

An Investigative Environmental Impact Assessment for Kutupalong Refugee Camp and Surroundings, Bangladesh

Preliminary research, analysis, recommendations, and work breakdown structure for in situ
EIA team.

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Acronyms

AAH	Action Against Hunger
ACF	Action contre La Faim
ARI	Acute Respiratory Illness
ARSA	Arakan Rohingya Solidarity Army
DDT	Dichlorodiphenyltrichloroethane
DoE	Department of the Environment
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organization of the United Nations
GHG	Greenhouse Gases
IOM	International Organisation of Migration
IPCC	Intergovernmental Panel on Climate Change
IRC	International Rescue Committee
ISCG	Inter Sector Coordination Group
IUCN	International Union for Conservation of Nature and Natural Resources
HCH	Hexachlorocyclohexane
MMR	Measles, Mumps, Rubella
MoEF	Ministry of Environment and Forests (Government of Bangladesh)
MSF	Médecins Sans Frontières
NEMAP	National Environment Management Action Plan
NERC	Natural Environment Research Council
NGO	Non-Governmental Organisation
NWMP	National Water Management Plan
PCBs	Polychlorinated biphenyls
PTSD	Posttraumatic stress disorder
UN	United Nations
UNEP	United Nations Environment Programme
UNHCR	Office of United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
WFP	World Food Programme
WHO	World Health Organization

Measures and Units

km	kilometre
m	metre
cm	centimetre

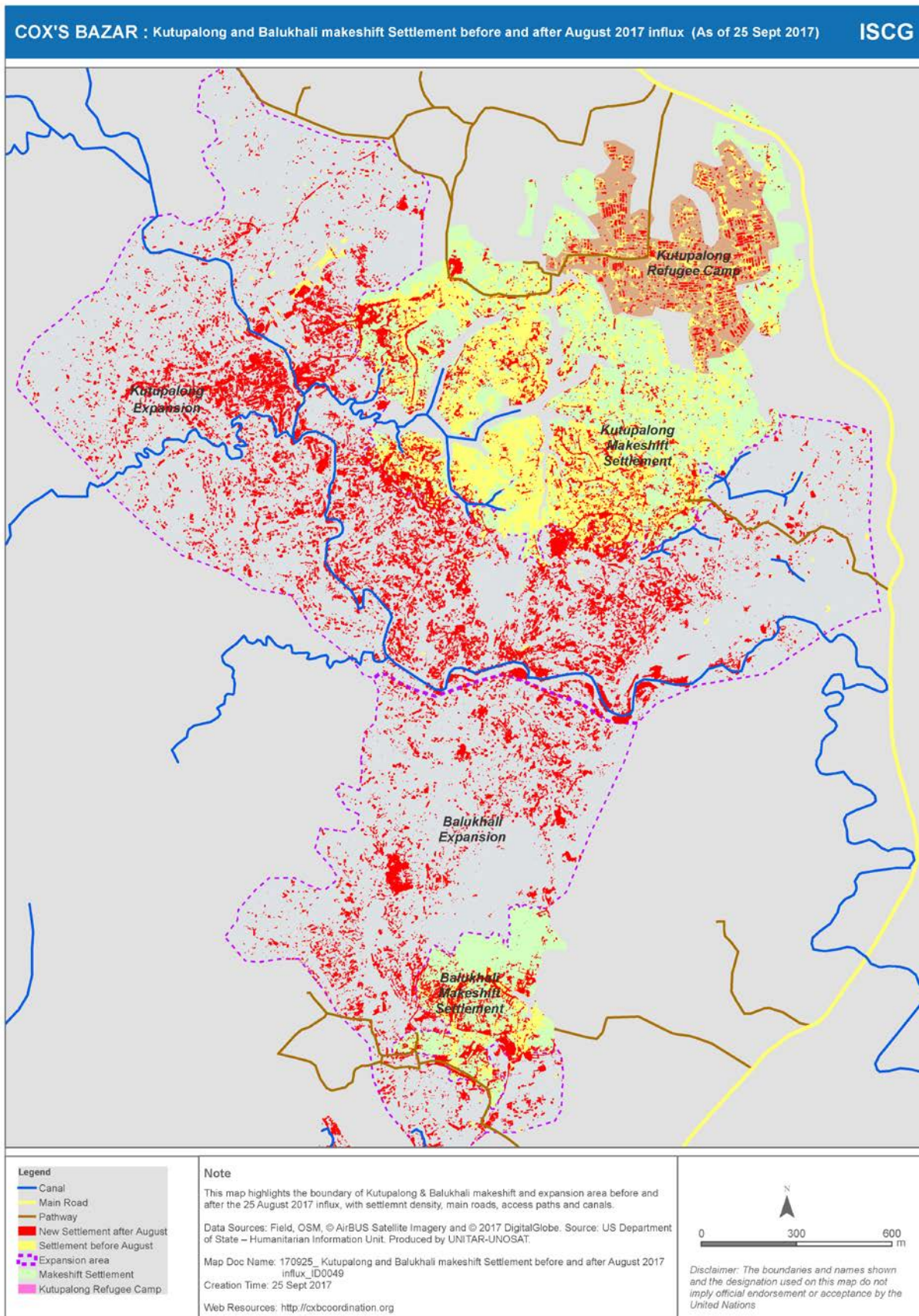
Introduction

The Rohingya Crisis

The Rohingya people are a stateless, ethnic minority group historically inhabiting the Rakhine region of Myanmar (previously known as Burma). They are an Indo-Aryan sect with the majority adhering to Islam, though a smaller subset are Christian or Hindu. The Rohingya are considered to be one of the most widely persecuted people in the world (Al Jazeera, 28 September 2017), enduring decades of apartheid-like legal and military measures against them by the Burmese government and military. The Rohingya have experienced significant military action as well as intensive propaganda campaigns throughout their history; in the last 100 years, the most notable attacks occurred in the 1970s, 1991-2, 2012, 2015, and 2016-present. In 1982, the government of Myanmar amended their nationality laws, removing citizenship and basic rights from the Rohingya (Lindblom et al., 2015). This refusal to acknowledge them as a people effectively made the Rohingya a stateless group, and allowed the government to cast them as illegal immigrants outside the national systems (Lindblom et al., 2015).

Further persecution has included acts of concerted, systematic dehumanization of this minority population, including but not limited to: severe military violence; violence against women; undue physical, mental, social, and economical stress; deliberate arson and destruction of Rohingya villages, and imposing measures to prohibit birth (Lindblom et al., 2015). Though many in the international community have described this as genocide, in accordance with Article II of the United Nations (UN) Convention on the Prevention and Punishment of the Crime of Genocide, the UN and several international players have been careful to avoid this label. The United Nations affirmed in 2016 that the treatment of the Rohingya by the Myanmar military and government constitutes ethnic cleansing linked to a diaspora of the Rohingya population. Since 2012, over 168,000 Rohingya have fled Myanmar (Tan, 2017), seeking refuge in neighbouring countries, most notably southern Bangladesh. Hundreds of thousands of Rohingya have continued to live in Bangladesh since the early 1990s, though the government of Bangladesh discontinued its practice of granting official refugee status to Rohingya in 1992 (Human Rights Watch, 2000). Due to this restriction, many Rohingya immigrants live in Bangladesh as unregistered refugees; many are considered to be illegal immigrants. This status has left them with a reduced ability to secure resources and has caused increased stress to the undocumented populations and their environment, leading Bangladeshi officials to seek alternative settlement locations for the Rohingya. In dealing with the influx of unofficial refugees, Bangladesh has, on several occasions, sought to prohibit Rohingya immigration through legal and physical barriers, and has repeatedly sought repatriation agreements with Myanmar (Human Rights Watch, 2000). On October 24, 2017 Bangladesh and Myanmar began talks for potential repatriation in order to ease the strain on Bangladeshi camps and reunite Rohingyans to the Rakhine State (Looi, 2017).

Since August 2017, a renewed wave of the Rohingya diaspora began, with thousands arriving at southern Bangladeshi camps every day (Safi, 2017). The rapid influx of refugees arriving through marine and border crossings has inundated campsites and strained already scarce resources. This report will identify the environmental and socio-economic impacts of the Rohingya refugee crisis in the Kutupalong- and Balukhari camps, including the makeshift and expansion areas. This is further referred to as the 'focus area' and is shown below.



The Focus Area: Kutupalong

Cox's Bazar is a district in the southern portion of Bangladesh, directly abutting Myanmar. As with Myanmar, the area has a sub-tropical climate and experiences three distinct seasons: the hot, cool, and rainy (monsoon) season. The camp and surrounding makeshift and expansion camps are close in proximity to both Teknaf Wildlife Sanctuary and Himchari National Park, leading to fears of further encroachment on protected areas. Appendix I shows the locations of this wildlife sanctuary and national park in relation to the focus area of.

Kutupalong is one of two state-run refugee camps built in the Cox's Bazar district of the Chittagong region of Bangladesh; Nayapara Refugee Camp, located further south, is the other.. Makeshift expansion settlements to the Kutupalong camp have grown rapidly since August 2017 due to the increased Rohingya exodus from Myanmar (Judah, 2017). With 34,000 inhabitants, the official Kutupalong camp is currently at capacity, and recent arrivals have been relegated to begging for basic supplies and creating crude shelters along the streets and makeshift areas; only 45% of the refugee population currently lives in adequate shelters (UN Children's Fund, 2017).

Due to overpopulation and lack of adequate resources, refugees in these areas are heavily impacting the surrounding environment, which has in turn caused a hazardous, cyclical relationship as increased environmental degradation has threatened overall health and well-being of the refugee inhabitants (UN Children's Fund, 2017). The distribution of Rohingya refugees within the focus area is shown in Appendix II. The influx of Rohingya has caused greater environmental and socio-economic stress in an already struggling, impoverished area due to improper waste management, deforestation, resource consumption, and increased pollution, among others. Recently, steps to merge Kutupalong and its peripheral camp together with the sprawling Balukhali camp will began in a 2,000-acre section of Cox's Bazar (Beech, 2017; Devex, 2017); when completed, this new mega-camp will be the largest refugee camp in the world. This infrastructure in this area is shown in appendix III.

Legal and Institutional Framework

Environmental Pollution Control Ordinance (1977)

This ordinance was built upon the issues and guidelines identified in the 1970 Water Pollution Control Ordinance set for East Pakistan. This ordinance encompasses environmental pollution standards and mitigation for all of Bangladesh and expanded the 1970 ordinance definition of pollution to include that of the air, water, and soil (the 1970 ordinance dealt with pollution primarily as it related to water pollution).

National Environmental Policy (1992)

This policy sets multi-sector concerns and priorities for addressing national and regional environmental standards, including sustainable utilisation of natural resources. The main objectives of the policy are:

1. Identify and manage activities and developments which impact the environment
2. Sustainable and environmentally sound development
3. Promote well-managed utilisation of natural resources
4. Encourage lasting involvement with international environmental policies and treaties
5. Improve measures to protect against natural disasters

Environmental Conservation Act (1995) & Environmental Conservation Rules (1997)

This act is implemented by the Department of the Environment (DoE) within the Ministry of Environment and Forest. Accompanying rules and guidelines for this act were formalized in 1997. Known as ECA'95, this act is the primary governing document for environmental management and compliance in Bangladesh, replacing earlier environmental legislation in 1992. This act outlines governance, management, improvement, and compliance for environmental issues such as:

1. Regulation and standards of emissions and contaminants (several heavy metal standards not addressed)
2. Rights of the DoE to seize, test, monitor, examine any industry, equipment, or material believed to be in violation of environmental standards
3. Setting standards for industries to obtain environmental clearance for all new projects
4. Ability of the DoE to set up further protections for ecologically critical areas (see below)
5. Collection, monitoring, and dissemination of published data on environmental pollution
6. Safeguarding water quality for public use, such as wash and human consumption
7. Identifying and establishing safety and abatement regulations to mitigate environmental crises
8. Regulating the utilization and handling of hazardous material, especially during transportation

Ecologically Critical Areas

The Environmental Conservation Act allows for the establishment of “ecologically critical areas” for protection of vulnerable or critically important areas by the government. The Department of the Environment has the power to manage and regulate ecosystem impacts and issue corrective measures to those deemed to be directly or indirectly impacting the environment.

National Environmental Management Action Plan of Bangladesh (1995)

Action plan written by the Ministry of Environment and Forest to manage and analyse impacts of new projects in Bangladesh as well as actions for sustainable development and management of scarce resources. The plan deals with various environmental concerns and prioritizes actions based on the number of people affected by the project, the vulnerability level of the affected area, project feasibility, and dependable stakeholder involvement. This plan focuses heavily on stakeholder participation and outlines the following steps to be taken:

1. Initiate the National Environment Council
2. Retain the NEMAP secretariat in the MOEF
3. Distribution of information to promote public awareness about the NEMAP
4. Assist agencies in preparing environmental guidelines
5. Establish local environmental committees to explore and analyse ecosystem needs

Environmental Court Act (2000)

This act establishes and provides framework for court systems for environmental non-compliance trials (both civil and criminal). The courts deal with violations to the 1995 Environmental Conservation Act or “environmental law”. Under this act, the courts have the power to:

1. Impose penalties for environmental violations
2. Confiscate equipment or tangible object causing offense

3. Make recommendations for future compliance
4. Decree compensation

In 2010, bills were passed in order to increase the number of environmental courts in Bangladesh.

National Water Act (2013)

This act is written by the Ministry of Law, Justice and Parliamentary Affairs for the management, utilization, and protection of water resources in Bangladesh. This act states that access to public waterways and rights to water as its highest priorities, and outlines penalties for non-compliance. The Act regulates public rights to water related to:

1. Potable drinking water
2. Sanitation (wash) and sewage disposal (effluence)
3. Water control (including regulation of wetland drainage)
4. Protection and conservation of water resources

National Wetland Policy

Wetlands are ecologically important areas which make up approximately 50% of Bangladesh's landmass. The draft identifies regulations for sustainable utilization of wetland resources while maintaining biological diversity of the area. It classifies wetland types and the functional value and importance of maintaining these systems.

The UN International Refugee Convention of 1951 and the International Refugee Protocol of 1967

Addressing the issue of refugees in Bangladesh has been difficult, in part, due to the lack of legislation regarding status, land use, and responsibilities. The UN International Refugee Convention of 1951 and the International Refugee Protocol of 1967 set out international guidelines for dealing with refugees and displaced persons; these are widely considered to be the basis for international refugee rights. These documents set guidelines for:

1. Identifying refugee and displaced persons status
2. Rights to, and allocation of, resources (welfare, food, shelter, land, water)
3. Basic human rights (safety, health, education, legal pathways)
4. Allocation of wage earning jobs
5. Administrative and legal provisions and implications

Bangladesh has not signed these refugee protocols, and is not responsible for the guidelines within, though this has recently been challenged due to the increasing influx of Rohingya.

Scoping

Objectives

The Kutupalong refugee camp has grown by hundreds of thousands of refugees within the past few weeks. Satellite images show an expansion of almost 650 acres within three months, resulting in a refugee camp of approximately 917 acres. The growth areas are unofficial and within the makeshift and expansion camp, but the government of Bangladesh has designated an additional official growth area. Official and unofficial growth together

accounts for a refugee camp of almost 2,000 acres or 4km²(UNHCR, 2017a). The unofficial makeshift camps receive little help from aid organisations due to insufficient infrastructure and a lack of supplies. This is causing a variety of environmental and land use issues (Mendoza, 2017a).

It is highly likely that this population will have a severe impact on the environment due to the large scale of the refugee camp and rapid influx of refugees prior to the development of proper infrastructure and management. The number of refugees is exceeding 300,000 in the focus area (UNHCR, 2017a; Mendoza, 2017). This amount of people settling in an area for a long period of time, using resources, will have negative effects on the ecosystem. A literature review during the scoping process revealed that the refugee camp and the future expansions are likely to cause degradation of land (deforestation, flooding, human waste disposal etc.), stress on water resources and building material, disturbance of wildlife and life in protected areas, pollution and overpopulation in the area. It is most likely that the effects will impact local and regional environments and societies. This can be mitigated by taking measures now to protect the environment in the future. Both the refugees and locals will benefit from the mitigation measures, by creating a healthier environment, providing jobs, improving health, and providing resources. The goal of this investigative assessment is to identify, assess, and provide initial mitigation recommendations for potential threats to the environment and society due to the anticipated continuing influx of people to the established and extended Kutupalong refugee camp. The main objectives (derived from: IUCN & UNEP, 2013) of this study are to:

- establish baselines (ecological, social),
- propose recommendations to mitigate current and future environmental and social impacts,
- establish a link between the EIA and the Kutupalong refugee camp management plan,
- communicate environmental impacts to refugee camp management,
- minimise the impact of activities in the Kutupalong refugee camp and the makeshift camps to the surrounding environment, and
- alert stakeholders to potential areas of non-compliance with national (Bangladesh) and international environmental and social standards

These potential impacts are grouped into two sections: environmental and social impacts.

To achieve success, the deployment team will need to work closely with the refugee camp management plan, which is organised by the Inter Sector Coordination Group - ISCG.

The ISCG was created by the Bangladesh government in conjunction with the IOM, to cope with the growing number of refugees and the number of agencies working in the area. The government needed coordination on issues between the various actors involved. The ISCG operates under guidance from the UN, international NGO's and national agencies. (IOM, 2017) This coordination ensures that humanitarian action is achieved for the target populations (ISCG, 2017).

A full list of ISCG partners with contact information is available in Appendix XV

Environmental Impacts

The unofficial refugee camps receive little assistance from aid organisations and official camp management, which causes a variety of land use problems. Although these organisations try to mitigate the humanitarian and land use problems by providing shelter and roads (in cooperation with the Bangladeshi authorities), the overwhelming influx makes it inevitable that refugees create their own shelters out of readily-available wood and plastic (UNHCR, 2017a; Mendoza, 2017) This may cause:

Deforestation

The rate of deforestation in Bangladesh is estimated to be 3.3% per year. The main reasons for deforestation are: population pressure, extensive land use, and poverty (Mia, 2014). Bangladesh, a crowded country with a high poverty rate, is depleting its natural resources (Iftekhar & Hoque, 2005). Deforestation is a concern in areas with refugees, as they do not have regular access to fuel for cooking or sustainable building materials to build their shelters.

Poor Infrastructure

The coastal zone of Bangladesh is a region affected by natural disasters such as cyclones, storms, earthquakes and floods (Islam, 2007). Due to heavy weather conditions in recent weeks, the Cox's Bazar area is flooded. This has limited the availability of suitable locations to set up logistics, and dirt roads within the camps have turned to mud, limiting accessibility and increasing the environmental impact of driving through the camps (IOM, 2017).

To get shelter kits to the refugees, roads must be well-maintained to ensure fast distribution. Unfortunately, the roads are poorly maintained or, in some areas, there are no roads at all. This results in problems with poor shelter for refugees or no shelter at all.

The waste management system within the focus area is inadequate. One third of families reported open defecation (IRC & Relief International, 2017). Soon after latrines are built, they are already filled, forcing people to defecate elsewhere. De-sludging the latrines is often impossible as access to many areas within the camps is limited. Furthermore, the capacity for disposal of sludge after it has been removed from the camps is insufficient (IOM, 2017). Currently, the rainy season has caused wastewater overflow within the camps (The Nation, 2017). The lack of infrastructure for waste and sewage is causing potential health risks such as epidemics of diarrhoea, cholera, and other waterborne diseases. The need for latrines and showers is urgent, but the current distribution among the refugees is limited (UNHCR, 2017a).

Apart from further intensive setup of latrines and proper roads, new technology like reusable light latrine floor concrete or plastic slabs (IUCN & UNEP, 2013) might be an alternative to solve the sludge management problem. Currently, the only alternative solution to avoid potential water contamination would involve the installation of a wastewater treatment plant (IOM, 2017).

Wildlife

Kutupalong refugee camp is located near the Teknaf Game Reserve, see Appendix I. With deforestation of the area it is likely that the wildlife in this nature reserve will be affected. Recently, an elephant rampage killed several refugees near Kutupalong refugee camp (IOM, 2017). The refugees had built their shelters in the habitat of the elephants, which resulted in stress for the animals. The endangered, and protected, elephants pose yet another threat to the refugees. With the refugees living in their habitat and consuming their food (mangos, jackfruits) it is highly likely that the refugees will continue to have aggressive encounters with elephants and potential other wildlife. Scaring the wildlife with lights could help to avoid such impacts (UNHCR, 2017b). The construction of fences would suffice to keep some species out of the camps.

Social Impacts

Physical Safety

The Rohingya refugee crisis has displaced over 800,000 individuals in Bangladesh. The individuals seeking refuge in Bangladesh from Myanmar are facing threats such as landmines, brute military force, arson, rape, and murder

(IOM, 2017). The concern about physical safety does not subside once in Bangladesh. Physical stressors such as heat exhaustion, malnourishment, and dehydration are prevalent amongst the refugees upon arrival to the camps (IOM, 2017). Other factors to consider with regard to physical safety are potential intra and inter group conflict within the camps, safe spaces for women and girls, wildlife, and the other hazards of the surrounding environment.

Potential inter and intra group conflict can arise from religious disputes, resource allocation, and general overcrowding. According to IOM's Humanitarian Response Plan (2017), the general lack of security within the new makeshift camps allows for vulnerable populations to be taken advantage of and for many to lose their sense of dignity. The most vulnerable populations are women and children. Safe spaces created to dissuade harassment and/or assault are necessary.

Wildlife and the surrounding environment of the camp present many hazards. Not only are the refugees in danger, the refugees are also encroaching on a habitat that is inherently wild and there are many unknowns.

Telecommunications

Bangladesh has banned phone companies from selling SIM cards to new Rohingya refugees due to potential "security concerns". This ban occurred after Facebook listed Arakan Rohingya Salvation Army (ARSA) as a "dangerous organization". To protect Bangladesh from backlash, the cellular companies are also banned from selling to any Bengali who does not have appropriate documentation (Chong, 2017). However, despite this ban many Rohingya have acquired SIM cards at an extremely high price in the camps from vendors using forged documents and biometrics taken from illiterate and unsuspecting locals (Mahmud, 2017).

Food and Water Security

The Rakhine state already has one of the highest rates of malnutrition in Myanmar, therefore, the influx of individuals who require emergency food and nourishment is extremely high. Many families are impoverished and must rely solely on aid workers and natural resources for food and nourishment (IOM, 2017). Although standing fresh water is currently present due to the recent monsoon season and the camp's location in a riparian zone, the groundwater in many areas is contaminated with arsenic (see section 2.1.3.) and other pollutants (Islam, 2007). Fresh water is not widespread, with 250,000 refugees in the district not having access to water and relying on unfiltered (rain) water or water from plastic bottles (UNHCR, 2017d). Directly linked to human health and the prevention of several diseases, is the access to clean water. The demand on water supplies in overcrowded urban areas can be excessive (UNHCR, 2002). In the Kutupalong Camp, the access to clean water is for some still rare, and rain might be the only source of water (The Nation, 2017). There are even some reports of refugees who get their drinking water from paddy fields (IOM, 2017). Although nearly 75% of families interviewed in the Cox's Bazar area reported consistent access to drinking water, 25% noticed inconsistent access (IRC & Relief International, 2017).

Within the refugee camps, water pollution is caused by an insufficient waste management infrastructure and open defecation near water supplies. Tests have shown contaminations of coliform bacteria in some water sources which lead to diarrhoeal diseases, an issue already noted within the camps (UNHCR, 2017d).

Communicable Diseases

In mass movements of people as a result of natural disasters or a refugee crisis, disease has the opportunity to spread wildly. Bangladesh is known to have diseases such as cholera, Japanese encephalitis, malaria, and dengue fever (CDC, 2017). It is estimated that 1,167,000 people are in need of a health action plan (IOM, 2017). A lack of access to clean water and sanitation facilities increases the risk of disease outbreaks, due to overcrowding and weakened immune systems (IOM, 2017).

Spontaneous settlement sites on the outskirts of Kutupalong do not have any water or sanitation facilities, leading to refugees washing, playing, drinking, and potentially defecating in the same water (UNHCR, 2017d). In more recently established makeshift camps, 50-90% of new refugees are living out in the open with no shelter (IOM, 2017). This exposure and overcrowding of the camps causes concern for a potential measles outbreak and acute respiratory infections (ARIs). The baseline for vaccinations of measles in any population is extremely high (90-95%) (Salathe, 2015), thus in a population such as the Rohingya, the risk of a measles outbreak may be high. The World Health Organization, in conjunction with the government of Bangladesh, organised a mass vaccination campaign to protect 150,000 children from measles, mumps, rubella (MMR) and polio (2017). Although this demonstrates progress, with the rampant increase in numbers, more efforts must be made.

As tensions continue to run high and resources are limited some women and children have gone into prostitution as a way to make money in an effort to feed their families. Most individuals work outside of the camp to give the image of purity to the Rohingya people. However, because of this, women are not regularly tested for sexually transmitted diseases (South China Morning Post, 2017). HIV/AIDS is of concern in this scenario, as some men do not use condoms (South China Morning Post, 2017). In early October, sixteen cases of HIV/AIDS were confirmed in the Cox's Bazar Sadar hospital; one of them passed away. With weakened immune systems and malnutrition, individuals exposed to HIV have a greater chance of contracting and spreading the virus (Prathom Alo, 2017).

Non-Communicable Diseases

Within the camp of Kutupalong the refugees lack adequate food and water security, adequate care for previously existing conditions, and have experienced recent traumatic events that may affect the individuals mentally and/or physically (IOM, 2017). Physical disabilities are present, as well as post-traumatic stress and trauma. Due to the distance to latrine facilities, some families with disabilities are choosing to keep their “stomachs empty” rather than trek to the latrine, in many cases this ends up being the forest (ABC, 2017). The mental health status of the refugees is extremely varied, especially amongst the children. Crucial years of development are affected by the trials they have experienced, from familial separation to witnessing death (IOM, 2017). To help minimize those impacts social workers are needed as well as a mental health department.

Impact Assessment

L= LOW M=MEDIUM H=HIGH E=EXTREME (Derived from IUCN & UNEP, 2013)

Impact	Magnitude	Mitigation
Infrastructure		
<ul style="list-style-type: none"> shelters 	H	<ul style="list-style-type: none"> Alternative building materials such as bamboo that has a low import cost Provide stronger materials Information for construction design
<ul style="list-style-type: none"> roads 	L	<ul style="list-style-type: none"> Improve access roads and rate of construction
<ul style="list-style-type: none"> Waste Management 	H	<ul style="list-style-type: none"> Recycling system Awareness campaign Increase disposal bins Investigate incineration and alternative management
<ul style="list-style-type: none"> Safety and Security 	H	<ul style="list-style-type: none"> Improve lighting Increase authority presence
<ul style="list-style-type: none"> Telecommunications 	L	<ul style="list-style-type: none"> Promote access to sim cards Electricity points
Food and Water Security		
<ul style="list-style-type: none"> Drinking water 	E	<ul style="list-style-type: none"> Encouraging NGO's to bring water purification measures Monitor arsenic levels in camp wells Improving sanitation in proximity to wells Refillable water bottles and a water truck
<ul style="list-style-type: none"> Food Source 	H	<ul style="list-style-type: none"> Ensuring renewable source extraction Sustainable agriculture Knowledge gap in fisheries and aquaculture
<ul style="list-style-type: none"> Agriculture 	M	<ul style="list-style-type: none"> Resilient crops Ensuring edible yields, monitoring for spoiled food Educating for campbased agriculture

Impact	Magnitude	Mitigation
<ul style="list-style-type: none"> Weather Conditions 	M	<ul style="list-style-type: none"> Warning systems concerning extreme weather events Creating more dykes potentially with bamboo to protect shelters from flooding Implementing more alternative water sources during drought/flooding season Enforcing climate change strategy and action plan from 2009 (see section 5.3.3.1) NGO's bringing in more clothing and shelters
Health		
<ul style="list-style-type: none"> Staffing 		<ul style="list-style-type: none"> Encouraging NGO's to bring in more qualified doctors and nurses
<ul style="list-style-type: none"> Self-care 	H	<ul style="list-style-type: none"> Promoting home-growth of medical plants and herbs
<ul style="list-style-type: none"> Mental Health 	M	<ul style="list-style-type: none"> Spreading awareness Creating support groups
<ul style="list-style-type: none"> Maternity 	M	<ul style="list-style-type: none"> Assessing need for prenatal and postnatal care Spreading awareness concerning birth spacing and birth control Establish more maternity centres for support Increased access to prenatal vitamins and nutritional food sources
<ul style="list-style-type: none"> Disease 	H	<ul style="list-style-type: none"> Information campaigns on how to recognise symptoms Collaboration with local health services

Impact	Magnitude	Mitigation
<ul style="list-style-type: none"> Sanitation 	H	<ul style="list-style-type: none"> Increase access to sanitation facilities Increase distance between wash facilities and potential contamination sources Increasing awareness with informational campaigns concerning proper hygiene Increased maintenance and treatment of sites, hire refugees to perform these tasks Designate specific locations for sanitation and restrict access to said locations to a certain number of refugees at one time Create map/guide handed to refugees so they are aware of all sanitation/latrine locations
<ul style="list-style-type: none"> Malnutrition 	H	<ul style="list-style-type: none"> Ensure reliable distribution of food resources to refugees and that they meet required daily nutritional values Genetically enhanced nutritional value foods
<ul style="list-style-type: none"> Air Pollution 	H	<ul style="list-style-type: none"> Designate cooking locations separate living environments to reduce health hazards and fire risks See deforestation Knowledge gap, more information required
Social Issues		
<ul style="list-style-type: none"> Gender Issues 	M	<ul style="list-style-type: none"> Create a woman-only environment with centres providing information concerning abuse and violence as well as counselling opportunities Ensure that qualified women personnel are hired Increased training for camp authorities on appropriate interactions Keep records of incidence
<ul style="list-style-type: none"> Education 	M	<ul style="list-style-type: none"> Improved transportation to educational facilities Recruit more instructors

Impact	Magnitude	Mitigation
<ul style="list-style-type: none"> • Employment 	M	<ul style="list-style-type: none"> • Encourage NGO's to employ refugees in cooking and cleaning tasks, small construction and infrastructure jobs • Improve employment security and safety of the workers by implementing a training program • Encourage more women to join the work force
Land Use		
<ul style="list-style-type: none"> • Planning 	L	<ul style="list-style-type: none"> • Prediction for camp expansion
<ul style="list-style-type: none"> • Deforestation 	E	<ul style="list-style-type: none"> • Create boundaries between camps and sensitive areas • Reduce firewood use through improved kitchen utilities and alternative food options • Implementation of regeneration projects • Integration programs
<ul style="list-style-type: none"> • Wildlife Management 	L	<ul style="list-style-type: none"> • Protective fences • Protect Teknaf Game Reserve
<ul style="list-style-type: none"> • Energy 	M	<ul style="list-style-type: none"> • Alternative fuel sources

Baseline Study

Geophysics

The Kutupalong camp is located south of Cox's Bazar and borders with the Rakhine state in Myanmar. Teknaf highway is situated to the North of the camp and runs south east. Teknaf Game Reserve is west of Kutupalong and encompasses an area of 11,615 hectares. The Kutupalong camp can be divided into 'Refugee camp', 'Makeshift area' and 'Expansion area' as explained in the introduction. Appendix IV shows that the focus area is mainly situated in a forested area, with wetlands used for rice cultivation located nearby (also see 5.3.4).

Topography and Geomorphology

Bangladesh is on a relatively young and low-lying area with three main geomorphologic regions: plains, terraces, and hills (Imamul & Shoaib, 2013). It is geomorphologically young because of the sedimentary deposition that has formed much of the land. The plains compose 80% of the country and are highly susceptible to flooding. Bangladesh's deltaic coastline is wide near sea-level, with numerous rivers carving through the sedimentary silt to reach the ocean. There are regions of tertiary hills in both the north-east and south-east (Imamul & Shoaib, 2013).

Kutupalong and the focus area inhabited by refugees are situated on a combination of plains and small hills, extending into the Chittagong Hill tracts bordering Myanmar. Elevation in the focus area are shown in Appendix V. Heavy rain on the Chittagong Hill tracts has resulted in numerous landslides. District administration has restricted tree-cutting to limit erosion in the hope of limiting further landslides and related fatalities (Mamud, 2017). Geology and Soil

The soil in the Chittagong region is composed of coarse material and is less mature than the rest of the coastal areas. Similar to the rest of the coastal region of Bangladesh, the area also contains various silts, sands, and some clay (Fisheries and Aquaculture Department, 1985).

Kutupalong and the Chittagong district are on Pleistocene formations and have a Dupi Tila formation as shown in Appendix VI. The Dupi Tila formation consists of yellow to light brown sandstone that varies from fine to medium grained (Roy et al., 2012).

Hydrology and Water Resources

In Bangladesh, surface water and groundwater are used for human resources. The availability and restoration of both water systems vary depending on the season (2030 WRG, 2015). There are shallow and deep aquifers on which 97% of the Bangladeshi population depend (NERC, 2001). Sikder (2010) mentions that the Kutupalong camp depends on the groundwater in the region and uses tube wells to access the resource (Appendix VII). In the Kutupalong refugee camp, there is one working tube well available for every 107 refugees (Sikder, 2010). Smith et al. (2000) mention that inorganic arsenic occurs naturally in Bangladesh's groundwater and poses many threats to the health of humans. A study by Grant (2013) found that 38 sampled wells in the Kutupalong area had a pH from 3.9 – 7.73. Water that has a pH less than 5 raises concern for those areas that contain toxic heavy metals (Grant, 2013). The safety standard for arsenic-contaminated water by WHO is 10µg/L, although the Government of Bangladesh has a regulation of 50µg/L (HRW, 2016). Flanagan et al. (2012) found that 45%-62% of arsenic-related deaths are from drinking water within the 10µg/L and 50µg/L concentration guidelines.

There are 405 rivers in Bangladesh and 57 of them are transboundary (2030 WRG, 2015). The Ganges, the Brahmaputra, and the Meghna are the three major rivers in the country that contribute to alluvium deposits (Quazi, 1986). The Kutupalong camp is in the southern part of the Chittagong region (Appendix III) where small rivers flow through the makeshift settlement and expansion regions. The source of these small rivers derives from larger rivers that are located further north within the Chittagong region. Located in Rangamati, Kaptai Lake is the largest water reservoir in Bangladesh. It drains into the Karnafuli River. There are six major rivers in the Chittagong region and two coastal channels. The surface water moving through the Kutupalong camp expansion and makeshift areas are believed to be derived from the Bakkhali River and the Naf River. The Naf River comes from the Northern areas of Myanmar and travels through the Chittagong and Cox's bazar region before discharging into the Bay of Bengal.

Biological Environment

Climate

In Bangladesh, the summer temperatures fluctuate around 40°C, and the winter months are around 18°C during the day and 10°C at night (Islam, 2013). According to NWMP, the mean annual rainfall for the Eastern Hills region, which includes Chittagong and Cox's Bazar, is 2,445mm (2014). The Cox's Bazar station found a minimum mean annual rainfall of 1,913.4mm and a maximum of 4,431.7mm from 1967-1981 (FAO, 1985). In the monsoon season, all but 20% of the annual total rainfall occurs, and humidity is estimated to be 98%, whereas during the winter season it is reduced to around 60% (FAO, 2011). During the monsoon season, Bangladesh is one of the most flood prone countries in the world, with 80% of the country situated on flood plains (Hossain, 2017). The focus area is not particularly prone to flooding, as shown in Appendix VIII.

In the winter, the prevailing winds along the coast gust between 3 and 6km/h and come from the north, whereas the prevailing winds in the pre-and post-monsoon seasons come from the south and move at approximately 160km per hour (Islam, 2013). According to MoEF, intense cyclones are most commonly found in the southern districts of Bangladesh, which can produce winds up to 120km/h (2009). Most of these severe storms happen in the pre-monsoon season since the temperatures are at their highest and poses a threat for the Kutupalong camps. During the winter months, Bangladesh experiences a drought period because of the limited rainfall. However, the focus area of Kutupalong is located in an area that is not prone to drought, as shown in Appendix IX.

Pollution

Evidence gathered from published papers seem to indicate that there are several pollution sources near the Kutupalong refugee camp (Datta, 2015). Both water and air are known to have been contaminated with a wide range of harmful substances for human health prior to the settlement (Karn, 2001; McArthur *et al.*, 2001). Moreover, the lack or scarcity of safe drinking water is a serious threat to human security (see Health and Water Use sections). Over 15,000 people die in Bangladesh each year due to extremely high levels of air pollution which leads the major poisoning factor (Mahmood, 2011).

One of the major sources of greenhouse gas (GHG) emissions in Bangladesh is the methane released from bio-waste. This occurs from the burning of biomass for brick making and cooking. The Environmental Performance Index carried out by the United Nations (2014) reports a 60% decline in air quality over the previous decade. Climate change is already an issue in Bangladesh but an increase in air pollution through the burning of fossil fuels from large populations will exacerbate the problem. Brickfields in Bangladesh expel a huge amount of GHGs into the air annually due to a combination of old technology, weak environmental legislation and enforcement, and lack

of corporate responsibility (Darain *et al.*, 2013). According to the Department of Environment in Bangladesh (2012), brick kilns are one of the most important sources of gas emissions into the atmosphere in the country.

As discussed in Section 2.1.3., some toxic substances, such as arsenic, have been repeatedly found in regional groundwater (McArthur *et al.*, 2001). Furthermore, agriculture practices, as well as sewage, are considered the main sources of pollution in surface waters, such as rivers and tributaries in Bangladesh (Ahmad *et al.*, 2010). It follows that all wetlands fed by the waters of those contaminated rivers might also store a high concentration of pollutants that will then bio accumulate in the crops in the area.

Coastal zones are also important regarding food sources since many species are being cultured for human consumption. These areas have been found to host high levels of pollutants such as PCBs, HCHs, and DDTs (Rajendran *et al.*, 2005) that bio accumulate in fish tissues, and may be toxic to humans. Increased demographic pressure can lead to the collapse of the sector in the near future.

The above-mentioned sources of pollution might seriously affect not only the refugee's situation, but also the surrounding ecosystems by causing eutrophication in surface waters and depriving them of dissolved oxygen.

Hazardous Materials

While this assessment will not cover hazardous materials sources, it will deal with the presence of both chemical and biologically harmful materials, and recommends mitigation for the risks resulting from hazardous biological materials that arise from lack of adequate sanitation systems, as well as from the high concentrations of arsenic that exist throughout Bangladesh, as depicted in Appendix X. Further, agrochemicals and waste from the tanning and dyeing industries present risks to human and environmental health. The lacking infrastructure around the Kutupalong camp and surrounding area makes biological waste of high concern. Within the camps, community use of batteries and plastic should be monitored for safe disposal.

Land Use

Information concerning the use of land prior to camp installation is not readily available. Indications are that there was little in the way of agriculture in the area, and nearby areas are reserved for protected park areas (Hossain *et al.*, 2003 and Tani & Rahman, n.d.). No baseline can be established due to lack of information. Shelter in the makeshift camp is predominantly made from debris, wood, bamboo, plastic, and other materials that can be found in the surrounding environment. The houses are vulnerable to factors such as weather and wildlife encounters. UNHCR is trying to provide the refugees with adequate shelter in shelter kits (including bamboo poles, ropes, tools and tarpaulins). The makeshift camps are built upon agricultural land, thereby affecting productivity, socio-economic relations with host communities, and resulting in a loss of food for the refugees and locals alike (UNHCR, 2017a).

Bangladesh boasts extremely fertile lands with heavy rainfall which keeps the area lush. Its biological environment is intrinsically linked to its economic security as the highly arable land is used for agricultural purposes, while the rich coastal waters provide further economic opportunity through fishing and shrimp-farming (Hossain, 2001).

Solid Waste

Statistics for the Kutupalong camp on the management of solid waste were not found. Reports on major cities show an increase in solid waste from 0.31kg/cap/day (kilograms per capita per day) in 1991 to 0.41kg/cap/day in 2005 (Bhuiyan, 2010). Following this trend, urban areas of Bangladesh should average an estimated 0.51kg/cap/day

by 2019 (Bhuiyan, 2010). Assuming that the residents of Kutupalong generate solid waste at the same rate as urban residents, the baseline should be set at approximately 0.51kg/cap/day. In cities, roughly 50% of solid waste is uncollected (Bhuiyan, 2010). Kutupalong likely faces similar inadequate infrastructure for solid waste removal; however, a small amount of solid waste is being used for fuel to cook in the camps.

Vegetation

Bangladesh has a rich forest area, covering 2.52 million ha, maintained by various sectors including the Forest Department, Ministry of Land, and private owners (Chowdhury and Koike, 2010). The vegetation biodiversity is high, with forests dominated by mixed evergreens, and plant communities consisting of diverse herbs, shrubs and bamboo jungles (Chowdhury and Koike, 2010). There is a small section of mangrove forest on the coast near Kutupalong which encompasses a diverse ecosystem, including medicinal plants (BCAS, 2008). The vegetation is being directly impacted by infrastructure development and medicinal plant collection.

Wetlands

Wetlands occupy one half of the territory of Bangladesh, and they have traditionally been used for fruit and vegetable cultivation and are more recently responding to more complex and modern methods of agriculture, i.e. hydroponics (Haq *et al.*, 2004). Even though sustainable practices involving wetlands have already been developed, Bangladesh has lost 45% of its wetlands due to overexploitation, as can be seen in Appendix XI (Islam, 2010). Among the main activities carried out in the wetlands, are shrimp-farming and rice culture, geared towards sustaining a high population density (Islam, 2010).

There are two important wetlands in close proximity to the settlement, which could be used by the refugees as a resource base for cultivating vegetables and culturing endemic fish species (Appendix XII). Naf Estuary (30.4 km away) and Sonadia Island (60 km away) host the closest wetlands to the settlement, but due to the ground and road conditions it may take up to six hours to reach them, making access impractical without further infrastructural development.

Socio-economic Environment

Gender Issues

Domestic and gender based violence are prevalent in the camps. Rape, sex trafficking, forced engagement, and battery are all factors that women and children face. This type of assault not only alters physical and mental development, but is culturally considered extremely shameful and can ruin a woman's chance to find economic independence (Kojima, 2015; IOM, 2017).

An influx of refugees within the Kutupalong camp has raised concerns amongst aid workers as they have noticed an apparent correlation between increased stress due to the limited availability of resources and domestic abuse (Akhter & Kusakabe, 2017). Men are often required to leave the camp in order to search for jobs and generate some sort of income; there are high risks associated with these situations as they have not been granted permission to leave the camp and face violence and persecution from locals as well as police (Akhter & Kusakabe, 2014). Contrarily, women often work within the confines of the camp, allowing them to further provide for their families, a custom that is not normally accepted within the Rohingya culture (Akhter & Kusakabe, 2014). The increased presence of female responsibility can create some imbalance within the household; while it does provide

the family with two incomes, men can feel inadequate in their ability to successfully provide for their families and turn to violence in order to demonstrate masculinity and dominance (Akhter & Kusakabe, 2014). Women are also potentially threatened by authorities within the camp concerning sexual assault. In these situations, they are left with no other alternative but to approach the chief, commonly known as Mahjee, and report the incident (Akhter & Kusakabe, 2014). However, it is unlikely that the chief will press the matter further and can potentially ask for sexual favours in return for assistance (Akhter & Kusakabe, 2014).

Health

The massive influx of individuals within the camp has put immense pressure on the current health facilities available to refugees. Makeshift shelters are springing up in already cramped quarters and sufficient sanitation stations are lacking, inevitably leading to communicable diseases spreading even more rapidly (UNHCR, 2017; WFP, Government of the Republic of Bangladesh, UNHCR, 2012). Organisations, such as Médecins sans Frontières, have set up clinics, where they perform “outpatient consultations, antenatal consultations and individual mental health consultations” (Médecins sans Frontières, 2016), however, they have noted an increased demand in individuals requiring aid since the most recent influx, this includes treatment of gunshot wounds and general exhaustion from travelling long distances (Médecins sans Frontières, 2016). After flooding events in Bangladesh in 2004, a cholera outbreak affected 17,000 individuals directly. Hepatitis A and E are also potential concerns. Although many infants develop immunities to hepatitis A at an early age, Hepatitis E is a potential cause for concern, with the number of pregnant women coming into the camps. Fatality rates can reach up to 25% (WHO, 2006).

Mental Health

Mental health is an issue that needs to be addressed within the Kutupalong camp. Many refugees suffer from disorders ranging from PTSD, depression and increased stress (UNHCR, 2017). Lack of basic needs such as food, water, sanitation and security only increases the intensity and prevalence of these disorders, which may lead to feelings of helplessness and hopelessness, and can impact refugees’ ability to react and assimilate to their surroundings (UNHCR, 2017). Furthermore, these feelings of extreme frustration and stress can result in increased incidences of sexual assault and domestic abuse (WFP, Government of the Republic of Bangladesh, UNHCR, 2012). While there are some organisations set up to address these concerns, a lack of personnel and fear of stigmatization decrease the likelihood of all those in need receiving the help they require.

Reproductive and Maternity Health

One report indicated that approximately 120,000 of the new arrivals in the Kutupalong camp were either “pregnant or lactating women requiring urgent assistance” (IOM, 2017). Many of these women had travelled long distances for many days and required urgent care associated with injuries, malnutrition and exhaustion (IOM, 2017). Some organisations, such as Médecins sans Frontières, have set up sites where women can receive information concerning appropriate birth spacing and birth control information, as well as rape and abuse response strategies. Furthermore, they have access to vitamins and other important medical and health equipment, and trained personnel on site (Holland et al., 2002).

Morbidity

Malnutrition and diarrhoea epidemics are the most widespread issues within the Kutupalong camp (UNHCR, 2017). Cholera is also endemic to Bangladesh, and the outbreak risk in this scenario is high (WHO, 2006). There

are also high instances of other communicable diseases such as upper and lower respiratory tract infections as well as skin diseases (Milton, 2017). These health issues arise due to “highly congested living environments” in conjunction with “unsatisfactory sanitation infrastructure” (WFP, Government of the Republic of Bangladesh, UNHCR, 2012). In one sample, it was noted that out of 13,102 Rohingya refugees, approximately 7.1% suffered from acute watery diarrhoea and 44.6% had various health issues associated with upper and lower respiratory tract infections (Milton, 2017). It remains unclear how many deaths occur within the camp and what percentage of those are associated with these illnesses, however, it would be important to consider how Rohingyans are dealing with the influx of individuals within the camp and how this impacts their burial traditions (Chalty, 2017). The Muslim religion does not consider cremation an appropriate disposal method, rather they require that the body “be buried as soon as possible after death” following a washing and draping ritual (Gatrad, 1994). This has led to refugees burying “their dead wherever they could find space” which in turn potentially creates future social and environmental issues; especially in relation to infrastructure, as shelter and other establishments will be constructed over burial sites and could lead to bodies being exhumed (Chalty, 2017).

Water Use

Water sources within the Kutupalong camp are scarce and individuals are struggling to collect enough water for daily use, such as drinking, bathing and cleaning (Hena, 2010). Many are reliant on tube wells dug approximately 25m into the ground, for their permitted approximate 19 litres of water a day (Hena, 2017). Before the influx of new refugees, one study reported that one tube well provided water for approximately 107 refugees. This number has since gone up, due not only to the increased number of individuals within the vicinity but also as tubes near the boundaries of the official camp are being used by those in the extended areas (Hena, 2010). These tubes require much more maintenance and camp officials have implemented a management programme, through which locals are paid in rice to repair and maintain the tube wells (Hena, 2010). Furthermore, other programmes are in the process of being implemented as well, such as three new water purification facilities and rainwater collection initiatives (Hena, 2010). Additionally, some locals have taken the initiative to dig their own wells. While this does not provide them with suitable drinking water, it does fulfil their bathing and cleaning needs (Hena, 2010). Currently, organisations are working on installing more tube wells, with 55 of them having been installed in recent months (UNHCR, 2017). These organisations are also trying to promote safe practices concerning potable drinking water to reduce or eliminate the risk of contaminating the wells (UNHCR, 2017).

Food Use

As malnutrition is currently one of the most pressing issues amongst the Rohingya refugee population, with 1.2 million individuals suffering from some sort of nutritional deficiency, most of which are infants, adolescent females, pregnant and lactating women (IOM, 2017), it is important that some of their concerns are addressed. According to a joint assessment mission completed in 2012 within the Cox’s Bazar area, “17% of the population had exceeded the WHO emergency threshold for malnutrition in 2011,” and it can only be assumed that this number has increased with the recent influx of refugees (WFP, Government of the Republic of Bangladesh, UNHCR, 2012). Potential explanations for the high incidence of malnutrition may include, unregistered refugees being “denied access to general food distributions” or due to “an overall lack of certain types of food” (WFP, Government of the Republic of Bangladesh, UNHCR, 2012).

One study reported that a typical aid basket contains products such as “rice, pulses, vegetable oil, salt, sugar and blended foods”, while items such as “food of animal origin, vegetables and spices were lacking,” thus causing men and women to search for food sources in other, potentially risky locations or establishing some sort of barter system (WFP, Government of the Republic of Bangladesh, UNHCR, 2012). The study also mentioned that some of

the refugees believed that they were not receiving adequate rations based on the number of household members, and that the personnel in charge of distribution were keeping portions of the rations for themselves (WFP, Government of the Republic of Bangladesh, UNHCR, 2012; Holland, 2002). In order to mitigate this situation, camp officials have replaced locally hired food dispensers with members of the Rohingya refugee population, this seems to have alleviated some of their concerns (Holland, 2002).

Deforestation

A study of one hundred and ninety households of Rohingya refugees living in close proximity to Cox's Bazar found that 23.8% make a livelihood by cutting timber and selling it in markets as fuel (Tani & Rahman, n.d.). The Dhaka Tribune reports between 1,500 and 2,000 acres of forest from upazilas in proximity to refugee camps have experienced deforestation (Mahmud, 2017). This number, corroborated by forest officials, represent a small percentage of the increasing deforestation as new refugees cross the border to Bangladesh. Timber is used for fuel at 750,000kg per day (Mahmud, 2017). The baseline for deforestation is a minimum of 1,500 acres cleared per month and a consumption of 750,000kg of firewood used per day.

The location and the size of the camp construction, including the high number of shelters, will modify the landscape and imply a land occupation that might otherwise be used for cultivation activities by the local community. The cheapest option available for refugees is to utilise wood or bamboo from the surrounding area for shelter construction and as a fuel resource. This causes damage to local forests and the greater environment (see Section 3.4.). EIAs from the influx of refugees in Tanzania during the period of 1994-1996 demonstrated the negative effects on the local environment, with 167km² of forest severely impacted and taking decades to recover.

Deforestation will also affect the refugees directly because as it continues, the distance to fuel and building material will increase. They will have to walk further to obtain the resources they need, and the potential risk of physical/sexual assault by fellow refugees or locals increases with longer distances, especially as this task is often performed by women and children (Shepherd, 1995).

Given this increase in the demand of energy and resources, as well as the lessening of available land extensions, local and refugee communities may have to compete for the use of existing resources for their survival. This competition could become a source of confrontations and conflicts.

Sanitation

Sanitation is an important issue within Kutupalong camp (IOM, 2017). The lack of infrastructure allows the development and spread of waterborne diseases in the Rohingya population. Infrastructure has been put in place to ensure sanitation in the camp after the 1992 crisis (Hena & Kamal, 2010). Indeed, NGOs implemented sanitation measures in every block in the official camp (17 units of 5 latrines) (Hena & Kamal, 2010). Though they are still working on sanitation implementation, 17,800 refugees in Bangladesh had access to 350 latrines in only five weeks because of UNHCR's effort (UNHCR, 2017). Their objective is to implement sanitation for 250,000 within the next six months. Encouraging good hygiene practices and raising awareness on this issue among refugees are efficient tools to improve life quality regarding sanitation (Hena & Kamal, 2010).

Education

The education system within the official Kutupalong camp is changing both in quality and prevalence of refugees attending; with ten primary schools and one secondary institution now established (Prodip, 2017). The extended areas of the camp outside the official boundaries have compensated by installing various facilities and establishing

programmes such as, Children on the Edge, who are helping the Rohingya community by implementing the ‘stand on the gap’ method (Children on the Edge, 2010). This programme requires one child per family to attend school and then pass on their knowledge to the rest of their siblings (Children on the Edge, 2010). This allows approximately 2,700 children to attend a “safe and child-friendly environment and gain a full primary education” (Children on the Edge, 2010). Considering the Myanmar government restricts the amount of education Rohingya children receive, many of them arrive at the camps with little or no educational background and, therefore, this programme provides them with the opportunity to acquire some formal education and ultimately have better career prospects (Children on the Edge, 2010). Some NGOs (UNHCR AND WFP) have also provided adults, especially women, with learning opportunities, such as making soap, handcrafting, and tailoring (Akhter & Kusakabe, 2014).

Energy

Currently there is a shortage of natural firewood sources due to the increase in camp population. In the past, there have been initiatives to create alternate energy sources for the camps, but these have been limited to certain areas and are not sufficient for the current numbers. A solar based mini grid system is in place, providing indoor lighting and street lights in different areas. Other alternative fuels which have been used are biogas, compressed rice husk, and kerosene for lamps (UNHCR, 2017). These options could be further explored for future plans for the camps.

Transport

Humanitarian assistance has been hindered by the lack of physical access to and within the camps. The existing roads were not made for the heavy influx of vehicles and people during varied climatic conditions. Plans are underway to construct new roads, commissioned by the Bangladeshi government and being implemented by the Bangladeshi National Army. Road construction has started in certain areas to relieve congestion.

As the size of the camps have increased, the need for faster access from the operational hubs has become critical. Due to lack of space, there are few storage facilities, hence Chittagong will remain the main location for logistics as it has an airport and international port, but these are 175km from the camps (IOM, 2017).

As aid relief enters Bangladesh there will be the need to create storage facilities in suitable locations. The Logistics Sector which is part of the Inter-Sector is constructing a logistics hub at Ukhiya Degree School, where there will be mobile storage units (IOM, 2017).

Strong cooperation between the government and agencies will ensure access and that timely delivery responses occur.

Telecommunications

As of 23 September 2017, the government of Bangladesh has implemented a ban on the sale of SIM cards to Rohingya refugees. Bangladesh requires citizens and refugees alike to provide a biometric ID for the purchase of SIM cards to “frustrate the organisational capacity of homegrown militants” (Firstpost, 2017). The reason for the ban, cited as a security concern, has yet to be substantiated through evidence of militant Rohingya within the camps.

There are attempts being made to issue biometric IDs to recently arrived refugees, but it could take up to six months for those who have already arrived in camps to receive theirs (Times of India, 2017). For those not already in possession of a mobile SIM card capable of making local and/or international calls prior to their arrival in

Bangladesh, this could pose a serious problem for the dissemination of crucial information concerning the resources available, such as latrines, wash stations, waste disposal areas, etc., to the newly arrived refugees.

Employment Opportunities

In order to generate some form of income, including barter and trading, many men are forced to venture outside the camp boundaries in search of job opportunities (Akhter & Kusakabe, 2014). This poses several risks for them as they are generally not allowed to leave without explicit permission from camp authorities. They can face violence, detainment and physical violence if caught (Akhter & Kusakabe, 2014). The primary livelihood activities among Rohingya men are “fuelwood collection, sun grass collection, bamboo and cane extraction, fruit and vegetables collection as well as fishing and shrimp fry catching” (Fox, 2007). Furthermore, they can work as day labourers, fishermen, rickshaw pullers as well as camp construction workers (Akhter & Kusakabe, 2014). Women often take care of household duties, such as cooking and cleaning, but can also generate income by selling firewood, weaving nets, selling clothing and, also as sex workers (Akhter & Kusakabe, 2017). Some NGOs have employed local women in cooking and cleaning tasks within the camp (Akhter & Kusakabe, 2017). The table below displays the expected income within each field.

Table 1 Difference of wage between locals and refugees (Akhter & Kusakabe, 2014)

Occupation	Wage for Locals	Unit/Taka	Wage for Rohingya	Unit/Taka
Men				
Daily labourer	175-200	per day	100-130	per day
Farm worker	175-200	per day	100-130	per day
Rickshaw puller	175-201	per day	100-130	per day
Business (tea stall)	4,200-5000	per month	2,500-3000	per month
Women				
Domestic worker	Do not work	N/A	1,000-1200	per month
Hotel cook	Do not work	N/A	1200-1500	per month
Camp volunteer	N/A	N/A	300	per month
Cloth seller	N/A	N/A	70-120	per day
Firewood seller	N/A	N/A	50-100	per day
Net weaver	N/A	N/A	700-1000	per month
Cleaner	N/A	N/A	300	per month
Sex worker	N/A	N/A	800-1000	per month

Analysis of Alternatives

Bangladesh is attempting to accommodate the current influx of Rohingya refugees. The government and local Bangladeshis are hosting the refugees and, with help of UNHCR and NGOs on the ground, attempting to provide adequate food and shelter to those who arrive in the camps. The government of Bangladesh has begun the process of biometrically registering the refugees upon arrival, registering up to 1,000 people per day in the Kutupalong camp alone (UNHCR, 2017). There are plans to expand the camp to encompass an area of 2,000 acres (UNHCR, 2017a), which would merge the camps presently known as Kutupalong and Balukhali, including official, makeshift and expansion areas. This is, however, not a long-term solution as the infrastructure is not in place to assimilate such a large population of refugees into one of the poorest nations in the world, nor is there a willingness within the Bangladeshi government to offer refugees a route to citizenship. Although not a long-term solution to the present refugee crisis, this ongoing effort will be referred to as Alternative A, as it is currently the only viable option until measures have been taken to end the violence and persecution of the Rohingya people in Myanmar and allow the Rohingya population to return to their homeland.

A second approach, as proposed on 21 September 2017 by the Bangladeshi Prime Minister Sheikh Hasina to the UN General Assembly, would be to send the Rohingya refugees back to the Rakhine state and set up UN-supervised 'safe zones' within the borders of Myanmar in order to protect the Rohingya people within the boundaries of their own state. This is a problematic suggestion, as the Rohingya people are not recognized as citizens of Myanmar by its government. Regardless, this will be referred to as Alternative B.

Lastly, the government of Bangladesh could close its borders to the Rohingya currently fleeing the humanitarian crisis in Myanmar. Bangladesh is not a signatory to the United Nations Convention on refugees and, therefore, could opt to block their entry into the country. However, Alternative C would require costly and long-term monitoring of the border regions and would likely fail to staunch the flow of refugees fleeing the violence in Rakhine state.

As Alternative A is presently being implemented by the Bangladeshi government, this study elaborates on this management approach.

Negative Impacts

With time, the impact will be more severe at the expansion and makeshift camps following the settlement stage. The original Kutupalong refugee camp is already impacted and will change faster with the thousands of refugees arriving. The environment will be influenced over time due to the increase in population and unsustainable demand for natural resources. These concerns and related mitigation recommendations are discussed in detail.

Mitigation Activities

Non-Hazardous and Hazardous Waste

Collecting and selling recyclable materials presents an opportunity to incentivize keeping these materials out of waterways or haphazardly chosen locations. As infrastructure catches up to the high demand for sanitation facilities, the community can be educated on the importance of not defecating in the open to minimize the spread of disease. Defecating away from water sources is of particular importance. In emergency situations a trench or hole can be dug at least 30 metres away from water sources and covered when it has served its purpose (WHO, 2017).

- Collection facilities for plastics and batteries should be established.
- The community should be versed on the importance of utilizing available latrines.

Biological Impacts

The influx of refugees will likely disturb the landscape, though proper infrastructure and management can negate the breadth of the impact, as outlined below.

- Establishing appropriate sanitation infrastructure will help mitigate the chance of hypoxic water zones as well as eutrophication.

Climate Change Risk and Air Pollution

As mentioned by Walsham (2010), the frequency and severity of floods, cyclones, storm surges and droughts is expected to increase in Bangladesh because of climate change. Bangladesh is ranked first as the most vulnerable country to cyclones with 32.2 deaths per 100,000 people exposed to the disaster (UNDP 2004). These disasters will also cause serious impacts on coastal and freshwater environments and the people who depend on these areas. As stated by IUCN (2009), with increasing rainfall during the monsoon months, the volume of river water will be much higher and there will be an increase in sedimentation and riverbank erosion. Sea water is expected to rise in the future which will also contribute to saline intrusion. Saline intrusions can have repercussions on surface water and groundwater systems as well as mangrove habitats (ICUN, 2009). Changes in weather normalities because of climate change have also contributed to the increase in drought (IPPC, 2007), which will have many impacts on the surrounding environment and people. Drought poses a risk to vegetation involved in agriculture and to the amount of safe drinking water. Miyan (2015) mentioned that droughts contribute further to pollution, diseases, and also increases the chance of wildfires in regions with significant vegetation.

The increasing potential of air pollution in Bangladesh poses many concerns for the health of the environment and people. Much of the air pollution is created by the large urban cities in Bangladesh that have brick kiln industries and use motorised vehicles. In rural areas like Kutupalong, burning biomass for cooking and heating (Department of Environment, 2012) is most common. A large portion of burning is done indoors, which contributes to serious respiratory problems.

The Kutupalong refugee camps are located in a rural area which suffers from extreme poverty and lack of resources. It is therefore not realistic to form a large mitigation plan for climate change and air pollution as the majority of the GHG emissions and over-exploitation of resources are generated in the larger and wealthier regions

in Bangladesh. There is a Bangladesh Climate Change Strategy and Action Plan (2009) that was established by the Ministry of Environment and Forests from the Government of the People's Republic of Bangladesh. There is also an Air Pollution Reduction Strategy (2012) for Bangladesh that was created by the Department of Environment of the Government of Bangladesh.

However, these reports are designed for the major cities of Bangladesh, making them difficult to apply to the Kutupalong refugee camps.

- A short-term mitigation strategy would be to communicate the importance of cooking outdoors regularly. This will benefit the health of women and children as they are eliminating their direct exposure to black carbon emissions. In addition, indoor cooking can be a risk since most of the housing structures at these camps are constructed of wood and bamboo. The likeliness of a house catching fire is much higher during drought season. A long-term mitigation strategy would be to develop housing that separates the cooking area from other spaces. This improves the safety and health of the people, especially the women and children who are most affected.
- Finally, the development of a tree and plant re-growth programme would aid the restoration of important plant species. This programme would also help to mitigate the release of CO₂ emissions and also restore habitats that have been impacted by soil erosion, salinity intrusion, and deforestation.

Fragile Ecosystems

The Teknaf Game Reserve, located less than 12km from the focus area, is especially exposed to increased anthropogenic impact. Studies suggest that previous livelihood activities undertaken by Rohingya refugees were more harmful to the forests in the reserve than those carried out by locals (Uddin & Khan, 2007), therefore an increase in people's demand on these resources would result in environmental damage. Appendix XII shows those areas in Bangladesh that deserve special attention due to their environmental value.

Furthermore, mangroves have been severely hit by livelihood activities e.g. Chakaria Sunderban in the Cox's Bazar region (Hossain *et al.*, 2001), suggesting that these ecosystems are susceptible to increasing demographic pressure, such as that caused by a new refugee camp nearby. Equally important, wetlands must bear a lot of stress from aquaculture and agriculture practices.

Based on our knowledge of the current issue, we propose the following mitigation measures:

- Livelihood activities carried out by locals and refugees need to be addressed and managed properly by the relevant environmental authorities,
- Protected areas such as Teknaf Game Reserve must step up the surveillance of their geographical boundaries,
- Previously stipulated cultivation lands lent to the Rohingyans could translate into the self-sufficiency of the community and a decreased anthropogenic pressure on the surrounding food resources, and
- Engaging both local and refugees in participatory programmes to keep a good environmental status in the region. Training programmes might also be needed to give the new refugee community the knowledge and tools that allow them to live off the natural resources with sustainable practices.

Deforestation and Energy Demand

Deforestation, due to the need of significant quantities of timber to cover the energy demands, will become a significant impact. The potential consequences that derive from deforestation include a high likelihood of landslides due to loss of soil steadiness (Mahmud, 2017), floods, and an increase in CO₂ concentration levels in the air since a large amount of vegetation has been removed.

Recommended mitigation measure:

- Choose strategic locations for the houses within the refugee camp with the aim of causing the least possible impact on the environment,
- Develop training programmes to teach and sensitize local and refugee communities about the impact of forest harvesting,
- Develop political and regulatory strategies to reduce GHG emissions in Bangladesh,
- Supply alternative energy resources to avoid overexploitation of forests,
- Protected areas in the surroundings of the settlement must step up the surveillance of their geographical boundaries for a better protection of trees and other native vegetation,
- Apply time-saving practices, such as changing the food supplied by aid organisations to types that cook faster and have aid organisations provide lids for pans to conserve heat ("The Impact of Refugees on the Environment and Appropriate Responses - ODI HPN", 2017), and
- Reduce the need for wood fuel for fires as a key component to reducing the felling of trees.

Land Use, Population and Settlement

Refugee housing consists of a bamboo structure covered with tarpaulin, sometimes stabilised with mud walls. The original camp has expanded due to the influx of refugees which is predicted to continue to grow. This in turn will put pressure on land resources such as bamboo for housing structure, agricultural land for food production, and forest land for firewood collection. In addition, there have been issues between Rohingya refugees and Bangladeshis (Akhter and Kusakabe, 2014).

Sustainable management of resources will be crucial for future regeneration of the camp area and to prevent continued damage. The government has already banned deforestation for firewood due to the negative environmental impact. Future mitigation proposals will be addressed to all stakeholders and NGOs. These include:

- The government should endeavour to predict future expansion and establish preferred settlement locations for additional refugees so proactive management can avoid high risk environmental areas (i.e: the camp should not expand into the Teknaf Game Reserve),
- Designated areas for bamboo deforestation should be established, and bamboo regeneration projects should be addressed,
- Integration management programmes for Rohingya into local communities should aim to tackle any discrimination and violence through effective enforcement of laws,
- Provide refugees with gas canisters to cook and pre-fabricated shelter units to decrease the amount of deforestation and subsequent pollution taking place, and
- Improve infrastructure by building roads to distribute aid packages as quickly as possible. Currently, Bangladeshi authorities are improving roads with the support of UNHCR (UNHCR, 2017a).

Health

In the focus area there are four doctors, six nurses, and six community health workers (Milton et al., 2017). There are several health clinics situated throughout the focus area and a hospital nearby. MSF created a 24-hour facility within the Kutupalong camp in partnership with different departments to cover the needs of the residents, such as for neonatal care, children, and adults, as well as sexual and reproductive healthcare services. Collaboration with local health services is taking place by giving them access to proper laboratories for investigation of cholera and

other diseases (MSF, 2017). However, there are not enough clinics to deal with the overwhelming medical needs and several mitigation methods need to be addressed:

- Additional health clinics need to be set up, and additional doctors and nurses hired,
- Women's health should be a focus point, with facilities available for collection of menstruation products, and promoting the use of menstrual cups. Breast pumps should be available so pregnant women are more mobile and therefore less vulnerable to sexual assaults,
- Mental health is a large concern in the camp due to the level of trauma the refugees have experienced. There should be a specific location where refugees can go to address these problems with a health professional,
- There should be clinics designated for testing for waterborne diseases such as cholera, in addition to transferable diseases and viruses,
- Increased communication for sanitation areas is key to avoid spread of diseases,
- In order to aid those suffering from acute watery diarrhoea, the UN Refugee Agency has set up one treatment centre and plans to open up an additional 4-6 centres within the next six months (UNHCR, 2017). Furthermore, they wish to make "the gradual transition from mobile health services to five primary health care centres (including both mental and reproductive health facilities)" (UNHCR, 2017).
- Additional medical facilities with 24-hour access for emergency cases is recommended.

Education

The population of Rohingya children within the camp is increasing due to the high number of pregnant women. UNFPA (2017) estimates that 13% are pregnant or breastfeeding. There are few schools in the official camp and fewer still in the makeshift and expansion camps. Children are facing a lack of education.

Recommended mitigation activities include:

- The number of schools and teachers should be increased in order to improve children's education within official and unofficial camps. Refugee families should be involved in education development within the camp and help build school programmes for their children.

Waste Management

The Lebanon-based organisation Arcenciel has generated success through its programmes for waste management, particularly in refugee camps and the UNHCR report (The State of The World's Refugees, 2006), endorses the programme.

- Similar structures could be developed in Kutupalong. Action Against Hunger (AAH) has been on the ground in Cox's Bazar since 2008. By contacting AAH a programme may be set up and supported through the experience with Arcenciel. The programme is intended to be led for a short time before becoming self-sustaining through the education and efforts of the refugees (Sorting Centers for Recyclable Waste, 2017).
- Human settlements should respect a 50m buffer zone around streams and wetland ecosystems, and ideally each family should have their own latrine. Plastic slabs for latrines should be sunk downstream of wells, at least 30m from any groundwater source.
- Provide lighting throughout the focus area and in key risk areas, to protect refugees from physical safety risks (such as sexual and gender-based violence (SGBV) that often occur in unlighted areas at night or while refugees search for firewood. Lighting programmes should focus on strategic locations, including latrines and washing zones, and areas where people meet socially or gather for activities. (UNHCR, 2002) Poor Infrastructure

- Encourage NGOs to provide alternative building materials such as bamboo, which is easily accessible, has a rapid growth rate, and is relatively inexpensive in comparison to other materials,
- Alternative materials should also be durable to withstand extreme weather conditions,
- NGOs and camp officials should provide refugees with adequate information regarding the design of their shelters and aid them throughout the construction process whenever possible, and
- Roads should be completed as quickly as possible to provide both refugees and camp officials with access to a variety of locations within the camp. This will allow for increased maintenance of sanitation and water facilities.

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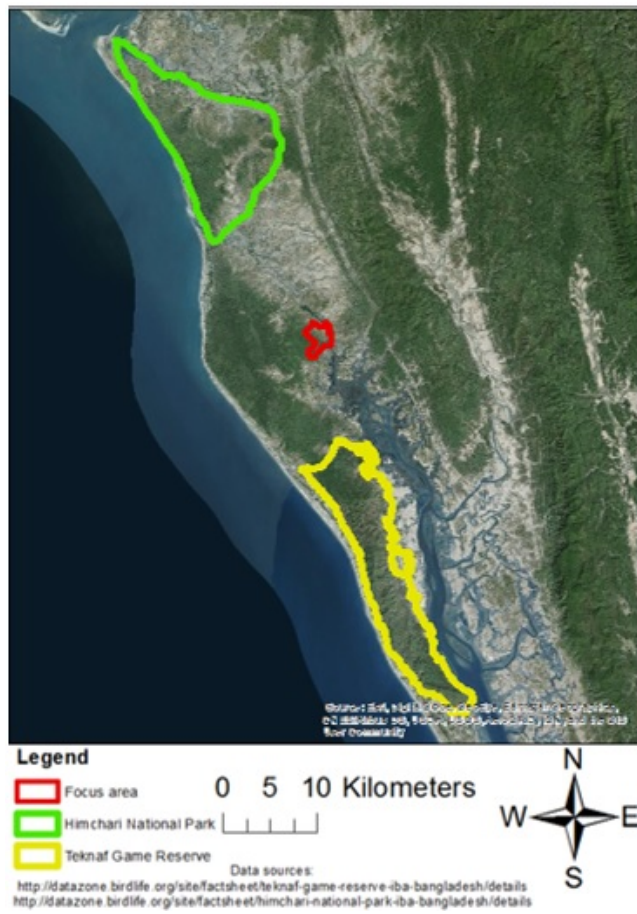
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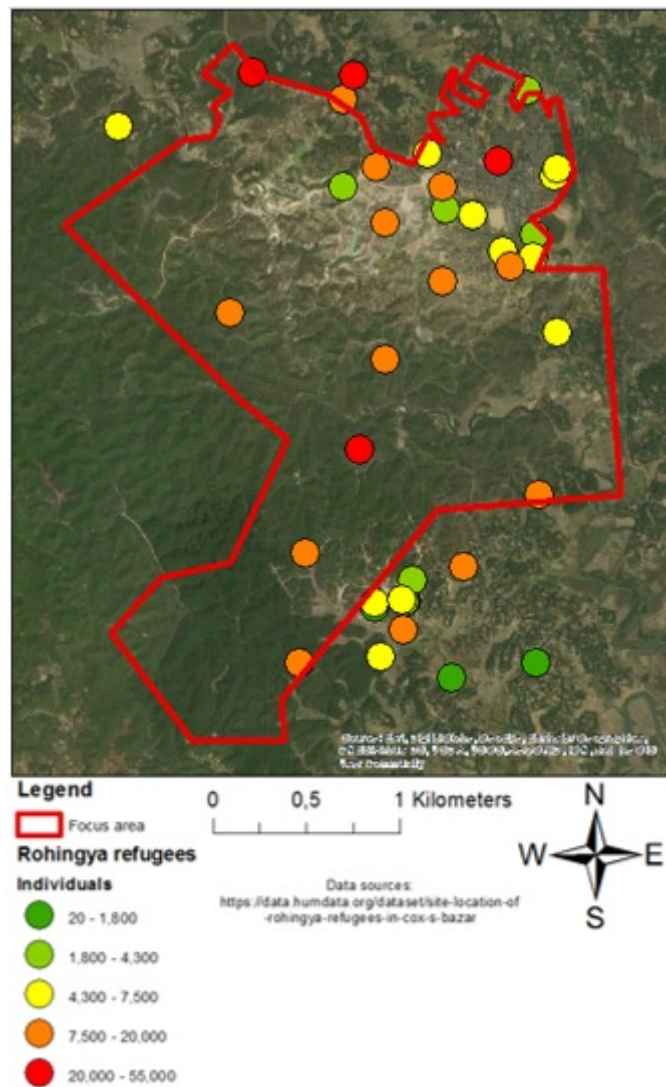
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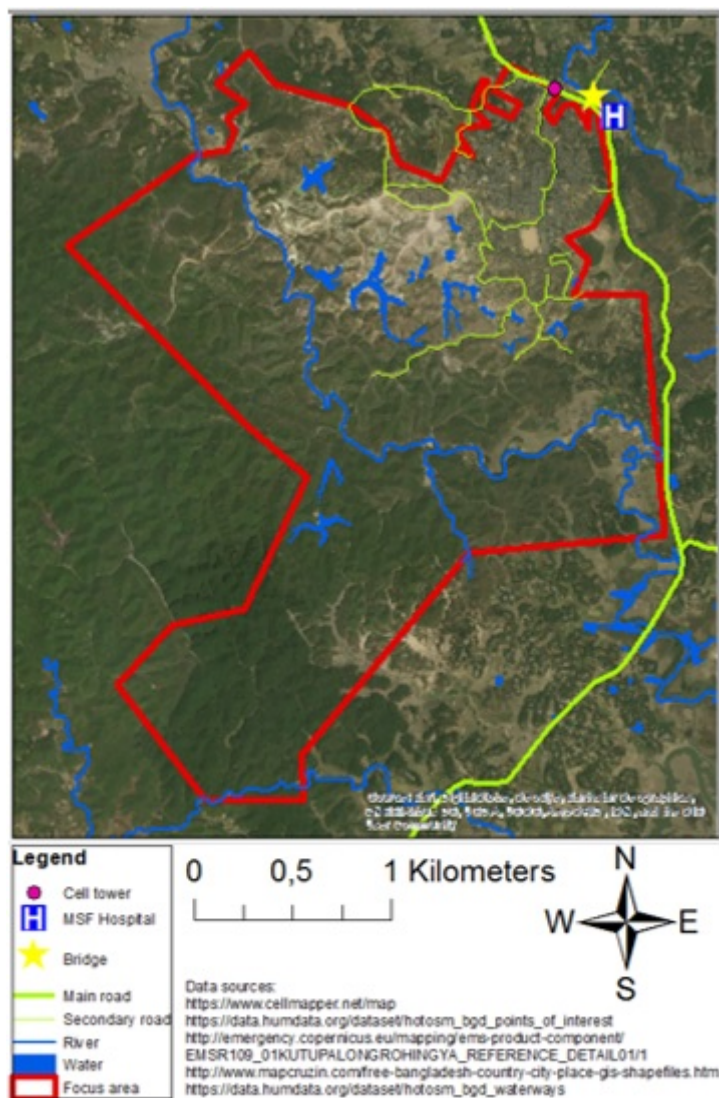
APPENDIX I Nature Reserves



APPENDIX II Rohingya Refugee Density

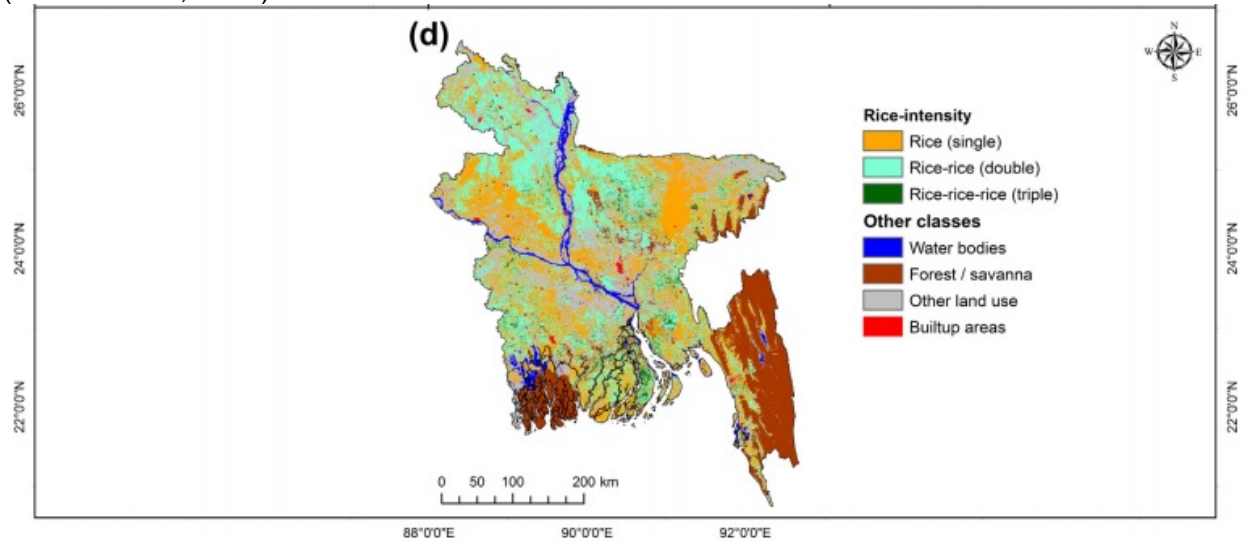


APPENDIX III Infrastructure

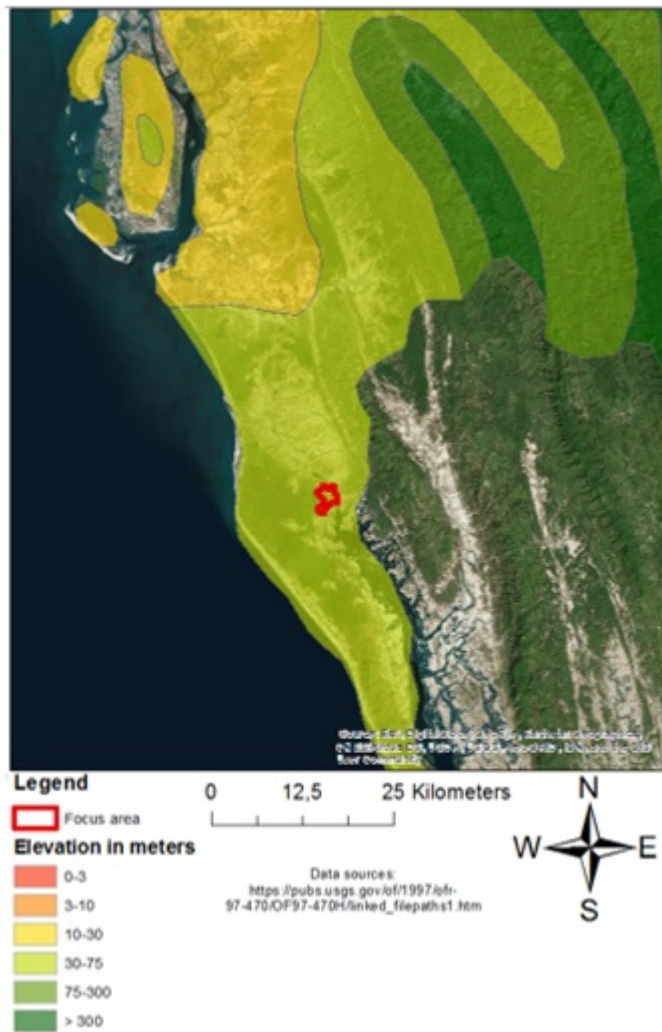


APPENDIX IV Land Use Bangladesh

(Gumma et al, 2014)

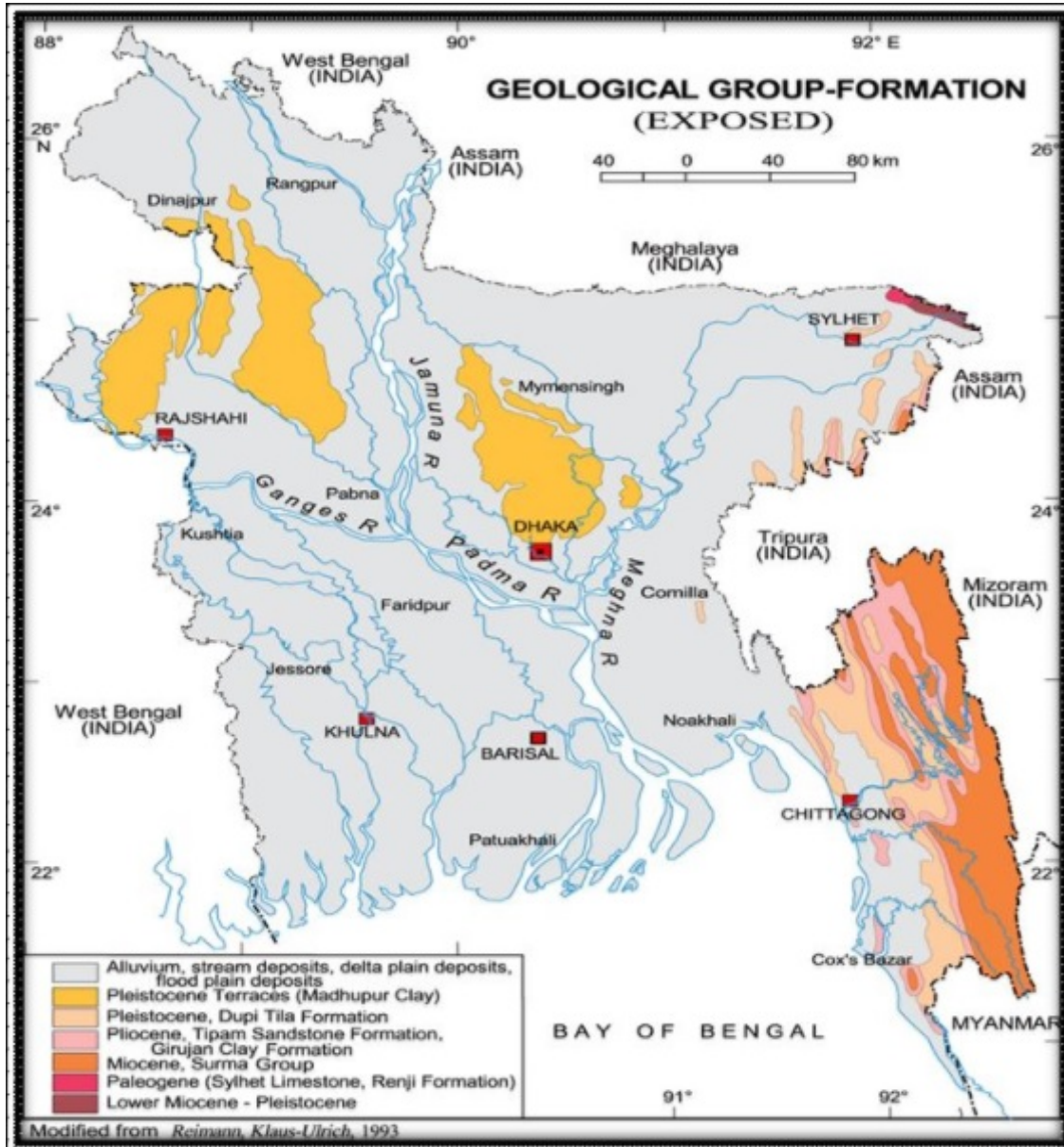


APPENDIX V Elevation



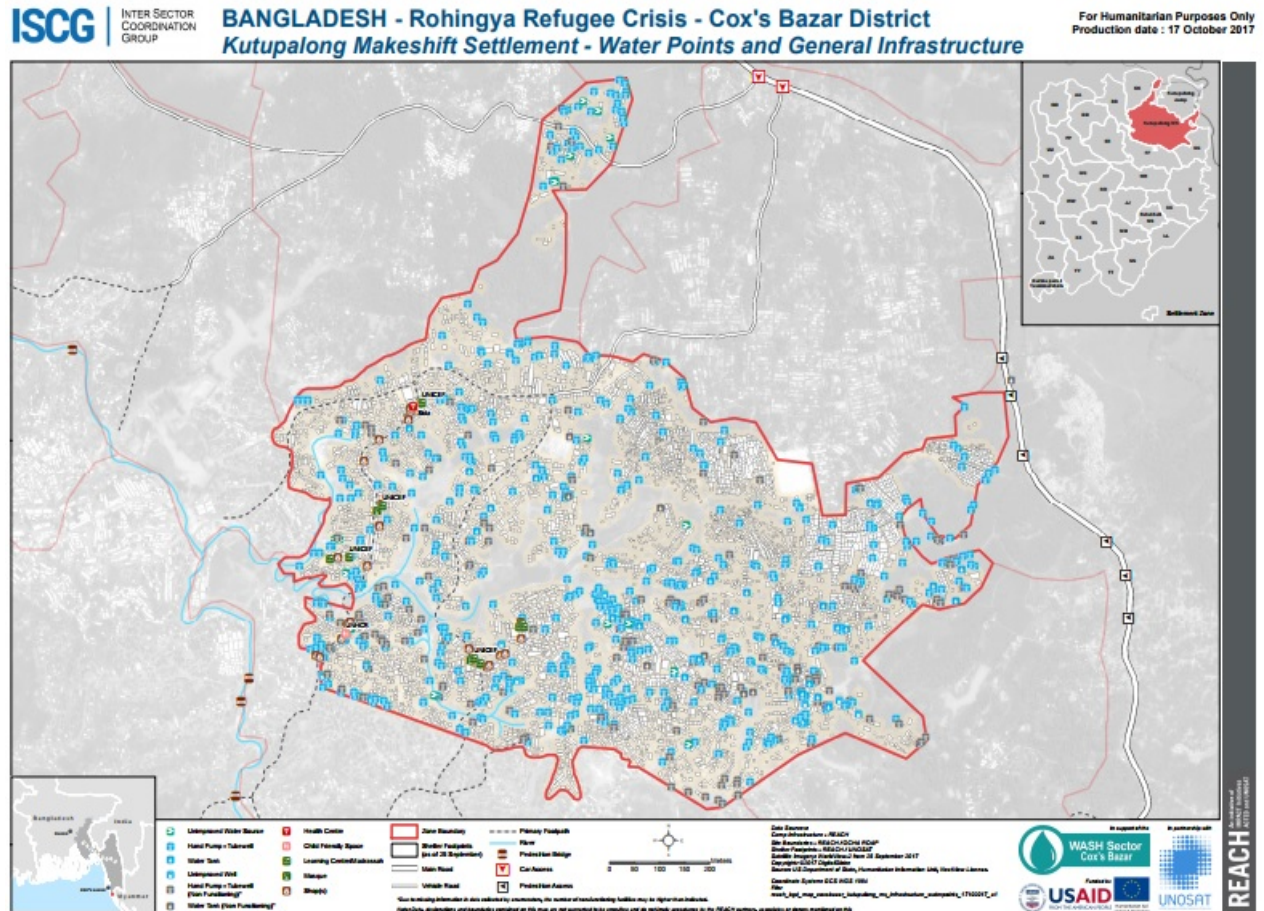
APPENDIX VI Geology Bangladesh

(Roy, 2009)

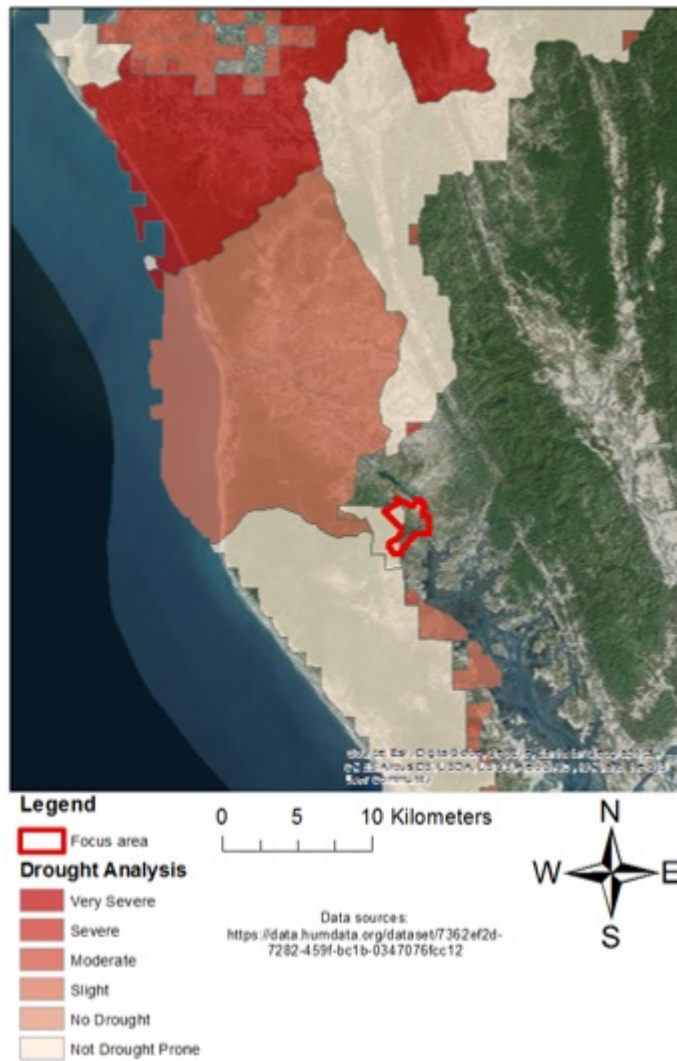


APPENDIX VII Waterwells Kutupalong MS

(ISCG, 2017)

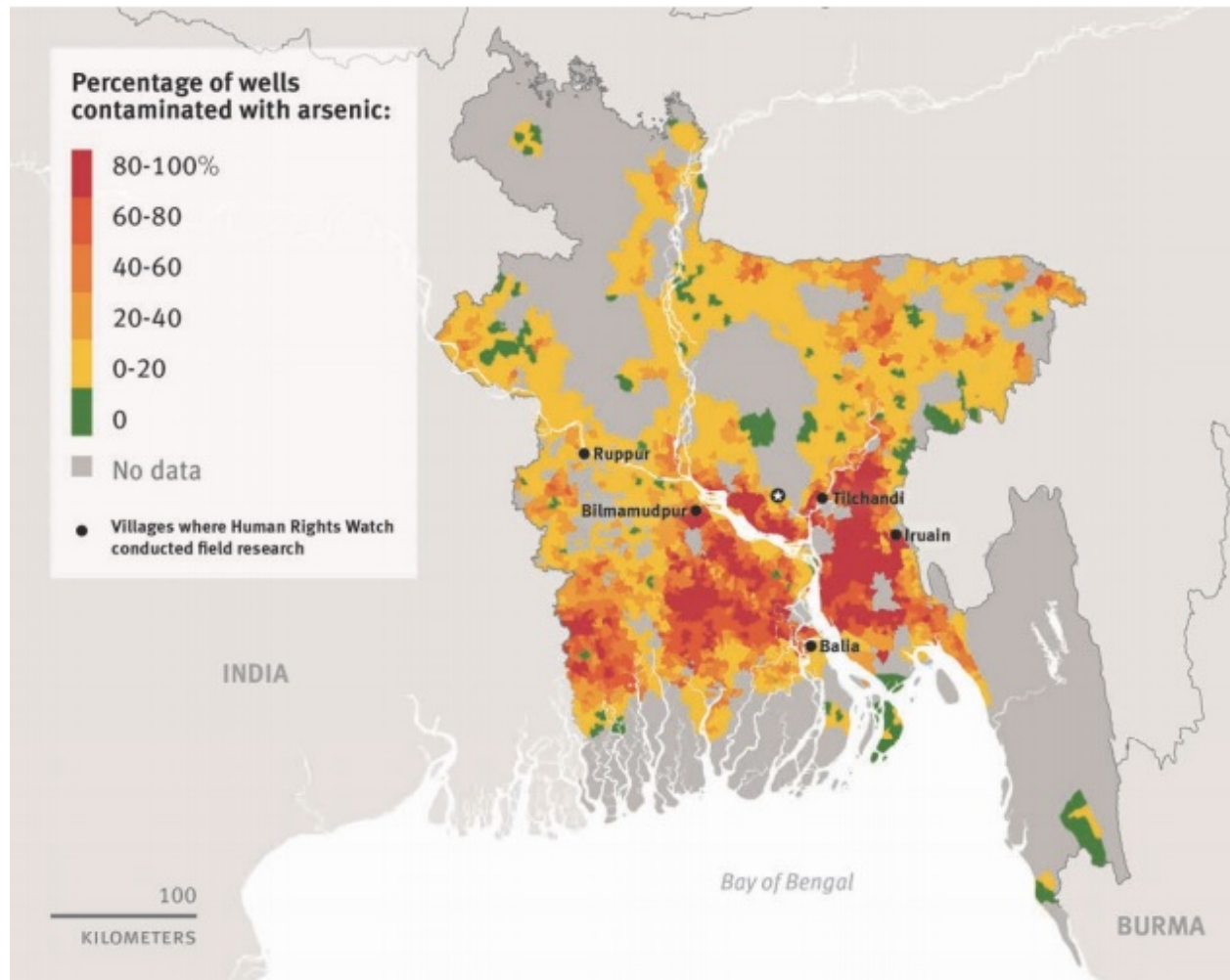


APPENDIX IX Drought Analysis



APPENDIX X Wells Contaminated with Arsenic

(Pearshouse, 2017)



APPENDIX XI Wetland Usage in Cox's Bazar

(Islam, 2010)



APPENDIX XIII Terms of Reference

Upon arrival tasks should be delegated to a team consisting of representatives of the Swedish Civil Contingencies Agency, translators, social care workers, volunteers, and, if possible, social or environmental professionals. For the two months, it is advised that the team have primary focus on monitoring and mitigation of the following impacts:

- Safe drinking water availability and accessibility,
- Deforestation surrounding camp and intruding into Teknaf Game Reserve,
- Shelter location and material,
- Solid waste management and recycling,
- Safety and security of refugees in and around the camp,
- Food source security and quality,
- Disease prevention to reduce the spread of communicable illness and improve treatment,
- Air pollution monitoring for improved mitigation planning, and
- Improving sanitation for the benefit of life quality within camp.
- Public involvement through surveys, and scientific studies administered as suggested within the method section for investigating impacts.
- It is advised to create weekly progress reports.

Work Breakdown Structure

(BA= Bangladeshi Authorities/Nationals, ET= Environment Team, SET= Socio-economic Team)

Team members		
	Task	Participant - role
1	Team Coordination / Planning	Team leader
2	Team Coordination / Planning	Team leader
3	Translation	Interpreter (BA)
4	Team safety and health care	First Aid responder (BA)
5	Team safety and health care	Security (BA)
6	Coordination of Environment Team members	Environment Team Leader (BA)

7	Coordination of Socio-Economic Team members	Socio-Economic Team Leader (BA)
8	Biodiversity study	Biologist- ET (BA)
9	Water resources, coastal safety	Oceanographer- ET (BA)
10	Food safety & hygiene	Environmental manager- ET (BA)
11	Food safety	Aquaculture expert- ET (BA)
12	Geological/groundwater survey	Geologist- ET (BA)
13	Strategic settlement design/ improve infrastructure	Engineer- ET (BA)
14	Psychological / socio-economic survey	Psychologist- SET
15	Community Counseling / environmental. Training / stakeholder involvement	Social Worker- SET
16	Community Counseling / environmental. Training / stakeholder involvement	Social Worker- SET
17	Carry out surveys	10 locals- SET
18	Perform environmental samplings / take measurements in the field	10 locals- ET

Materielle

	Materials needed	Quantity
1	Field laptop	4
2	Measurement tape (60m)	2
3	Portable fluorometer	3
4	Rain gauge	1

5	Microscope	2
6	Portable malaria test kit	80
7	Fishing nets and traditional fishing gear	2
8	GIS software	4
9	Sampling bags	2000
10	Database of species abundance over time, software	1
11	Lab material (petri dishes, alcohol, rubber gloves, lab coats, tweezers etc.)	N.A.
12	Portable /submersible oximeter	5
13	Portable commercial arsenic kits	75
14	Metal detector	1

APPENDIX XIV Survey

SURVEY					
Section	Question	<15 years	15-49	51+	Additional Information
General	Age	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		M	F		
	Sex	<input type="checkbox"/>	<input type="checkbox"/>		
		Healthy	Unhealthy	Pregnant	
	Health status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		1-2	3-4	5+	
	Family size	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Section	Questions	Yes	No	Additional information
Public Health				
	Is it easy to find access to healthcare?	<input type="checkbox"/>	<input type="checkbox"/>	
	Which agency has provided medical attention?			
	Were you ill before entering the camp?	<input type="checkbox"/>	<input type="checkbox"/>	
	How long have you been showing symptoms?			
	What are your symptoms?			
	From which source have you taken your water?			
	Have you eaten food you purchased?	<input type="checkbox"/>	<input type="checkbox"/>	
Water Resources				
	Is there enough water available to you?	<input type="checkbox"/>	<input type="checkbox"/>	
	If no, what is the reason?			
	Is there another source which is available?	<input type="checkbox"/>	<input type="checkbox"/>	
	How far is the nearest source of drinking water?			
	How much clean water is available to you daily?			
	Do you receive bottled water from aid agencies?	<input type="checkbox"/>	<input type="checkbox"/>	
	Are any water stations known to cause illness?	<input type="checkbox"/>	<input type="checkbox"/>	
Wildlife Management				
	Have you relied on wild animals for sustenance?	<input type="checkbox"/>	<input type="checkbox"/>	
	Are the mosquitos very prevalent in the camps?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is sickness from mosquitos common?	<input type="checkbox"/>	<input type="checkbox"/>	
	Have you encountered any wild animals?	<input type="checkbox"/>	<input type="checkbox"/>	
	Was it inside or outside the camp?			
	What kind of animal did you encounter?			
	Did the animals cause problems?	<input type="checkbox"/>	<input type="checkbox"/>	
Land Use				
	Where do you obtain your firewood from?			
	Is there enough wood available?	<input type="checkbox"/>	<input type="checkbox"/>	
	If not, what do you do to cook?			
	Are fires shared with neighbours?	<input type="checkbox"/>	<input type="checkbox"/>	
	Are there any agricultural areas close to camp?	<input type="checkbox"/>	<input type="checkbox"/>	
	Is there any farming within the camp?	<input type="checkbox"/>	<input type="checkbox"/>	
	Have you noticed the trees being removed?	<input type="checkbox"/>	<input type="checkbox"/>	
Infrastructure				
	Does your shelter protect you from the weather?	<input type="checkbox"/>	<input type="checkbox"/>	
	Do you feel safe in your shelter?	<input type="checkbox"/>	<input type="checkbox"/>	
	How did you make your shelter?			
	Did you retrieve the materials from the source?	<input type="checkbox"/>	<input type="checkbox"/>	
	Do you have access to transportation?	<input type="checkbox"/>	<input type="checkbox"/>	
	Are there roads usable and close?	<input type="checkbox"/>	<input type="checkbox"/>	
Flooding				
	Are you concerned about dangers of weather?	<input type="checkbox"/>	<input type="checkbox"/>	
	Have you seen any flooding since you arrived?	<input type="checkbox"/>	<input type="checkbox"/>	

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	If yes, which areas were affected the worst?		
	How long did the water remain?		
	Were there casualties within the camp?	<input type="checkbox"/>	<input type="checkbox"/>
Waste Management			
	What do you do with waste materials?		
	Are there bins provided for disposal of garbage?	<input type="checkbox"/>	<input type="checkbox"/>
	Do you burn any garbage?	<input type="checkbox"/>	<input type="checkbox"/>
	Are refuse piles close to shelters or drinking water?	<input type="checkbox"/>	<input type="checkbox"/>
	Is garbage commonly left on the ground?	<input type="checkbox"/>	<input type="checkbox"/>
Pollution			
	How many vehicles do you see a day?		
	Does every family have their own fire?	<input type="checkbox"/>	<input type="checkbox"/>
Culture and Religion			
	Do you practice a religion?	<input type="checkbox"/>	<input type="checkbox"/>
	If yes, which religion?		
	Are cultural practices difficult to perform?	<input type="checkbox"/>	<input type="checkbox"/>
	Are there religious structures nearby to practice?	<input type="checkbox"/>	<input type="checkbox"/>
Food Security			
	Does your food come from an aid organisation?	<input type="checkbox"/>	<input type="checkbox"/>
	If not, where do you obtain it from?		
	Do you have enough food for two meals per day?	<input type="checkbox"/>	<input type="checkbox"/>
	If not, why is there not enough?		
Seasonal Change			
	Do you have access to warm clothing and shelter?	<input type="checkbox"/>	<input type="checkbox"/>
	If so, did you bring it with you?	<input type="checkbox"/>	<input type="checkbox"/>
	If not, did you get it from an organisation?	<input type="checkbox"/>	<input type="checkbox"/>
Education			
	Are your children accessing education?	<input type="checkbox"/>	<input type="checkbox"/>
	If yes, from whom and how far from your shelter?		
	Can you learn how to do activities within camp?	<input type="checkbox"/>	<input type="checkbox"/>
	If so, from which organisation?		
Livelihood			
	Are you earning income?	<input type="checkbox"/>	<input type="checkbox"/>
	If yes, how do you make money?		
	Are there risks associated with your job?	<input type="checkbox"/>	<input type="checkbox"/>
Maternity			
	Do you have access to prenatal and natal care?	<input type="checkbox"/>	<input type="checkbox"/>
	If yes, who is providing it?		
Sanitation			
	Do you use latrines?	<input type="checkbox"/>	<input type="checkbox"/>
	How far is the distance to the nearest latrine?		
	Do you feel safe using the latrines unaccompanied?	<input type="checkbox"/>	<input type="checkbox"/>
	Is there a space available for washing?	<input type="checkbox"/>	<input type="checkbox"/>
	Are the latrines cleaned?	<input type="checkbox"/>	<input type="checkbox"/>
	If so, how often?		
	How close are the latrines to sources of water?		
	How close is the nearest area of food preparation?		
Security			
	Do you feel safe in the camp?	<input type="checkbox"/>	<input type="checkbox"/>
	If not, what makes you feel unsafe?		
	Have you reported any issues to authorities?	<input type="checkbox"/>	<input type="checkbox"/>
	Do you feel comfortable reporting problems?	<input type="checkbox"/>	<input type="checkbox"/>
	If not, why?		

APPENDIX XV Organisations

Location	Child Centered Care	Education	Food Security	GBV	Health	NFI/ Shelter	Nutrition	WASH
Kutupalong MS	ACF, IOM, UNICEF, BRAC, COAST Trust,	HI, UNICEF, BRAC, CODEC, Mukti CXB, WFP	ACF, ActionAid, HI, IOM, RI, UNFPA, Help CXB	ACF, HI, IFRC, IOM, MSF, BDRCS, UNICEF	ACF, HI, IFRC, IOM, MSF, BDRCS, UNICEF	ACF, IOM	ACF, UNICEF, WFP, MoHFW, SHED	ACF, MSF, UNICEF, DPHE, NGO Forum
Kutupalong RC	ACF, UNHCR, SC	HI, UNHCR, WFP, SC	ACF, WFP, Mukti CXB	ACF	ACF, UNFPA, UNHCR, HI	ACF, SHED	ACF, UNICEF, WFP, SHED, MoHFW	UNHCR

(ISCG; 2017) BANGLADESH: Cox's Bazar refugee response (4w),

ISCG (2017) BANGLADESH: Cox's Bazar refugee response (4w) Retrieved from <https://cxbcoordination.org/maps/>

Sector	Lead agency	Role	Name	Email	Phone
Education	UNICEF	Sector Coordinator	Kaisa-Leena Juvonen	edusector.cxb@humanitarianresponse.info	0170120 2807
		Information Management Officer	Henry Renna Gellano	edusector.cxb.im@humanitarianresponse.info	0170120 2808
		Information Management Officer	Md Sajidul Islam	msislam@unicef.org	0171540 4155
	SCI	Sector Coordinator (CXB)	Maheen Chowdhury	maheen.chowdhury@savethechildren.org	0171923 8286
		Agency delegate to ISCG Dhaka	Jacklin Rebeiro	jacklin.rebeiro@savethechildren.org	0191816 7576
Food Security	WFP	Sector Coordinator (CXB)	Davide Rossi	Davide.rossi@wfp.org	0170120 2958
		Information Management Officer	John Durcan	john.durcan@fscluster.org	0710202 934
	Mukti	Sector Co-Coordinator	Hera	hrbanik@gmail.com	
Health	WHO	Sector Coordinator (CXB)	SALVADOR, Edwin Ceniza	salvadore@who.int	017 0966 2055

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		Agency delegate to ISCG Dhaka	Dr. Mohiuddin Hussain Khan	mhkhan@iom.int	0171416 5298
Nutrition	UNICEF	Sector Coordinantor (outgoing)	Louise Enevoldsen	lenevoldsen@unicef.org	017 9658 7344
		Sector Coordinantor (Incoming)	Tabasum Abdul Rasul Masumbuko	tmasumbuko@unicef.org	
		Information Management Officer	Faith Nzioka	fnzioka@unicef.org	01701- 202814
Protection	UNHCR	Sector Coordinator (CXB)	Blanche Tax	tax@unhcr.org	0170836 7852
		Sector Coordinator (Dhaka)	Tayba Sharif	sharif@unhcr.org	0175423 8067
Child Protection	UNICEF	Sector Coordinator (CXB)	Mohaned Kaddam	mkaddam@unicef.org	017 3008 9087
		Information Management Officer	Mark Bonyo	mbonyo@unicef.org	
		Information Management Officer	Cleophas Tavaya	ctavaya@unicef.org	0 1700 703 805
		Agency delegate to ISCG Dhaka	Shabnaaz Zahereen	szahereen@unicef.org	0172003 9682
GBV	UNFPA	Sector Coordinator (CXB)	Saba Zariv	zariv@unfpa.org	0170890 6662
		Information Management Officer	Daniel Han	mhan@unfpa.org	
Refugee Response (Multi-Sector)	UNHCR	Sector Coordinator (CXB)	Mai Terawaki	terawaki@unhcr.org	0173255 5154
		Agency delegate to ISCG Dhaka	Showvik Das Tamal	tamal@unhcr.org	0177874 4379
Shelter/NFI	IOM	Shelter Sector Coordinator (CXB)	Graham Eastmond	sheltercxb.coord@gmail.com	0 187 274 8678
		Information Management Officer	Gaurab Pradhan	gaurab.pradhan@gmail.com	0187274 1793
Site Planning	IOM	Sector Coordinator	Wan Sophonpanich	smcxb.coord@gmail.com	0187274 8661
		Information Management Officer	Gaurab Pradhan	gaurab.pradhan@gmail.com	0187274 1793
WASH	ACF	Sector Coordinator	Abu Naim Md. Shafiullah Talukder	wash-cox@bd.missions-acf.org	0171674 3294
		Information Management Focal	Shajan Siraj	washdpm-cox@bd.missions-acf.org	0181321 3381
	UNICEF	Sector Coordinator Co-coordinator	Zahid Mahmood Durrani	zmdurrani@unicef.org	01700- 703813

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		Information Management Officer	David Alford	dalford@unicef.org	01700-70380
		Information Management Specialist	Aliocha Salagnac	asalagnac@unicef.org	01700-703807
Logistic	WFP	Logistics Cluster Coordinator	Nikola JOVANOVIĆ	nikola.jovanovic@wfp.org	
		Information Management Officer	Irene PAZZANO	irene.pazzano@wfp.org	
ETC	WFP	Sector Coordinator	Haidar Baqir	haidar.baqir@wfp.org	
		Information Management Officer	Katarzyna Chojnacka	katarzyna.chojnacka@wfp.org	
CwC WG	IOM	Working Group Coordinator	Virginia Moncrieff	vmmoncrieff@gmail.com	
Cash WG	ISCG	Working Group Coordinator	Jimena Peroni	peroni.jimena@gmail.com	0187274 1800
ISIM WG	IOM	Working Group Coordinator	John Marinos	marinosj@un.org	0170120 2867
Inter-Sector Coordination		Senior Humanitarian Coordinator	Sebastian Rhodes Stampa	rhodesstampa@un.org	017 0120 2869
		Senior Humanitarian Coordinator (incoming)	Julie Belanger	belangerj@un.org	017 0120 2869
		Inter-Sector Coordinator	Margo Baars	MBAARS@iom.int	017 5758 6391
		Field Coordination Cell	Samantha Orr	orrs@un.org	017 0120 2868
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		Field Coordination Cell (incoming)	Autumn Petersen	petersena@un.org	017 0120 2863
		Field Coordination Cell (incoming)	Ivy Sutsani		017 0122 7501
		Field Coordination Cell	Saikat Biswas	sbiswas@iom.int	017 1348 0305
		Civil-Military Cell	Ronaldo Reario	rearior@un.org	017 0120 2879
		Civil-Military Cell	Macdonald Kadzatsa	mackadam@gmail.com	017 0120 2862
		Civil-Military Cell	Dario Mentone	dario.mentone@gmail.com	017 0120 2879
		NGO Coordination Cell	Lisa Joerke	iscg.ngo2@gmail.com	018 7274 1798
		NGO Coordination Cell	Saiful Alam	iscg.ngo1@gmail.com	017 7774 1465

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		Information Management Cell	Mahmudul Hasan	mahhasan@iom.int	019 1503 5788
		Information Management Cell	Paballo Mosala	mosala@un.org	017 0120 2871
		Information Management Cell	Iosto Ibba	iostoibba@yahoo.it	017 0120 2873
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Appendix XVI Morbidity Index

adapted from Milton et al., 2017, taken from UNHCR, 2015.

Morbidity	Refugee Camp
	Kutupalong (n-13,102) %
Communicable Diseases	
Upper respiratory tract infection	33
Lower respiratory tract infection	11.6
Diarrhoea	7.1
Skin Diseases	11.5
Non-Communicable Diseases	
Respiratory disorders	29.9
Endocrine and metabolic disorders	30.4
Cardiovascular disease	19.4
Others	16.4
Mental Health	
Epilepsy/seizures	26.7
Mental retardation/ intellectual disability	+
Psychotic disorders	43.3
Medically unexplained somatic complaints	+
Others	30
Injuries	
Accidents	89.5
Self-harm	+
Assault (no weapons)	5.3
Others	4.8
Nutrition	
Prevalence of global acute malnutrition (6-59 months)	13
Prevalence of stunting (6-59 months)	52
Prevalence of severe acute malnutrition (5-69 months)	2
Prevalence of anaemia (5-59 months)	43
Prevalence of anaemia in women of reproductive age	13
Mortality	
Crude mortality rate (CMR/1000/month)	0.2
Under-five mortality rate (IMR/1000/month)	0.4
Infant mortality rate (IMR/1000/livebirths)	19.6
Neonatal mortality rate (NNMR/1000/livebirths)	11