bazar and 0.05% of the total national forest area have been destroyed (Babu, 2020; Khatun & Kamruzzaman, 2018). Teknaf Wildlife Sanctuary, Himchari National Park, and Inani National Park—all biodiversity areas famous in Cox’s Bazar—are threatened on account of population growth, the movement of the Rohingya, and the construction of housing, schools, water supply, and sanitation facilities (Ministry of Environment and Forests et al., 2018). According to the UNDP and UN Women (2018), the forest area of the Teknaf Wildlife Sanctuary (TWS) decreased from 3,304 hectares to 1,794 hectares between 1989 and 2009, representing a reduction of 46 percent (UNDP & UN Women, 2018). The tension between the two communities over forest resources is escalating.

Table 4. Deforestation caused by the Rohingya refugee influx (April 2018).

Location	No. of refugees staying at site	Occupied land (acres)	Destroyed project forest area (acres)	Destroyed natural forests (acres)	Losses from forestation projects (Tk. mil)	Losses from natural forests (Tk. mil)	Total loss (Tk. mil)
Ukhiya, Cox’s Bazar							
Kutupalong	218,000	1,767.5	570.0	1197.5	508.9	1,019.1	1,528.0
Balukhali 1 & 2	126,900	1,114.0	550.0	564.0	704.5	480.0	1,184.5
Balukhali Dhala	63,000	310.0	152.7	157.3	136.3	13.4	149.7
Tajnimar Khola	56,250	451.0	192.5	258.5	199.1	220.0	419.1
Hakimpara, Mokkarbeel, Jamtolee, & Begghona.	93,550	516.0	281.0	235.0	333.4	200.8	534.3
Shofillyakata (East & West)	13,000	201.2	92.5	108.7	96.2	92.5	188.7
Teknaf, Cox’s Bazar							
Kerontoli & Chakmarkul	16,020	79.8	78.8	100.0	60.5	0.9	61.3
Putibunia	30,000	88.6	0.0	88.6	0.0	75.4	75.4
Nayapara	20,100	245.0	82.0	163.0	100.0	138.7	238.7
Leda	15,000	45.0	0.0	45.0	0.0	38.3	38.3
Total:	651,820	4,818.1	1,999.5	2,917.6	2,139	2,279.1	4,472.7

Source: Impacts of the Rohingya Refugees Influx on Host Communities (UN Development Programme, 2018), 68.

In the Ukhiya, Whykong, and Teknaf forest ranges in southeast Bangladesh, which is the region that is close to the Myanmar-Bangladesh border, a total of 3713 acres (1502 ha) have been used

for the immediate construction of temporary Rohingya makeshift settlements (UNDP & UN Women, 2018). Hasan et al. (2021) conducted a recent study utilizing a multi-criteria evaluation method to evaluate the state of the forest vegetation. Based on the spatial severity of impact (SSI) index, 650 hectares out of the total degraded forest area of 5415 hectares are projected to incur the highest cost between 2017 and 2027 (Hasan et al., 2021). The environmental integrity (EI) index evaluated the area's significant decline in ecosystem integrity, decreasing from 1340 ha in 2018 to 1190 ha in 2019. It is further projected that in 2027 the integration will diminish, reaching 740 ha (Hasan et al., 2021).

Fuelwood and Bamboo Use- The IOM and FAO (2017) report shows that the average demand for fuelwood per day per person was 0.7kg before the August 2017 influx. As shown in the FAO report, there are currently estimates of 6,800 tons of fuelwood needed each month by the Rohingya population in the forest ^{19 20} (IOM and FAO, 2017).

Table 5: Demand for biomass and fuelwood of Rohingya in the influx area, Cox’s Bazar, Bangladesh.

Parameter	Buffer of 5 km	Buffer of 10 km
Total biomass available from natural forest (tons)	28,100	74,300
Total biomass available from plantations	124,100	211,600
Biomass required for 650,000 Rohingya (tons/month)	6,825	6,825
Time required to consume all available fuelwood from natural forest	4 months	11 months
Time required to consume all available fuelwood from plantations	18 months	31 months

Source: Rapid Environmental Impact Assessment done by UNDP, and MoEF, 2017.

¹⁹ IOM & FAO (2017). Assessment of fuel wood supply and demand in displacement settings and surrounding areas in Cox’s Bazaar District, Dhaka, Bangladesh (to be published).

²⁰ Assuming 0.7 kg of dry fuel wood per person per day, 30 days, 650,000 people, and 50% of required fuel collected in the forest.

The most significant change in forest degradation occurred between 2017 and 2020. Some of the impacts of deforestation and settlement expansion in the area include habitat and ecosystem degradation, biodiversity loss, human-wildlife conflict, soil erosion, hill cutting, carbon-dioxide emission, and loss of recreational and cultural ecosystem service values (Hassan et al., 2018; Hossen et al., 2019; Tallis et al., 2019). In prior literature, forest loss in Cox’s Bazar has been attributed to several mechanisms. These include (a) settlement expansion, (b) development of economic activities, facilities, services, and infrastructural projects, (c) high fuelwood demand leading to loss of forest, and (d) increased population and growing in-migration flow (Tani & Rahman, 2018; UNDP & UN Women, 2018).

Based on a study (Dampaha et al., 2022) utilizing remote sensing and econometric methods, it has been determined that deforestation has increased since 2017 compared to previous years. The district experienced a significant decrease in forest cover, with a decline of approximately 20 percent between 2017 (before the arrival) and 2020 (after the arrival). This corresponds to an annual loss rate of 6.7 percent.

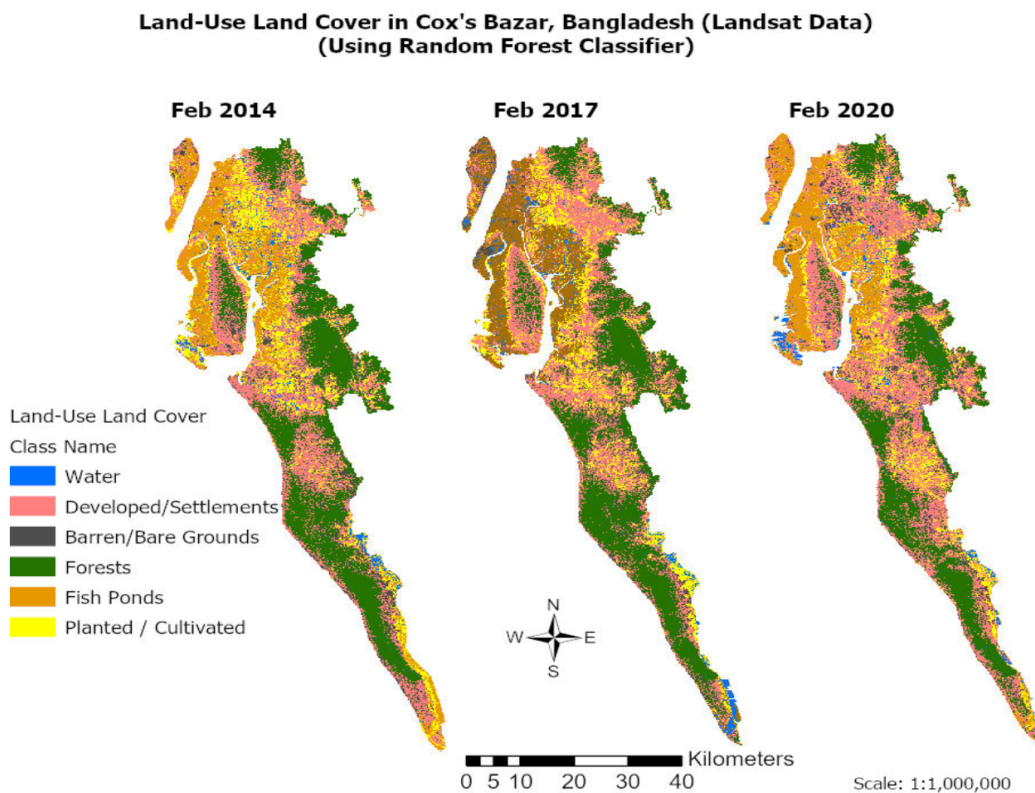


Figure 7: LULC composition of the study area, Cox’s Bazar, Bangladesh, using a small-scale map.

The maps show how the 2014 and 2017 pre-arrival periods differ visually (at a small scale) from the LULC composition of the area in 2020, post-arrival of Rohingya refugees. Source ²¹

The decrease in forest cover is linked to the expansion of residential areas throughout the district (Figure 7, Figure 8). The 2020 settlement areas experienced 21 percent growth compared to the estimated period before 2017 (Dampha et al., 2022).

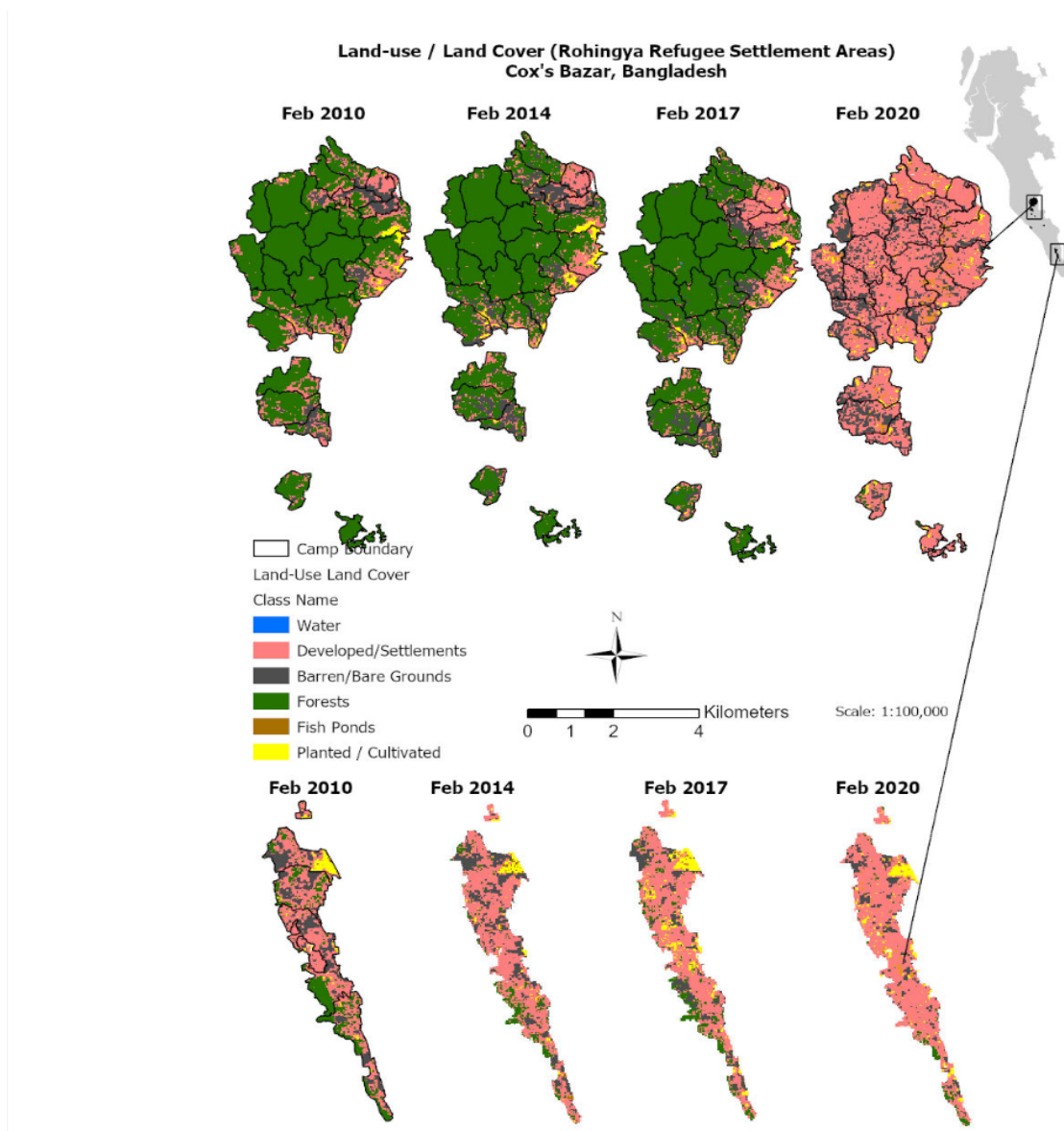


Figure 8: LULC Composition of the Current Rohingya Refugee Campsites in Cox's Bazar,

see Dampha, N. K., Salemi, C., & Polasky, S. (2022). *Rohingya refugee camps and forest loss in Cox's Bazar, Bangladesh: An inquiry using remote sensing and econometric approaches*. The World Bank.

Bangladesh, using a large-scale map. The maps show the composition of the sites in the 2010, 2014, and 2017 pre-arrival periods relative to the landscape configuration in 2020, post-arrival of Refugees to the area. Source²²

Figure 8 shows that forest transitions to settlement, including the expansion of refugee camps, are the primary determinants of LULC change, particularly in the district's southern area. The largest refugee campsite, the Kutupalong-Balukhali compound, gained a net settlement growth of 1,219 ha between 2016 and 2017 (from 146 ha to 1,365 ha) (Dampha et al., 2022). The annual per capita fuelwood consumption in Teknaf was estimated at 1,168 kg (Tani & Rahman, 2018). The Rohingya refugees collected an estimated 6,800 tons (6,800,000 kg) of fuelwood each month before the launch of the pilot phase of the liquefied petroleum gas (LPG) project in August 2018 (UNDP & UN Women, 2018). Besides fuelwood, both Rohingya refugees and the local population rely on bamboo sticks from the forests for shelter construction and other uses.

9. Gender-based Issues and Human Health

Women and girls are at an increased vulnerability to violence and mistreatment while gathering firewood in the forest, especially those from households with women or children (UNDP & UN Women, 2018). The risks include gender-based violence, trafficking, encounters with elephants, and potential conflicts with local communities whose survival depends on the depletion of natural resources (UNDP & UN Women, 2018). Further, recent FAO, IOM, WFP, and UNHCR assessments indicate that securing alternative fuel and improved cooking stoves is a key practical and strategic gender issue for Rohingya women and girls. As a result of strict gender-defined roles, the burden of household work, and highly conservative social norms, Rohingya women spend a significant amount of time inside the shelters. They express serious concerns about inhaling toxic emissions and experiencing high heat from cooking inside inadequately ventilated shacks, which result in health issues such as respiratory problems and eye infections. Uncontrolled construction of latrines by different humanitarian service providers, the private sector, and individuals without

²² see Dampha, N. K., Salemi, C., & Polasky, S. (2022). *Rohingya refugee camps and forest loss in Cox's Bazar, Bangladesh: An inquiry using remote sensing and econometric approaches*. The World Bank.

conforming to standard practices and a lack of awareness of the risks they are likely to pose have created a sanitation hazard in the camps (UNDP & UN Women, 2018).

10. Waste management-

The UNDP report (2018) identified the impact as moderate to severe. According to Zaman (2019), the Rohingya population in Cox's Bazar produces a monthly waste amount of 10,000 tons, which has detrimental effects on both the environment and public health. The exact quantity of waste generated daily at the camps is unknown to researchers.

Environmental Degradation Leads to Conflict: An Analysis Based on the Homer-Dixon Theory

Refugees need more access to income-generating activities and might use natural resources unsustainably (Jacobsen, 1997). The resources in Cox's Bazar were limited even before the Rohingya arrived, and the host communities in Teknaf and Ukhiya felt that their government ignored them and forced them to compete with the refugees (Khaled, 2021). This sentiment has bolstered the host communities' sense of self, incited opposition towards refugees, and caused them to view themselves as a distinct group separate from the refugees despite sharing cultural, linguistic, and religious similarities (Khaled, 2021). Coser (1956) distinguished between two types of conflict: internal (inside a group) and external (between groups). External conflict creates a division between groups, "us" and "them," and speeds up social integration (Coser, 1956).

Homer-Dixon's (1994) research suggests that diminishing supplies of physically manageable environmental resources, such as clean water and fertile agricultural land, would trigger interstate conflicts known as "simple scarcity" conflicts or resource wars. Homer-Dixon (1994) proposed that severe environmental scarcity would lead to economic deprivation and the disruption of important social institutions. This, in turn, would result in conflicts characterized by "deprivation," such as civil strife and insurgency.

The Rohingya have been resettled in almost 793 hectares of natural forestland in Cox's Bazar (Yasmin & Akther, 2019), and large portions of forest and conservation areas in Ukhia and Teknaf sub-districts have been demolished to build settlements and meet fuel demands (Uddin & Khan,

2007; Yasmin & Akther, 2019). Its demand for resources is enormous, and it exhausts natural resources and increases the rivalry between locals and the Rohingya (Rahman, 2010). The associated environmental destruction is causing ecological imbalance, climate change, and long-term economic loss (Hammer & Ahmed, 2020; UNDP, 2018). There is also no development of infrastructure and resources in the area to accommodate the nearly two million refugees and locals. The cows of the host community cannot graze on the land, and the excessive withdrawal of underground water by tube wells newly installed in the camps is reducing the groundwater level and may create a water crisis (Yasmin & Akther, 2019). Many Rohingya families collect daily fuel from the local forest, limiting the local community's access to natural resources (Cairns, 2017; Rahman, 2010).

The demographic imbalance in the area makes local people feel insecure and worried about the impact of the influx of refugees on their residential areas. The Rohingya are behaving aggressively and are involved in antisocial activities, which has created an unhealthy relationship with local Bangladeshi people (McDonald, 2017; Zafar, 2020). The unfair competition for limited opportunities and resources creates a conflict between these ingroup and outgroup communities (Zahed, 2023). The discontinuation of the social plantation/forestry initiative aimed at building shelters for refugees and the withdrawal of foreign assistance directed towards the refugees have resulted in financial hardships for the local impoverished population. The situation has exacerbated the tension between the refugees and the host communities (Babu, 2020).

Since the locals have to share their limited resources with more than a million constrained refugees, they consider Rohingya refugees rivals (Habib, 2022). Many locals consider the Rohingya influx to be like a “poisonous boil” or “an unexpected bone of our throat,” as the local people feel unsafe because of the demographic imbalance that the Rohingyas have caused (Zahed, 2023). Further, the locals raise their concern regarding the financial loss the local people have borne as they lost the social forestry plantation project to make room for Rohingya shelters (Zahed, 2023).

Since December 2020, the government of Bangladesh has relocated nearly 20,000 Rohingya to Bhasan Char, a muddy island in the Bay of Bengal, in an effort to lessen the negative social, economic, and environmental effects in the region as well as to manage the growing hostility

between the host communities and refugees (Human Rights Watch, 2021). Recently, the Bangladesh government imposed restrictions on refugees' freedom of movement and their use of Cell phones and the internet (UNHCR, 2019b). The government has erected watchtowers, installed surveillance cameras, and fenced off certain refugee settlements.

Chapter 7: Limitations of the Study and Contributions

Limitations of the study

Upon completion, the limitations of any research project become apparent. For a variety of pragmatic reasons, the study has its limitations.

- The study primarily focused on analyzing data from the Teknaf and Ukhia regions. Furthermore, this study specifically targeted the refugees who arrived subsequent to August 2017. Hence, the findings depict the fundamental consequences the local population experiences due to the substantial influx of refugees. Nevertheless, the enduring consequences of a substantial influx of refugees may require additional investigation.
- Considering the study design and the duration of the master's thesis, this study explored the available secondary data from relevant resources. The methodology was qualitative data collection and analysis. Primary data obtained through quantitative research methods could represent more distinguished results in future research.
- The majority of the data examined in this study originates from the pre-COVID era, namely prior to 2020. Due to COVID-19 quarantine measures and restrictions in camp areas, published scholarly articles and research papers are limited in availability.
- This research lacks inclusiveness and is represented in terms of gender and vulnerable groups of the population from both the host and refugee communities, as most of the earlier research focused mainly on the overall population as a whole. Additional resources and fieldwork interview methods would help overcome these drawbacks.

Theoretical, Practical Implications, and Contributions

Several studies have reviewed the impact of refugees on natural resources and the resulting conflicts with host communities, primarily in African countries (Maxwell & Reuveny, 2000). In

the context of South Asia, similar cases were examined in Sri Lanka, especially in Puttalam, where there were natural resource conflicts between the host population and refugees (Brun, 2001; Chatteraj, 2017, 2022). In the case of Bangladesh, however, significant studies have yet to be conducted on these issues. This study improves our understanding of the environmental consequences of the Rohingya refugee influx in forested areas, as well as the effects on the physical and social environment. Further, it examines the conflict that arises between the refugees and the local people in Bangladesh.

Practical Implications:

The Bangladesh government has received global acclaim for its expeditious handling of the Rohingya situation. However, Hammer and Ahmed (2020) have found that more consideration needs to be given to the potential immediate and long-lasting effects of the refugees' presence on the local ecosystem and natural resources in the context of Bangladesh. These findings can offer valuable insights to policymakers, humanitarian organizations, and local authorities on the specific environmental challenges Rohingya refugees and host communities face in Cox's Bazar, Bangladesh. The study also emphasizes the importance of sustainable forest resource management, particularly in developing countries like Bangladesh, where marginalized communities rely heavily on forests for survival. In addition, the study raises awareness about potential social conflicts that arise between the Rohingya and host communities. Therefore, the findings and practical recommendations presented in this paper can be advantageous for governments, policymakers, and stakeholders in dealing with resource conflicts between refugees and host communities, as well as addressing natural resource-related problems, prior to formulating any refugee policy.

Theoretical Implications:

The presence of refugees in Cox's Bazar, Bangladesh, has strained relationships between the two groups, and the interaction between the host population and refugees can escalate into a conflict due to various factors (UNDP & UN Women, 2018). The study investigates the relationship between forced migration, environmental degradation, and conflict dynamics in Cox's Bazar. It focuses explicitly on how Homer-Dixon's theory of environmental scarcity and potential violence applies to this context. The study contributes to existing theoretical frameworks and advances

scholarly discourse on the complex connections between refugee crisis-related environmental consequences and conflict.

Contributions:

The study examined the protracted Rohingya refugee crisis since it exemplifies the intricacies of the interconnections between climate change, conflict, displacement, and environmental hazards. Additionally, the present-day refugee crisis is extensively recorded, enabling the collection of a substantial number of secondary materials and published works, such as peer-reviewed papers, media reports, and articles. This study investigates the environmental consequences of the Rohingya refugees' forced migration to Bangladesh, specifically focusing on how it affects the susceptibility of the host populations to climate-related dangers and threats. The potential conflict due to environmental deterioration has heightened the vulnerability of both the refugees and host populations. Currently, there needs to be more extensive research on the environmental consequences resulting from the significant inflow of Rohingya refugees who relocated to Bangladesh after August 2017. Hence, this study has the capacity to enrich different fields including environmental studies, forced migration, conflict resolution, and humanitarian aid through the valuable insights it provides from its findings.

Prospects for Further Research:

The study's limitations accurately point to new areas for future research on this subject and areas for improvement. There is a great deal of room for more research on the subject, especially given the limited resources at hand and the master's thesis's scope. By conducting extensive fieldwork, the researcher will have the opportunity to explore areas beyond Ukhia and Teknaf, resulting in a more comprehensive understanding of Cox's Bazar district and its host communities. Conducting a comparative qualitative study would be a valuable future research endeavour. The study would involve comparing the current research findings with existing literature to identify comprehensive outcomes regarding the similarities and differences in hosting refugees in other regions. Furthermore, there is a dearth of previous research on the Rohingya crisis as an eco-conflict; nevertheless, a picture of the environmental layers of the crisis can be created by looking at Bangladesh's location and degree of degradation and natural disasters.

Chapter 8: Conclusion and Recommendations

Recommendations

Bangladesh has effectively handled this massive refugee influx and spent considerably on hosting Rohingyas, but its policy towards them is confused and disorganized. The government policies lack long-term strategies for international diplomacy, refugee absorption, border security, and Rohingya repatriation (Habib, 2021). The GoB strategy is to group the Rohingya in a set of large camps (in the Kutupalong and Balukhali areas) and relocate part of the Rohingya to Bhashan Char,²³ rather than deal with a multitude of small camps located across the Teknaf and Ukhia upazilas (UNDP & UN Women, 2018). This plan appears feasible from a management standpoint, but it will require a lot of work to sustain the operations of large camps close to environmentally sensitive areas with limited water and forest resources.

Nevertheless, the accurate solution to the Rohingya crisis lies in Myanmar through Myanmar's full implementation of the recommendations of the Advisory Commission on Rakhine State, which would pave the way for peace for and between all communities in Rakhine State and enable the voluntary, safe, dignified, and sustainable repatriation of Rohingya refugees (UNHCR, 2021a). However, according to the UNHCR (2024)²⁴ standing committee meeting update, in October 2023, Bangladesh and Myanmar organized a second “come and tell” visit during which Myanmar authorities travelled to Bangladesh to meet refugees, while Bangladesh continues to offer sanctuary to some 969,000 Rohingya (UNHCR, 2024).

This current situation reveals the barriers to the voluntary repatriation of the Rohingya people soon. Hence, this paper presents the following recommendations to address the environmental impacts of the Rohingya crisis, considering their extended stay in Bangladesh and the limited prospects of returning to Myanmar in the foreseeable future.

- The implementation of an improved resettlement strategy for Rohingya refugees will result in positive environmental outcomes for the host population in Cox's Bazar. It is imperative

²³www.dhakatribune.com/Bangladesh/nation/2017/12/03/rohingya-plan-bhasan-char-glance/

²⁴ UNHCR (2024). Update on UNHCR operations in Asia and the Pacific. From <https://www.unhcr.org/sites/default/files/2024-02/asia-and-pacific-89-sc-english.pdf>

to contemplate the evacuation of the Rohingya population from environmentally vulnerable regions such as steep hillsides. The Bangladeshi government must strategize for the Rohingya population in the short, medium, and long term while being cautious and considerate when moving individuals to 'Bhashan Char.'²⁵

- Given the pressing issues of the Rohingya crisis, population expansion, and excessive resource use, the government of Bangladesh must swiftly implement sustainable land management techniques to halt the ongoing degradation and loss of forests. Adopting sustainable agricultural practices and encouraging and supporting reforestation projects are crucial in addressing the deforestation problem.
- Reforestation efforts can be undertaken in camp areas by planting trees on hilltops, slopes, and valleys. It is highly recommended to promptly establish a variety of trees that provide shade and bear fruit on hilltops, contours, valleys, and roadsides.
- The government of Bangladesh should prioritize the preservation of topsoil by implementing a range of strategies. These strategies involve utilizing fast-growing tree species to quickly establish vegetation cover, implementing multiple layers of vegetation, stabilizing the topsoil using long-rooted grass species, and using bamboo as a living reinforcement on slopes prone to erosion. FAO (2022) has effectively implemented multiple strategies in their initiated projects.²⁶
- Identify areas that have experienced degradation and develop and execute plans to restore the ecosystem. Furthermore, preserving biodiversity may require the rehabilitation of wetlands, forests, and other natural habitats.
- All organizations must prioritize the implementation of cutting-edge and effective water technologies to ensure the provision of safe drinking water to communities. The community's awareness of the need to reduce wasteful practices and use less water may help achieve this.
- An upgraded drainage system in Cox's Bazar is crucial to mitigate the adverse effects of natural disasters on the refugee population and for more efficient waste management. Limiting the utilization of ecologically harmful substances, such as polybags and other

²⁵ see also <https://data.unhcr.org/en/documents/details/107320>

²⁶ see Food and Agriculture Organization of the United Nations (FAO). (2022). Restoring degraded land in Rohingya refugee camps in Cox's Bazar, Bangladesh. Retrieved from <https://www.fao.org/3/cc0518en/cc0518en.pdf#page=9.18>

waste materials that do not decompose naturally, is imperative. Encouraging the use of recycled materials among refugees and the host community is crucial.

- Promote the availability of diverse fuel sources alternative energy sources (such as solar energy) or liquefied petroleum gas (LPG), which can be found locally in Bangladesh.²⁷ Identify customized energy-conservation methods (such as enhanced cookstoves with increased thermal efficiency and pressure cookers) to address the immediate requirement for cooking and other essential needs (UNHCR, 2021b).
- Establishing and preserving the elephant corridor for Asian elephants in Myanmar and Bangladesh requires close cooperation. Both regions should be involved in participatory rural appraisal (PRA)-based social forestry, reforestation, and soil and mountain management initiatives. Connections between activities and livelihood programs should be established to foster mutual understanding and acquire insights (Chambers, 1994).
- Government and humanitarian institutions' projects should be well-rounded and inclusive, including conflict resolution plans and raising awareness through community-level meetings. Prioritizing local population well-being and achieving peaceful coexistence with the Rohingya community are essential to averting any unjust social and economic repercussions. It is important for any strategy that considers the needs of refugees to also offer benefits to the local host community.
- Incorporate environmental education into the curriculum of capacity-building programs since this will be beneficial in the long term. Enhance group dynamics, collaboration, and synchronization.

Conclusion

The 2017 Rohingya influx has had significant repercussions on the environment of Cox's Bazar District, necessitating the implementation of a mitigation program and offsets to prevent substantial degradation of the environment. The findings of this study conclude that the presence of the Rohingya camps has resulted in significant adverse effects on different aspects of the environment, both within the camps themselves and in surrounding areas, due to increased human

²⁷ see UNHCR. (2021b). Protection-Sensitive Access to Clean Cooking. p-12, Retrieved from <https://www.unhcr.org/au/sites/en-au/files/legacy-pdf/61af71194.pdf#page=10.09>

activity (UNDP & UN Women, 2018). Before the arrival of refugees, the Teknaf region was already grappling with environmental degradation due to climate change in the coastal region. The findings indicate that the increase in the number of people or things coming into an area has made environmental dangers more severe and intense.

The study outcome also demonstrates a decrease in the expanse of forests, reducing twelve out of sixteen subfunctions that contribute to ecosystem services between 2017 and 2021 (Sarkar et al., 2023). NGOs and government agencies in Bangladesh aid the Rohingya people in setting up a refugee camp in a different area after fleeing Myanmar. Although these exercises may be advantageous for Rohingya refugees, they harm the forest ecosystem and its long-term viability. Nevertheless, the most remarkable consequence is observed in pristine and newly formed forests, diminishing the region's "respiratory system," which serves as a natural carbon reservoir and oxygen provider.

Bangladesh's Cox's Bazar is well known for having abundant natural resources. On the other hand, this city has gained notoriety recently for housing the world's largest refugee community. The city needs more financial resources and the means necessary to handle this significant refugee inflow. The establishment presents a substantial menace to its abundant biodiversity. The region is currently facing the complex task of conserving the environment. This further increases the risk of climate stress. Experts anticipate that significant changes in weather patterns and a rise in pollution in the Bay of Bengal will result from climate change in the next few decades.

This study improves our understanding of how the influx of Rohingya refugees affects the amount of forested land and the physical and social environment, thereby increasing vulnerability and exposure to natural disasters. The results of this study have important policy implications for the preservation and administration of forests. The study highlights the necessity of implementing sustainable forest resource management, especially in developing countries such as Bangladesh, where marginalized communities depend heavily on forests for survival. Furthermore, the study highlights concerns regarding possible social conflicts between the Rohingya and native communities in the study region. Future policies should consider the ecological consequences of migration on nearby ecosystems and take proactive measures to minimize any negative impacts.

In order to safeguard the well-being and protection of individuals, the government of Bangladesh and other entities must adopt extensive environmental management strategies and establish ongoing surveillance programs. It is essential to foster awareness among both the host and refugee communities. The Bangladesh government strives to address the crisis; however, international cooperation is essential for a lasting solution. The Rohingya refugees present a humanitarian crisis not only for Bangladesh but also for other countries such as Malaysia, Indonesia, and India in the Southeast Asian and South Asian region. Only a cooperative attitude and inter-governmental dialogue can make Myanmar safe for the Rohingya and their repatriation successful.

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