REPORT ON

ENVIRONMENTAL IMPACT OF ROHINGYA INFLUX

March 2018 | Dhaka, Bangladesh

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ABBREVIATIONS AND **ACRONYMS**

ADB	Asian Development Bank
AoI	Area of Influence
BFIDC	Bangladesh Forest Industries Development Corporation
BFRI	Bangladesh Forest Research Institute
CiC	Camp in Charge
CPG	Community Patrol Groups
CPP	Cyclone Preparedness Programme
CZPo	Coastal Zone Policy
DO	Dissolved Oxygen
DoE	Department of Environment
E-Coli	Escherichia coli (bacteria)
ECA	Ecologically Critical Area
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EQS	Environmental Quality Standards
ESMF	Environmental and Social Management Framework
FD	Forest Department
FGD	Focus Group Discussion
GBVAW	Gender-based violence and violence against women
GoB	Government of Bangladesh
ICS	Improved Cooking Stove
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IOM	International Organization for Migration
KII	Key Informant Interview
MoEF	Ministry of Environment and Forest
MoDMR	Ministry of Disaster Management and Relief
NFI	Non-Food Item
NGO	Non-Governmental Organization
PA	Protected Area
REA	Rapid Environmental Assessment
SDC	Swiss Development Cooperation / Swiss Humanitarian Aid (SHA)
SES	UNDP Social and Environmental Standards
TDS	Total Dissolved Solids
TWS	Teknaf Wildlife Sanctuary
UMP	Undocumented Myanmar People
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
WFP	World Food Programme
WHO	World Health Organization

EXECUTIVE **SUMMARY**

The Rapid Environmental Assessment Study was initiated by the Ministry of Environment and Forest (MoEF) of Bangladesh and by UNDP and UN Women to assess the environmental impacts of the Rohingya influx into Bangladesh and propose a series of actions to address the high environmental risks related to the influx. The study received additional support from the environmental emergency response mechanism of the UN Environment/OCHA Joint Unit, through the Swiss Agency for Development and Cooperation.

The UNHCR Environmental Guidelines (1996) state that the environmental impacts of an influx of asylum seekers in host countries include: "*uncontrolled fuelwood collection, poaching, and overuse of limited water supplies. These impacts have placed serious strains on the ecosystems in many regions, including some unique areas set aside by local governments as parks or reserves or even sites recognized by UNESCO as World Heritage Sites. In the worst case, these activities, if continued, could result in irreversible losses of productivity, the extinction of species of plants or animals, the destruction of unique ecosystems, the depletion or long-term pollution of ground water supplies, or a variety of other destructive outcomes*".

The Rapid Environmental Impact Assessment (REIA) team found this description to be an accurate reflection of the situation with regard to the Rohingya influx, where the consequences of the influx are unfolding at an alarming rate and on an enormous scale.

The study addresses environmental and related gender-based issues and health risks. It aims to: establish a baseline of the environmental context in which Rohingya[1] asylum seekers have sought refuge;[2] identify the current and potential environmental impact of the influx; and propose measures that the Government of Bangladesh, UN and other partners can implement to mitigate or offset the current crisis.

The assessment methodology was informed by UNDP's Social and Environmental Standards (2015) and UNHCR's Environmental Guidelines. The study draws on existing information, stakeholder feedback, results from reconnaissance

[1] Rohingya refugee are referred here as 'forcibly displaced Myanmar nationals' as per government recommendation. However the word "Rohingya" is used here throughout the report.

[2] The detailed baseline conditions can only be defined within a full scale environmental assessment work. This rapid assessment provides only indicative findings and is based on a limited set of available data.

survey to the influx area and limited field surveys, including surface and ground water sampling and analyses, and the responses of residents from host communities and Rohingya to a questionnaire about use of wood for fuel and construction, encounters with wildlife and poaching. The scope of the study was limited by the short period of time available for the collection of baseline information, and by the scarcity and quality of this information.

The assessment was conducted on a qualitative level for physical environmental impacts and on a semi-quantitative level for cumulative impacts on ecosystems (using aerial photos, satellite images, ground truthing, GIS data and maps). The description of environmental baseline conditions is based on available information and the description of the current state of the environment after the Rohingya influx is presented as part of the baseline. A simple model using the available biomass, land cover information and cooking fuel demand was developed and used to assess the speed of potential forest degradation caused by excessive fuelwood collection.

Due to time constraints a comprehensive environmental impact assessment was not conducted. Rather, a rapid environmental impact assessment is conducted and hence this report has some limitation. Environmental losses and damage caused by Rohingya influx is therefore not evaluated and investment required for implementation of environmental management plan is not costed in this report.

Eleven environmental impacts were identified that have been or could potentially be exacerbated by the Rohingya influx. Six of these were physical environmental impacts on: ground water; surface water; acoustic levels; indoor air quality; solid waste management; and soils and terrain; and the remaining five were impacts on ecosystems: natural forests; protected areas and critical habitats; vegetation; wildlife; and marine and freshwater ecosystems. Key risks were pinpointed and assessed based on the rating of their impact. The following risks associated with the physical environmental impacts were assessed as high: ground water depletion; ground water contamination; poor indoor air quality; poor management of sewer sludge; removal of soils and terrain; and changes in terrain. Impacts on ecosystems with high associated risks were: deforestation and forest degradation; encroachment onto and resource extraction from protected areas; changes in land cover; rapid biomass reduction; loss of species; loss of wildlife habitat and shrinkage of wildlife corridor; and mortality risks for wildlife.

Most of the physical environmental impacts appear to be reversible, although those on soils and terrain may require considerable time to return to their baseline levels. The denuded landscape will have reduced water retention capacity which may impact ground and surface water in the area. Paramount to any reversal will be the implementation of closure of the Rohingya camps and the initiation of land reclamation plans.

The study identified the following gender-based issues: the health risks of inhaling smoke from cooking inside poorly ventilated shelters; the physical demands of firewood collection; and a lack of separate bathing and toilet facilities for women. Overuse of natural resources such as the unregulated collection of firewood and the extraction of ground water may give rise to conflicts between the Rohingya and the host communities, which could disproportionally affect women who are one of the most vulnerable groups of the population.

The study outlines a number of recommendations to implement mitigation measures and offset programmes.

One crosscutting mitigation measure to address the physical impacts of the influx is to provide alternative fuel and cooking stoves and/or a dedicated space for community cooking. This would improve air quality in the shelters, eliminate the need for fuelwood collection from forests and protected areas, and remove the associated gender-based health and safety risks. Improved planning and living standards would address issues of access to potable water, sanitation and solid waste management.

The immediate impact on ecosystems in the area is cumulative in nature and less visible than the physical impacts of the influx. Proposed mitigation, for example strict rules of resource use in protected areas, requires addressing the land and resource use patterns of both the host communities and the Rohingya. To improve the degraded forest habitat and compensate for the forest areas lost beneath the camps' footprint, proposed actions include assistance to community/social forestry, reforestation and artificial natural regeneration of shrub dominated areas, afforestation along the coastal line and agroforestry in the village common forests. Other measures include: to develop and implement closure and reclamation plans for abandoned camps, including landscaping, turfing in barren hills, improve drainage, soil restoration, and reforestation; to establish designated areas for bamboo afforestation and promote bamboo regeneration projects; and to consider enhancement of natural habitats in other areas of Bangladesh to ensure no net loss in biodiversity.

Current experience in managing influxes shows that at the stage when asylum seekers become repatriated or integrated, funds are scarce for the closure and reclamation of the abandoned camps and associated facilities as well as for the reforestation of degraded lands and the conservation of wildlife habitat. Sufficient resources will need to be secured to ensure that reinstatement of the land is adequately supported after the Rohingya repatriation.

Extensive environmental management and detailed long-term monitoring programmes are recommended to confirm and quantitatively define the results of this indicative Rapid Environmental Assessment Study, and mitigate the environmental loss and damage from the influx. The programmes will be integrated in the UN Humanitarian Response Plan process and led by the Ministry of Environment and Forest (MoEF) and the Ministry of Disaster Management and Relief with support from the Department of Environment (DoE), the Forest Department and the Department of Disaster Management and other associated line agencies.

Collection of fuelwood from the natural forest by Rohingya | Photo: UNDP Bangladesh/Arif Faisal

GLOSSARY[3]

Area of Influence	Area where the impact of activity is assessed. It usually includes the primary project site(s) and related facilities; areas and communities potentially affected by cumulative impacts from further planned development in the geographical area that are realistically defined at the time the assessment is undertaken; and areas and communities potentially affected by the impact from unplanned but predictable developments caused by the project that may occur later or at a different location.
Biodiversity	The variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.
Critical habitat	Areas with high biodiversity value, including habitat required for the survival of critically endangered or endangered species; areas having special significance for endemic or restricted-range species; sites that are critical for the survival of migratory species; areas supporting globally significant concentrations or numbers of individuals of congregatory species; areas with unique assemblages of species or that are associated with key evolutionary processes or provide key ecosystem services; and areas having biodiversity of significant social, economic, or cultural importance to local communities.
Cumulative impact	Changes in the environment caused by an activity in combination with other past, present and future activities. The combination of multiple impacts from existing projects, the proposed project, and anticipated future projects that may result in significant adverse and/or beneficial impacts that cannot be expected in the case of a stand-alone project.

Endemic species	Any species whose range is restricted to a limited geographical area. An endemic species is one that has ≥ 95 percent of its global range inside the country or region of analysis.[4]
Denudation	Process that causes the erosion of the earth's surface by moving water, ice, wind or waves, leading to a reduction in elevation and in relief of landforms and of landscapes.
Impact (effect)	Activity causing changes (effects) in the environment.An environmental effect is the result of environmental impacts on human health and welfare. The term is also used synonymously with environmental impact.[5]
Land cover (class)	The observed (bio)physical cover on the earth's surface.[6] Land cover indicates the physical land type e.g. forest or open water.
Mitigation	Measures taken to avoid, reduce, or compensate for adverse environmental impacts during project implementation.
Modified habitat	Areas where the natural habitat has been altered, often through the introduction of alien species of plants and animals, such as in agricultural areas.
Natural forest	A forest composed of indigenous trees and not classified as forest plantation. Forest typically refers to land with a tree canopy cover of more than 10 percent and area of more than 0.5 ha.[7] In this report, the term natural forest includes remnants of degraded forest and shrub land.
Natural habitat	Land and water areas where the biological communities are formed largely by native plant and animal species, and where human activity has not essentially modified the area's primary ecological functions.
Offset	Compensatory measures that aim to ensure that the project does not cause significant net degradation to the environment. Such measures may relate to conservation of habitat and biodiversity, preservation of ambient conditions, and greenhouse gas emissions.

[3] This list generally follows the definitions presented in the ADB Safeguard Policy Statement (ADB SPS 2009) and ADB Environmental Safeguards Good Practice Source Book (2012)

[4] See International Finance Corporation Performance Standard 6 (IFC PS6), 2012

[5] https://stats.oecd.org/glossary/detail.asp?ID=822

[6] http://www.fao.org/docrep/003/x0596e/x0596e01e.htm

[7] http://www.fao.org/forestry/en/

Physical cultural resources	Movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.
Planted forests (Plantation)	Planted forests are composed of trees established through planting and/or through deliberate seeding of native or introduced species. Establishment is either through afforestation on land which has not carried forest within living memory or by reforestation of previously forested land.[8]
Protected areas	Areas legally designated to protect or conserve biodiversity, including areas proposed by governments for such designation.
Social forestry	Tree planting or natural forest management designed to meet the forestry - related basic needs of rural people[9]. It excludes forestry which contributes to development solely through employment and wages, but includes activities by forestry industries and public services to encourage and assist forestry activities at a community level.
Threatened species	Any species which are vulnerable to endangerment in the near future. The International Union for Conservation of Nature (IUCN)[10] divides threatened species into three categories: vulnerable species; endangered species; and critically endangered species.
Wildlife sanctuary	A naturally occurring sanctuary, such as an island, that provides protection for species from hunting, predation, competition or poaching. A protected area, a geographic territory within which wildlife is protected.[11]
Upazila	Geographical region in Bangladesh used for administrative or other purposes. It functions as a sub-unit of a district.

[8] www.fao.org/forestry/plantedforests/67504/en/

[9] www.fao.org/docrep/ARTICLE/WFC/XII/0873-C1.HTM

[10] https://www.iucn.org/resources/conservation-tools/iucn-red-list-threatened-species

[11] https://en.wikipedia.org/wiki/Wildlife_refuge

BACKGROUND AND OBJECTIVE

1.1 BACKGROUND[12]

Violence in Rakhine State, Myanmar, which began on 25th August 2017, has driven an estimated 621,000 Rohingya across the border into Cox's Bazar, Bangladesh. The speed and scale of the influx has resulted in a critical humanitarian emergency. The people who have arrived in Bangladesh since 25th August 2017 are now reliant on humanitarian assistance for food, shelter, and other life-saving needs. Basic services that were available prior to the influx are under severe strain due to the massive increase in the number of people in the area. In some of the sites that have spontaneously emerged, water and sanitation facilities are limited or of poor quality, and extremely high population density raises the risks of an outbreak of disease. The Rohingya population in Cox's Bazar is highly vulnerable, living in extremely difficult conditions after having fled conflict. The figure below shows the estimated Rohingya population by location (as of November 19th, 2017).

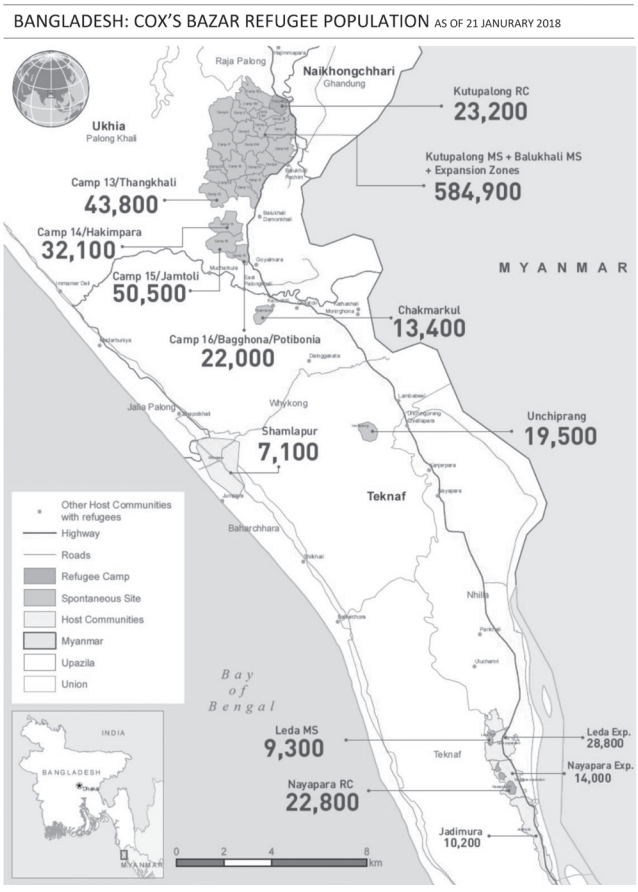
The Rohingya have been arriving in two upazilas, that of Ukhia and that of Teknaf in the Cox's Bazar district of Bangladesh[13]. The area of influx is bordered on the north by the Ramu and Naikhongchhari upazila, by the Arakan state of Myanmar on the east, and by the Bay of Bengal on the south and west. A base map is provided in Figure 1-1 showing the Rohingya influx area. The population of Rohingya by location is presented in Table 1-1.

Population movements within Cox's Bazar remain highly fluid, with increasing concentration in Ukhia, where the Government has allocated 3,000 acres (1,200 ha) for a new camp. People have begun arriving at the proposed site before infrastructure and services can be established. Crucially, there is limited access to the site and the construction of roads has just started, preventing the development of infrastructure including water and sanitation facilities. In some sites, people are constructing new shelters on any land they can find. Efforts by the Government of Bangladesh and the local community are being complemented by UN agencies

[12] This section follows the Situation Report: Rohingya Refugee Crisis. Cox's Bazar / 19 November 2017, Inter sector coordination group (www.humanitarianresponse.info/en/operations/bangladesh/document/situation-report-rohingya-crisis-coxs-bazar-19-november-2017).

[13] The physical setting of the Rohingya influx area is presented in terms of geographical location, demography, geography, bio-ecological settings and extent of services and facility providing institutions. Most of the demographic and infrastructural statistics are captured from the census and district reports published by the Bangladesh Bureau of Statistics in 2011 (BBS, 2013; BBS, 2014). Secondary literature sources are utilised extensively for the description of the geology, bio-ecological regions and river network.

Figure 1-1: Refugee Sites by Population and Location Type.



Creation date: 25 January 2018 | Source: ISCG, RRRC, Site Planning and Site Management Sector The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations

and NGOs who are scaling up their activities on the ground in Cox's Bazar, but a long-term plan for managing the situation has not yet been finalised. A good overview of the situation at the makeshift camps is presented in the recent publication "Life in the camps"[14].

The Rohingya Refugee Repatriation Commissioner (RRRC), under the Ministry of Disaster Management and Relief, is the government body in charge of the Rohingya influx. The RRRC gives authorisations for site planning and development. Camp in Charge (CiC) officials are government officials from Dhaka, designated by the RRRC. They are the administrators of the settlements, and responsible for the coordination and delivery of services in conjunction with the Bangladeshi Army. The army is a key operating actor in the settlements; it is responsible for safety and security, the distribution of food and non-food items (NFI), providing security at the distribution points, and is involved in the biometrical registration of all Rohingya.

There were several UN agencies (IOM, UNFPA, UNHCR UNICEF, WFP and others) as well as a number of national and international NGOs providing assistance to the Rohingya in Cox's Bazar before this latest influx, and their approach was to complement humanitarian assistance with support for host communities.

The local communities in Cox's Bazar have played host to a population of approximately 35,000 Rohingya settled in camps and an estimated 350,000 unregistered Rohingya for years. The new influx has placed a great strain on host communities and existing services. Despite this, local communities have been at the frontline of the response, providing food and basic items for new arrivals. According to official census figures, the number of new Rohingya represents almost a doubling of the population in the two sub-districts (Ukhia and Teknaf) which have received

[14] http://fingfx.thomsonreuters.com/gfx/rngs/MYANMAR-ROHINGYA/010051VB46G/index.html

the largest number of people, and this will change the demographic make-up of certain communities drastically in terms of ethnicity and religion.

The Rohingya are officially not allowed to leave the settlements. To that effect, checkpoints have been established on the roads. The army checks vehicles that leave the settlements, and requests passports or national ID. This restricts Rohingya in their freedom of movement from outside of their camp.

An important source of income for Rohingya is the collection of fuelwood from the natural forests and community forests. Rohingya, often women and children, gather fuelwood in the forests and sell it at local markets. Resources are shared with host communities and tensions over firewood collection are high.

The minimum World Health Organization (WHO) requirement of water for personal use is 7.5-15 L per person per day[15]. Cox's Bazar is a dry area, low on water resources. Groundwater from tube-wells is the only potable water source, yet this water often has elevated arsenic and salinity levels. Salinity is worse in winter as saline water goes upward[16]. The new influx of Rohingya has placed an additional strain on scarce resources and WASH facilities are not always proportionally allocated[17]. The quality of drinking water is of high concern, as 83% of samples tested at source and household level were biologically contaminated.

Approximately 250 deep tube-wells have been installed. Though deep aquifers exist, drilling for deep wells is expensive. It is unclear what volume of water they hold.

For camp-type settlements, a minimum area of 30m^2 per person should be available[18], if communal services can be provided by facilities outside of

Table 1-1 Population of Rohingya in Cox's Bazar by location

Location	Population before 25 Aug	Post-25 Aug Influx	Total Rohingya Population
Makeshift Settlement / Rohingya Camps			
Kutupalong-Balukhali Expansion1	99,705	339,918	439,623
Kutupalong Registered Camp	13,901	11,842	25,743
Leda Makeshift	14,240	9,786	24,026
Nayapara Registered Camp	19,230	15,327	34,557
Shamlapour	8,433	17,893	26,326
New Spontaneous Settlements			
Hakimpara	140	55,041	55,181
Thangkhali	100	29,604	29,704
Unchiprang	-	30,384	30,384
Jamtoli	72	33,226	33,298
Moynarghona	50	21,414	21,464
Chakmarkul	-	10,500	10,500
Host Communities			
Cox's Bazar Sadar	12,485	1,683	14,168

[15] http://www.who.int/water_sanitation_health/publications/2011/tn9_how_much_water_en.pdf
[16] www.dhakatribune.com/most-recent/page/3244/
[17] https://reliefweb.int/sites/reliefweb.int/files/resources/171122%20ACAPS%20Rohingya%20Crisis% 20Analysis.pdf
[18] Prepared for WHO by WEDC. TECHNICAL NOTES ON DRINKING-WATER, SANITATION AND HYGIENE IN EMERGENCIES. 2011.

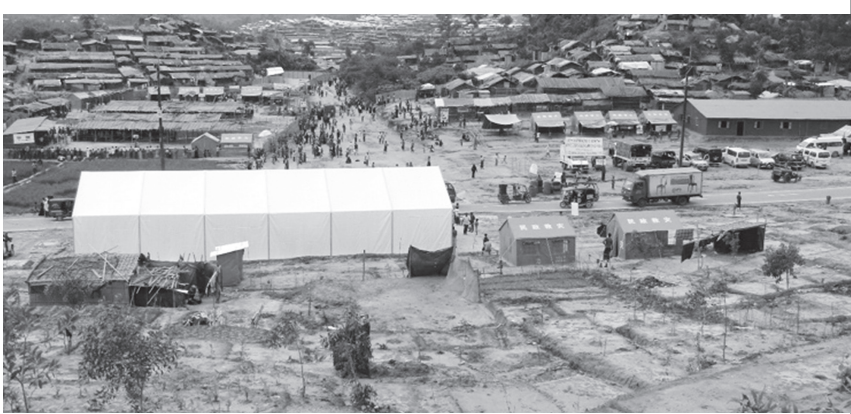
Location	Population before 25 Aug	Post-25 Aug Influx	Total Rohingya Population
Ramu	1,600	830	2,430
Teknaf	34,437	34,075	68,512
Ukhia	8,125	9,543	17,668
TOTAL Rohingya	**212,518**	**621,066**	**833,584**
Host Communities (Residents)			
Teknaf	264,389		
Ukhia	207,379		

the planned area. Communal facilities may include markets, hospitals, cemeteries, water treatment sites, and schools. If those communal services do not exist, 45m^2 per person including housing plots should be available. In the settlements, high population density paired with a scarcity of land complicates efforts to carry out effective site management.

The Armed Forces Division (AFD) is constructing a 22km access road, including bridges. The Rural Electrification Board (REB) is currently working on the installation of new light fixtures. After distribution of emergency shelter kits (including bamboo), the current focus is on shelter upgrades, decongestion and improving living conditions in the camps.

According to the most recent family counting data[19], approximately 53% of the Rohingya population are women and girls, with the largest gender discrepancy being among the population of working age (18-59) where 55% are female.

636,000 newcomers need immediate access to water and sanitation[20]. This increasing population currently lacks sufficient numbers of latrines, water points and bathing facilities, and overall these facilities lack basic protection measures including gender segregation. Moreover, they are in locations not easily accessible for women given gender mobility restrictions[21]. To avoid open bathing and defecation, women reportedly wash and defecate inside their shelters, restrict food and water intake, and restrict movement during their menstrual periods. This poses severe hygiene and health risks for them. Other women who have not been able to set up facilities inside their homes report using the shared facilities at night, hoping they cannot be easily seen; they remain highly vulnerable to gender-based violence and violence against women (GBVAW).



Balukhali makeshift camp | Photo: UNDP Bangladesh/A. Chaikine

[19] https://www.humanitarianresponse.info/en/operations/bangladesh/document/rrrc-unhcr-family-counting-dashboard-30-october-2017
[20] ISCG Situation Report: Rohingya Refugee Crisis, Cox's Bazar | 29 October 2017
[21] ISCG Situation Report: Rohingya Refugee Crisis, Cox's Bazar | 29 October 2017

1.2 OBJECTIVES OF THIS STUDY

Environmental problems associated with the influx of asylum seekers have been well documented over the years. In the absence of mitigating measures, physical deterioration of the surrounding environment soon takes place, in turn generating other impacts on both the newcomers and on local populations. Competition for natural resources such as fuelwood, building materials, fresh water and wild food may be an immediate concern.

Rohingya camps are situated near the protected areas (PA) of Teknaf Wildlife Sanctuary (TWS), the proposed Inani National Park and the Himchari National Park. These areas have already suffered degradation, and expansion of the camps is likely to result in significant ecological impacts as forest and agricultural land is converted to establish housing, schools, water supply and sanitation facilities.

This assessment process was conducted in constant communication with the Government of Bangladesh, UN organizations, NGOs, and other key stakeholders.

The Ministry of Environment and Forests (MoEF) raised the following Key Questions that this study has to address:

- What environmental impacts have been caused by the Rohingya influx to date?
- What are the predicted environmental impacts if the development continues?
- What is proposed to avoid, mitigate or offset the environmental impacts?

The Ministry of Disaster Management and Relief (MoDMR) raised the following Key Questions:

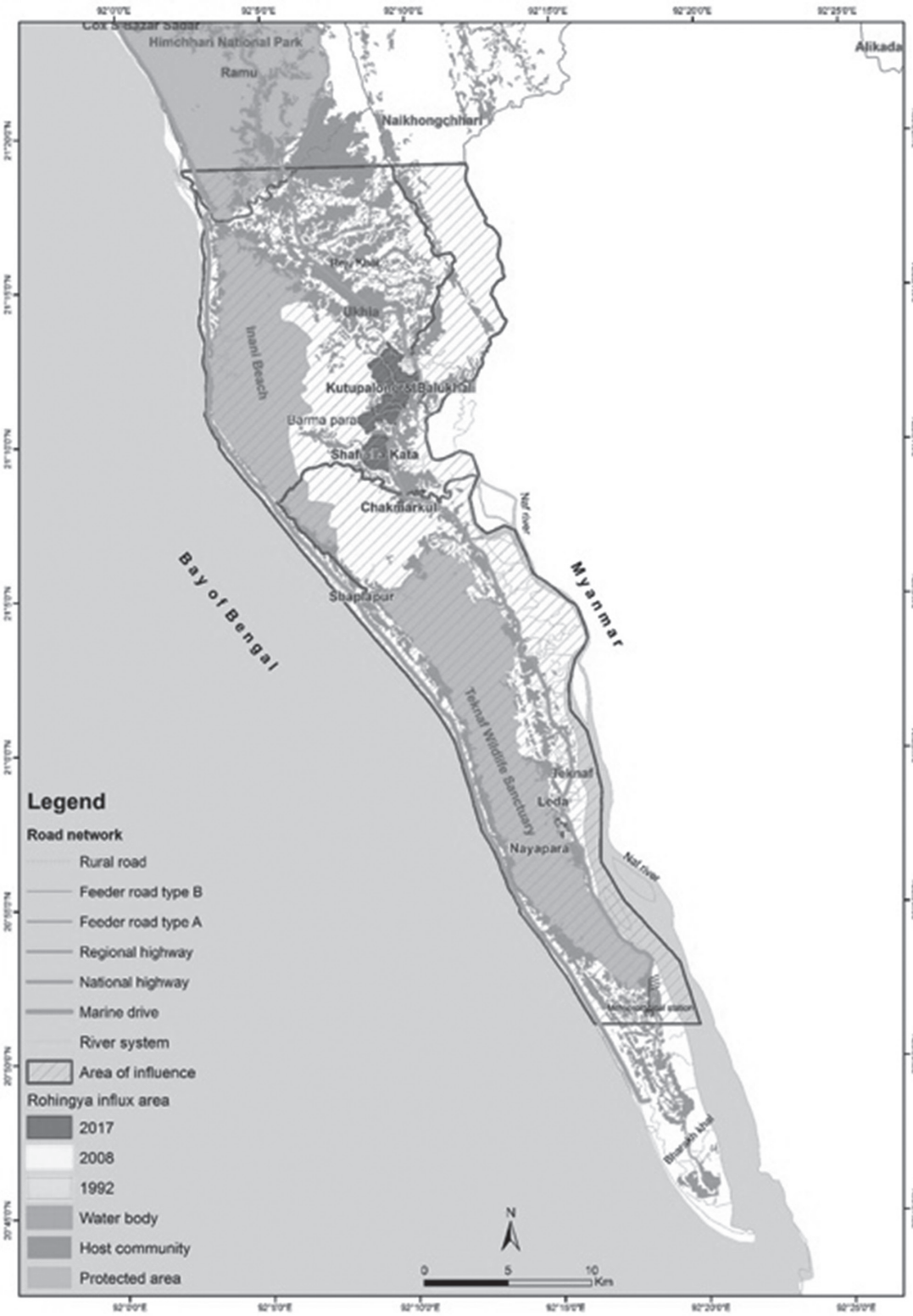
- What is the monetary value of environmental losses and damage caused by the Rohingya influx?
- What feasible restoration projects may be recommended to offset the environmental damage?
- How much investment is required for restoration of degraded ecosystem and implementation of environmental management plan?

The influx area map is presented in Figure 1-2. A broad Area of Influence was selected to accommodate the potential cumulative impacts of the influx on the ecosystems in the region.

The following activities related to the influx may cause environmental impacts:

- Land clearing for setting up the camps, supporting facilities, infrastructure and services;
- Construction of shelters, supporting facilities and roads;
- Construction and operation of water wells and latrines;
- Solid waste generation and litter;
- Cooking with fuelwood, charcoal and/or briquettes;
- Collection of fuelwood to support personal cooking and for income generation;
- Illegal hunting, poaching and fishing;
- Transport operation to deliver goods and services to the camps;
- Off-road movement of large groups of people.

Figure 1-2: Influx Overview Map



APPROACH AND METHODOLOGY

This study is informed by environmental requirements included in UNDP's Social and Environmental Standards (SES),[22] UNHCR's Environmental Guidelines (1996) and other national and international safeguards standards. It analyses developments, both current and future. The following methodology was used to address the study's objectives:

- Desk review of available information such as maps and reports[23]. Preparation of Rapid Environmental Assessment (REA) checklists[24] for the collection of relevant information (see Annexes A and B);
- Consultation with key stakeholders (Government of Bangladesh, UN agencies, NGOs, local people and Rohingya see Annex C);
- Conducting a series of Key Informant Interviews (KII);
- Focus Group Discussions (FGD) with forestry and environmental stakeholders;
- Limited primary data collection on forest inventory in the remnants plantation near to the Rohingya camps;
- Review of national policy, laws/regulations and procedures relating to environment, occupational health and safety, resettlement and rehabilitation, indigenous people, gender, etc.;
- Gathering of required environmental and socio-economic baseline information on the Rohingya influx and settled areas;
- Prediction of environmental and ecological impacts to be generated for the assessment and proposing of appropriate mitigation and restoration measures;
- Taking into account the benefits or positive impacts of an environmental management plan and proposing habitat enhancement measures; and
- Proposing mitigation measures to improve the degraded environment (forests, solid waste management, cooking fuel supply, water supply, etc.)

[22] http://www.undp.org/ses

[23] E.g. Investigative EIA – Kutupalong Refugee Camp. University Centre of the Westfjords, Iceland. The Swedish Civil Contingencies Agency. 2017.

[24] UNHCR Rapid Environmental Assessment. Module III. Framework for assessing, monitoring and evaluating the environment in refugee-related operations.

2.1 KEY RISKS

The following key risks were selected for the Rapid Environmental Impact Assessment (REIA) based on reconnaissance observations and feedback from stakeholders (Table 2-1).

Table 2-1 Selected Environmental Components and Key Risks

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

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

2.2 SIGNIFICANCE OF IMPACTS

Significance of impacts was determined using UNDP's Social and Environmental Screening Procedure (2015). The level of significance of the potential environmental risks includes both the potential impact (e.g. consequences if the risk were to occur) and probability (e.g. the likelihood of the risk occurring) for each identified risk.

The following factors were considered when estimating the potential impact:

Type and location: *Is the project in a high-risk sector or does it include high-risk components? Is it located in a sensitive area? (e.g. in a densely populated area, near critical habitats, indigenous territories, protected areas, etc.)*

Magnitude or intensity: *Could an impact result in the destruction or serious impairment of a social or environmental feature or system, or deterioration of the economic, social or cultural well-being of a large number of people?*

Manageability: *Will relatively uncomplicated, accepted measures suffice to avoid or mitigate the potential impacts, or is a detailed study required to understand if the impacts can be managed. If the latter, which management measures are needed?*

Duration: *Will the adverse impacts be short-term (e.g. exist only during construction), medium term (e.g. five years) or long-term?*

Reversibility: *Is an impact reversible or irreversible?*

Community Involvement: *Absence of community involvement is an inherent risk for the success and sustainability of any project. Have project-affected communities been consulted in project planning and design? Will they have a substantive role to play in the project going forward?*

Both impact and probability were assessed on a scale of 1 (low) to 5 (high) for each identified impact (see Section 5).

Table 3-2 Rating the 'Impact' of a Risk

Score	Rating	Social and environmental impacts
5	Critical	Significant adverse impacts on human populations and/or environment. Adverse impacts high in magnitude and/or spatial extent (e.g. large geographic area, large number of people, transboundary impacts, cumulative impacts) and duration (e.g. long-term, permanent and/or irreversible); areas impacted include areas of high value and sensitivity (e.g. valuable ecosystems, critical habitats); adverse impacts to rights, lands, resources and territories of indigenous peoples; involve significant displacement or resettlement; generate significant quantities of greenhouse gas emissions; impacts may give rise to significant social conflict.

Score	Rating	Social and environmental impacts
4	Severe	Adverse impacts on people and/or environment of medium to large magnitude, spatial extent and duration more limited than critical (e.g. predictable, mostly temporary, reversible). The potential risk impacts of projects that may affect the human rights, lands, natural resources, territories, and traditional livelihoods of indigenous peoples are to be considered at a minimum potentially severe.
3	Moderate	Impacts of low magnitude, limited in scale (site-specific) and duration (temporary), can be avoided, managed and/or mitigated with relatively uncomplicated and acceptable measures.
2	Minor	Very limited impacts in terms of magnitude (e.g. small affected area, very low number of people affected) and duration (short), may be easily avoided, managed or mitigated.
1	Negligible	Negligible or no adverse impacts on communities, individuals, and/or environment.

Rating the 'Probability' of a Risk

Score	Rating
5	Expected
4	Highly Likely
3	Moderately likely
2	Not Likely
1	Slight

Determining 'Significance' of Risk

Impact						
	5	R	R	R	R	R
	4	Y	Y	R	R	R
	3	G	Y	Y	Y	Y
	2	G	G	Y	Y	Y
	1	G	G	G	G	G
		1	2	3	4	5
		Probability				

Green = Low, **Y**ellow = Moderate, **R**ed = High

2.3 CUMULATIVE IMPACTS

As discussed further in Section 5, the physical impacts of the Rohingya influx do not have a cumulative potential. Therefore, the Area of Influence (AoI) for the physical impacts of the Rohingya influx is limited to the direct footprint of the camps and the small buffer area around them. For impacts on ecosystems, where potential exists for cumulative impacts, the study was conducted in a broader AoI to ensure inclusion of the relevant sources and receptors of the impacts. The AoI for the impacts on ecosystems encompasses the south part of the Cox's Bazar District (south of Ukhia) (see Figure 1-1).

REGULATORY REQUIREMENTS AND INSTITUTIONS

3.1 NATIONAL

The Constitution of the Peoples' Republic of Bangladesh, 1972
Article 18A, (15Th Amendment, 2012): The state shall endeavour to protect and improve the environment and preserve and safeguard the natural resources, biodiversity, wetlands, forest and wildlife for the present and future citizens.

Article 31: Right to Life has been extended to include right to safe environment when the importation of radiated milk was challenged through a writ petition, WP No. 92/1996.

National Environmental Policy 1992
The Bangladesh National Environmental Policy (GoB, 1992) sets out the basic framework for environmental action together with a set of broad sectoral action guidelines.

National Water Policy, 1999
Recognizes that poor water quality results in watershed degradation and deforestation, reduction of biodiversity, wetland loss and coastal zone habitat loss. Relevant policy includes ensuring adequate upland flow in water channels to preserve the coastal estuary ecosystem threatened by the intrusion of salinity from the sea.

The Coastal Zone Policy, 2005
This is a policy of integrated management of the coastal zone through the agreement of different Ministries, Departments and Agencies to harmonise and coordinate their activities in the coastal zone.

Based on the CZPo, a Coastal Development Strategy to harmonise the sectoral policies of relevant Ministries and provide an integrated coastal zone management framework for all development work in the coastal zone, was approved in February 2006.

National Tourism Policy, 1992
The main objectives of the National Tourism Policy (1992) are: to create interest in tourism among the national population; to preserve, protect, develop and

maintain tourism resources; to alleviate poverty through job creation; and to build a positive image of the country abroad.

Environment Conservation Act 1995 (ECA 1995)
The Environmental Conservation Act, 1995 (ECA '95) is currently the main legislative document relating to environmental protection in Bangladesh. The main objectives of ECA '95 are: the conservation and enhancement of the environment; and the control and mitigation of environmental pollution.

The main strategies of the act include: the declaration of ecologically critical areas, and restriction on operations and processes, which can or may not be carried out or initiated in them; a ban on hill cutting; and regulation in respect of vehicles emitting smoke causing environmental harm.

Environment Conservation Rules, 1997 (subsequent amendments in 2002 and 2003)
A set of relevant rules to implement the ECA' 95 was made public in August 1997.

Standards in Bangladesh in general are less stringent than those in developed countries. This is with a view to promoting and encouraging industrialisation in the country.

Environment Court Act, 2000 (Amended 2002)
Provides for the establishment of one or more Environment Courts, initially in every division of the country, with specific terms of reference to deal with environmental offences (under the Environment Conservation Act, or any other law specified in the Official Gazette and the rules made under those laws).

Antiquities Act (1968)
Ensures that antiquities of historical, anthropological, religious, military or scientific interest are protected.

Forest Act, 1927 (Amended 1990,2000)
Empowers the Government to declare any area of forest as reserve and in doing so allows it to take measures for in-situ conservation of biological diversity.

Wildlife (Preservation) Order, 1973 & Wildlife (Preservation) (Amendment) Act, 1974 and Wildlife Preservation and Security Act, 2012
Provides for the protection of wildlife as well as their habitat. It defines various protected areas in the form of game reserves, national parks and wildlife sanctuaries and aims to preserve wildlife in those protected areas.

Marine Fisheries Ordinance (1983) & Marine Fisheries Rules (1983)
Makes provisions for the management, conservation and development of the marine fisheries of Bangladesh.

National Biodiversity Act, 2017
Regulates biodiversity conservation and sustainable use of its resources, biota and the fair and equitable share of the benefits derived from their use, as well as other matters.

Ecologically Critical Area Act (2016)
Sets forth the activities that are permitted in ecologically critical areas, and those that are not.

3.2 INTERNATIONAL

Ramsar Convention on Wetlands of International Importance Especially Waterfowl Habitat (2 February 1971), as amended

Provides the intergovernmental framework for international co-operation for the conservation and wise use of wetland habitat and species.

The Convention of Biological Diversity (1992)

Requires each signatory nation to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity.

UN Framework Convention on Climate Change (UNFCCC)

Signatory countries have to submit GHG emission inventory to UNFCCC with mitigation options to reduce emissions contributing to climate change.

Convention Concerning the Protection of World Cultural and Natural Heritage (Paris, 12 November, 1972)

Protects cultural monuments and natural sites within their territory that are recognised to be of such outstanding universal value that their safeguarding concerns humanity as a whole.

Convention on International Trade in Endangered Species in Wild Fauna and Flora (Washington, 3 March 1973)

Ensures, through international co-operation, that the international trade in specimens of species of wild fauna and flora does not threaten the conservation status of the species concerned.

Bonn Convention on the Conservation of Migratory Species of Wild Animals (Bonn, 23 June 1979)

Conserves migratory species by Parties restricting harvests, conserving habitat and controlling other adverse factors. Sustainable utilisation is an implicit goal.

The International Tropical Timber Agreement (Geneva, 18 November 1983)

Promotes the management of tropical forests on a sustainable basis and provides a framework for co-operation between producing and consuming member states in the tropical timber industry.

International Laws related to EIA

Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991):

This is the first multi-lateral EIA treaty. It entered into force in 1997 and looks at EIA in a transboundary context. The Espoo Convention sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning.

Rio Declaration (1992):

Principle 17 of the Rio Declaration on Environment and Development calls for the use of EIA as a national decision-making instrument.

The other principle (15) of this declaration that is relevant to EIA practice is the application of the precautionary principle.

Agenda 21, which was also as a result of this convention, proposes that governments should:

a. Develop, improve and apply environmental impact assessment to foster sustainable industrial development (9.18); and

b. Introduce appropriate EIA procedures for proposed projects likely to have significant impacts upon biological diversity, providing for suitable information to be made widely available and for public participation, where appropriate, and encouraging the assessment of impacts of relevant policies and programmes on biological diversity.

The UNECE (Aarhus) Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters (1998) covers decisions at the level of projects and plans, programmes and policies and by extension, applies to EIA and SEA.

3.3 PARTNER REQUIREMENTS

UNDP's Social and Environmental Standards (SES) (2015)

The SES underpin UNDP's commitment to: mainstream social and environmental sustainability

in its programmes and projects to support sustainable development; strengthen its efforts to attain socially and environmentally beneficial development outcomes; and present an integrated framework for achieving a consistent level of quality in UNDP's programming.

Asian Development Bank (ADB)'s Safeguard Policy Statement, 2009

ADB affirms that environmental and social sustainability is a cornerstone of economic growth and poverty reduction in Asia and the Pacific. ADB's Strategy 2020 emphasises assisting Developing Member Countries (DMCs) to pursue environmentally sustainable and inclusive economic growth. In addition, ADB is committed to ensuring the social and environmental sustainability of the projects it supports.

World Bank's Environmental and Social Management Framework (ESMF), June 2011

The Environmental and Social Management Framework (ESMF) provides general policies, guidelines, codes of practice and procedures to be integrated into the implementation of the World Bank-supported Project.

3.4 INSTITUTIONAL ARRANGEMENTS

Ministry of Environment and Forests (MoEF)

The role of the MoEF is to ensure a sustainable environment and optimum forest coverage.

Department of Environment (DoE)

The role of the DoE is to help secure a clean and healthy environment for the benefit of present and future generations through: the fair and consistent application of environmental rules and regulations; guiding, training and promoting awareness of environmental issues; and sustainable action on critical environmental problems that demonstrate practical solutions, and that galvanise public support and involvement.

Forest Department (FD)

Responsible for the conservation and expansion of forest and its biodiversity and socio-economic development through modern technology and innovation.

Bangladesh Forest Research Institute (BRFI)

Aims to maintain the sustainable productivity of forest land and forest industries without resource depletion.It provides research support to the FD, BFIDC, end-users and others engaged in forestry activities.

Ministry of Disaster Management and Relief (MODMR)

The mandate of the MoDMR is to drive national risk reduction reform programmes. Its mission in relation to this agenda is: 'To achieve a paradigm shift in disaster management from conventional response and relief to a more comprehensive risk reduction culture, and to promote food security as an important factor in ensuring the resilience of communities to hazards.'

Department of Disaster Management

The disaster management vision of the Government of Bangladesh is to reduce the risk of people, especially the poor and the disadvantaged, from the effects of natural, environmental and human induced hazards, to a humanitarian level that is manageable and acceptable, and to have in place an efficient emergency response system capable of handling large scale disasters.

Cyclone Preparedness Programme (CPP)

CPP is active in the field of disaster management in Bangladesh especially in early warning systems, search and rescue, evacuation, sheltering, first aid, relief distribution and rehabilitation activities.

BASELINE CONDITIONS

4.1 RESOURCE USE

Both deforestation and reforestation have shaped the present condition of the Teknaf peninsula. As part of the programme of afforestation of newly accredited and acquired lands in coastal areas beginning in the late 1960s, the Forest Department widely planted hundreds of hectares of coastal forest. A forest management policy later allowed for the conversion of natural forest into plantations. Deforestation and forest degradation have taken place concurrently as forest resource extraction has become a secondary occupation for coastal households. These practices have not only decimated wildlife habitats, but have aslo changed plant species composition and have been responsible for ecosystem degradation in the region.

Hill cutting, usually for filling in low lying areas, has occurred throughout the Teknaf peninsula since the early 1970s. Population pressure, including the influx of a total of 240,000 Rohingya from Myanmar in the early 1970s and again in the early 1990s, has seen the large-scale conversion of forest as well as agricultural land for human settlement purposes. This has had a severe impact on flora and fauna species and habitats. The construction of shelters for the Rohingya built in the forest areas of Teknaf peninsula has contributed to forest degradation and deforestation.

Historically, the main uses of the land of the region were small scale agricultural crop production, betel nut/leaf cultivation and another homestead agroforestry. Along with settlement, the clearing of the native vegetation has had one of the greatest impacts on the natural reserve forests in this region. Currently, the main use of the land includes site for the construction of hotels and resorts, the development of urban and tourism facilities, agriculture, aquaculture and salt farming, human settlement, shrimp hatcheries, fishing and dry fish processing.

The Naf river estuary once supported extensive mangroves on its tidal floodplain areas, but almost the entire area of mangrove has been converted for agricultural use. In the 1990s around 30% of the land was used for crop production. According to GIS records, agricultural land covered 7202 ha in 1999[25].

[25] DoE-GIS and Geographic services- Coastal wetland and Biodiversity Management Project, 1999

The region, now a degraded forest land, includes three Ecologically Critical Areas (ECAs)- the western, coastal zone of Teknaf Peninsula, St Martin's Island, and Sonadia Island, and two Protected Areas (PA) - the Himchari National Park and the Teknaf Wildlife Sanctuary (TWS). The Inani National Park, proposed as a protected area but not officially established as one, is considered a key biodiversity area and should be treated as a critical habitat. An overview map of the protected areas is presented in Figure 4-5.

The region is rich in biodiversity with numerous environmental assets and scenic beauty. It has various tourist attractions, its most attractive feature being a picturesque beach which is the longest uninterrupted stretch of beach in the world. The sea beach also supports five species of sea turtles - the olive ridley turtle (*Lepidochelys olivacea*), the green turtle (*Chelonia mydas*), the hawksbill turtle (*Eretmochelys imbricate*), the loggerhead turtle (*Caretta caretta*), and the leather back turtle (*Dermochelys coriacea*). Mudflats and sand dunes across the sea beach are the area's other two environmental assets. The Ipomoea pes-caprae dominated sand dune vegetation in the shore line of Cox's Bazar through Teknaf protects the beach from soil erosion, increases the elevation of the beach and supports the breeding of the turtles. There is a significant area of sea-beach found to be planted by Jhau (*Casuarina equisetifolia*) and Baen (*Avicennia officinalis*) tree in the Cox's Bazar zone. A large size sand dune formation due to this plantation was observed.

On the other side, the hilly range runs from Cox's Bazar to Teknaf. The Cox's Bazar-Teknaf peninsula forms part of the East Asian Australasian and the Central Asian flyway. The Teknaf Wildlife Sanctuary (TWS), one of the few places in Bangladesh where elephants can be seen in the wild, is at one end of the influx area.

The habitat of these environmental assets and biodiversity has a very fragile ecosystem. Surface and ground water availability is limited and the saline water on both sides of the influx area can only support a few crops and trees. Local people are dependent on small water streams originating from the hills/terrains in the area.

Social forest plantation near TWS | Photo: UNDP Bangladesh/Arif Faisal

Betel leaf garden near TWS | Photo: SDC/A. Egli

4.2 CLIMATE

The climate of this region is tropical and characterised by a change of four, monsoon-related seasons: pre-monsoon (March to May); monsoon (June to September); post-monsoon (October to November); and the dry season (December to February). The influx area is highly susceptible to tropical cyclones and tidal surges. Cyclone storms develop in the Bay, generally in the periods from April to May and October to November, occasionally making landfall and causing severe damage to human settlements and vegetation.

Bangladesh is widely recognised as one of the most climate-vulnerable countries in the world. It experiences frequent natural disasters, which cause loss of life, damage to infrastructure and economic assets, and adversely impact lives and livelihoods, especially those of poor people. Climate change will exacerbate many of the current problems and natural hazards the country faces and the predicted higher wind speeds and storm surges will lead to more damage in the coastal region. Predictions include: increasingly frequent and severe tropical cyclones; heavier/lighter and more erratic rainfall; higher river flows; river bank and coastal erosion; increased sedimentation; melting of the Himalayan glaciers; and sea level rises.

Coastal casuarina plantation near TWS | Photo: SDC/A. Egli

4.3 NATURAL DISASTERS

Bangladesh is vulnerable to floods, flash floods, salinity, storm surges, landslides and earthquakes. Flooding, mainly in the period from May to October, occurs almost annually and affects most of the country with the exception of Barind Tract and hilly areas. The western part of the country, including Barind Tract, is a drought prone area which faces severe problems due to a scarcity of water, particularly during the dry season. The southern coastal part of Bangladesh is prone to storm surges and soil salinity while the hilly areas of Bangladesh (Chittagong Hill Tracts, Cox's Bazar and Teknaf) are vulnerable to landslides[26].

The area of the Rohingya influx has a history of occurrence of landslides, earthquakes, flash floods and tidal surges. Although the main area of the Rohingya camps is located outside of the flood zone, the camps are vulnerable to extreme weather events such as cyclones and have to withstand major precipitation and strong winds. The steep slopes may become unstable in the monsoon seasons and cause landslides, shelter damage and other destruction.

In general, neither the structures in the Rohingya camps nor those in the makeshift settlements are able to withstand cyclones or floods; nearly 70% of shelters in settlements were damaged by Cyclone Mora in May 2017[27].

[26] https://info.undp.org/docs/pdc/Documents/BGD/Final_Report%20Mid%20Term%20Review_CDMPII.pdf

[27] (ISCG 01/06/2017) https://reliefweb.int/report/bangladesh/iscg-situation-report-cyclone-mora-cox-s-bazar-1-june-2017

4.4 AIR QUALITY

Baseline data on air quality is currently not available. However, the area of influx is hilly and close to the sea, and this geographical location, coupled with the limited amount of industry in the area, means that air quality remains within acceptable limits. Pollution from cars may be a factor in the future; there is relatively heavy tourist traffic from Cox's Bazar to Teknaf.

4.5 SURFACE AND GROUND WATER

Surface water

The Moheshkhali Channel, Baak Khali and Naf rivers and Bay of Bengal are the main waterways of the region. The Moheshkhali Channel flows into the Bay of Bengal near Cox's Bazar and passes the north western boundary of the AoI. The Bakkhali River originates from the Chittagong Hill Tracts and flows into the Bay near Cox's Bazar. Five other canals run through the hilly hinterland. They are: the Reju, Inani, Mankhali, Rajachora and Mathabanga canals. During winter, the canals become almost dry. Because of the scarcity of fresh water, the region is dependent on ground water sources for its crops and horticulture. Watersheds are presented in Figure 4-1.

Ground water systems

Bangladesh is considered rich in ground water resources. Ground water resources are determined by properties of ground water storage reservoirs and volumes of annual recharge. Figure 4-2 below is the ground water zoning map of Bangladesh, 2010. From the map, it can be seen that the ground water level in and around the influx area is shallow.

Ground water storage reservoirs are composed of three aquifers in Bangladesh. They are: the upper aquifer or composite aquifer, the main aquifer (at a depth of 6 m to 100 m) and the deep aquifer. With the increased trend of urbanisation and irregular rainfall patterns, surface run-off has increased in recent times and this is likely to further reduce ground water recharge in all aquifers in the influx area. It is evident from the map that the transmission of the main aquifer is good to excellent over most of the country but it is deteriorating towards the south and the east. In the areas near the coast the water table is descending due to over exploitation.

4.6 SOILS AND TERRAIN

Soils

The major soil types are red, alluvial, muddy and sandy soil. The soils of the Dupitila formations were formed on unconsolidated and compact rocks, moderately well to excessively drained and probably the oldest of the area[28].

The soils range from clay to clayey loam on level ground and from sandy loam to coarse sand on hilly land. In the forest areas, the clayey and sandy loams are fertile, and the sandy soil is often infused with iron, resulting in a red or yellowish tinge. The hilly soils developed from un-consolidated rocks are moderately well to excessively well drained, generally deep, and probably the oldest soils in this region, while those occurring on hills from consolidated rocks tend to be formed in weathered sandstones, shales, and siltstones[29]. The soils developing from the weathered sandstones tend to be sandy loams to clay loams, and those in shales silty clay loams. Generally, the soils of Tipam Surma formations are less acidic in reaction relative to the soils of Dupitila formations[30].

Geomorphology

Bangladesh is relatively young and situated in a low-lying area with three main geomorphological regions, plain terraces and hills. Most of the area of Bangladesh is a vast low lying alluvial plain, sloping gently to the south and southeast. According to the Ecological Zoning Map of Bangladesh, the influx area falls under the Chittagong Coastal Plain and in terms of physiological formation, the area has lower

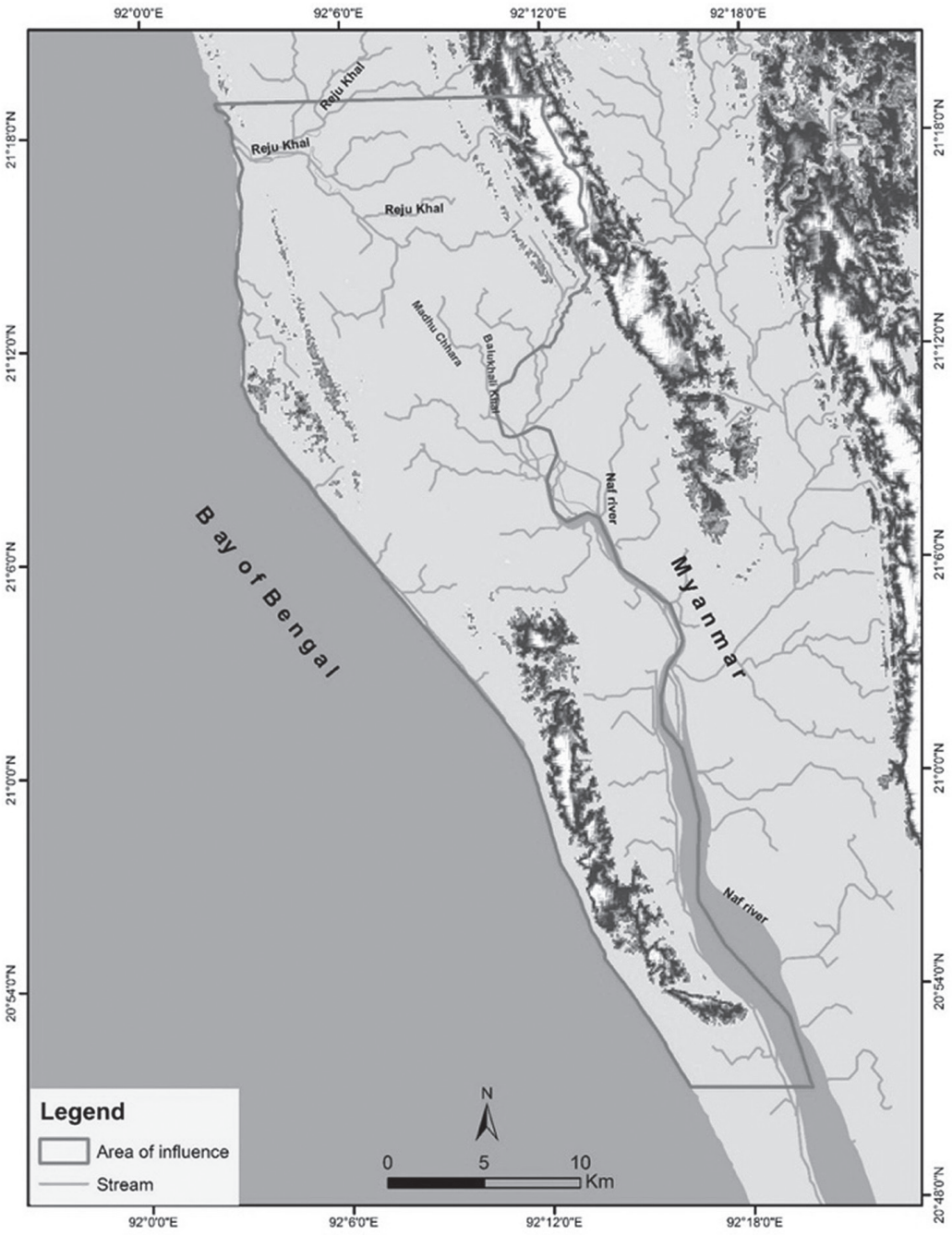
[28] http://www.sacep.org/pdf/Reports-Technical/2001-State-of-Environment-Report-Bangladesh.pdf

[29] Canonizado, J.A. 1999. Integrated forest management plan, Noakhali C/A Division (1999-2008), FRMP TA Component. Mandala Agril. Dev. Crop/FD/MOEF, 1999.

[30] Arannayk Foundation. 2013. Biodiversity of Protected Areas of Bangladesh, First edition. The Arannayk Foundation, Dhaka.

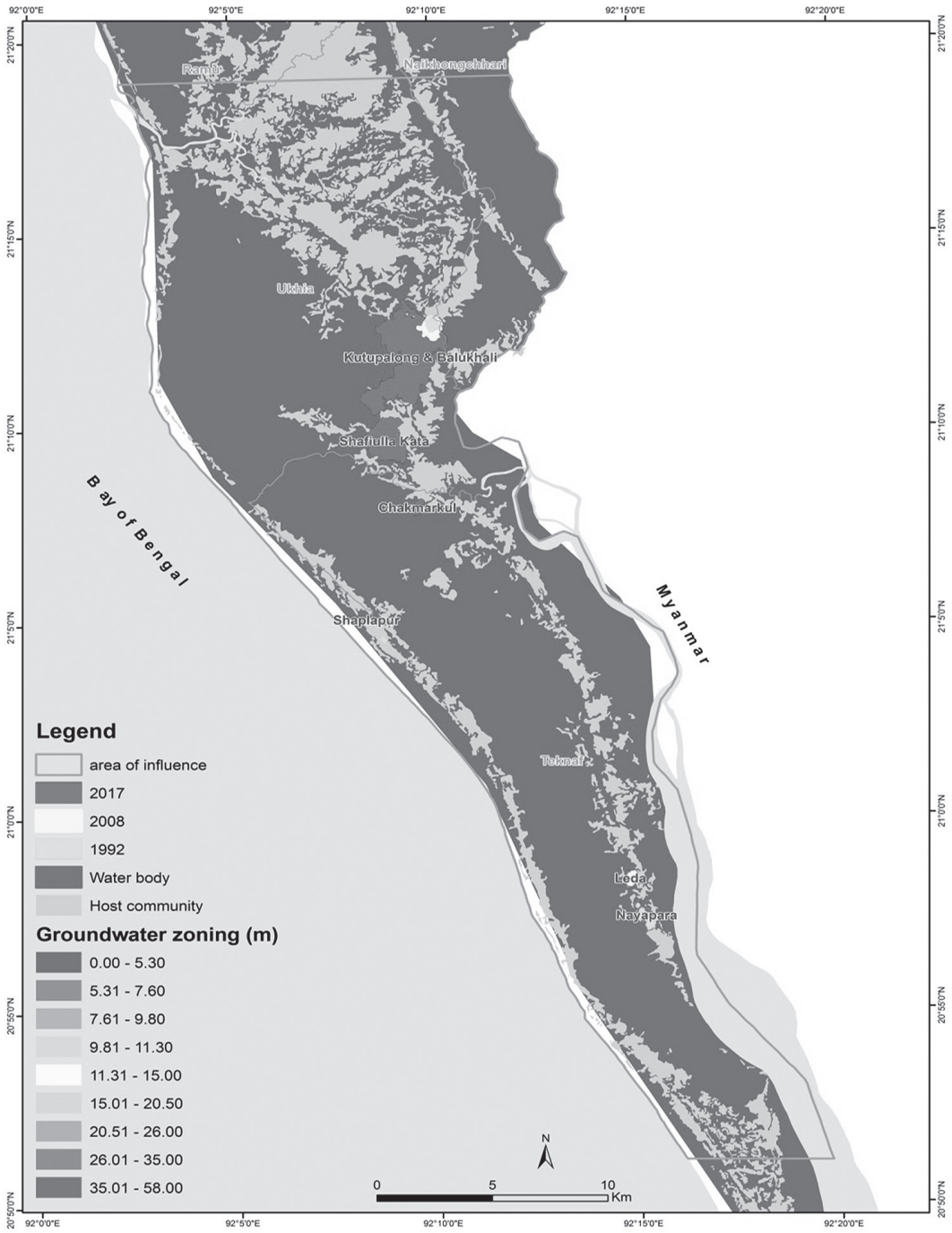
hill ranges. The area also has one of the world's longest uninterrupted natural sandy sea beaches; the beach in Cox's Bazar is an unbroken 125 km sandy sea beach with a gentle slope. The influx area is situated on a combination of small hills and plains extending into the Chittagong Hill Tracts bordering Myanmar. This region has a complicated and relatively recent tectonic history, including a succession of anticlines and synclines of tertiary rock with a NW-SE axis and local separation by a

Figure 4-1 Watersheds in the AoI



complex of alluvial plains and Pliocene and recent alluvial deposits. The quaternary of the coastal plain is a complex of various sediments of old sand beach, old calcareous corals, silty clay, acid-sulphate clays and alluvial deposits. The area is used for agriculture and is largely a complex of alluviums, terraces and old terrace fans with unconsolidated sediments of sand, sandy loam and loamy clay.

Figure 4-2 Ground water zoning map of Bangladesh



4.7 VEGETATION AND WILDLIFE

The forest land in the Ukhia and Teknaf upazilas is covered by tropical evergreen and semi-evergreen forests dominated by Garjan (Dipterocarpus spp.) occurring in deep valleys and shaded slopes[31]. Human activities have denuded most parts of the hills which have been re-occupied by sungrass, herbs and shrubs. Still, the area houses rich biodiversity, especially within the protected areas (PA).

In the last two decades, the forest areas in Ukhia and Teknaf have been significantly degraded or have been cleared. Between 1989 and 2009, the forest coverage of TWS was reduced by 46% from 3,304 ha to 1,794 ha. The shrub type of forests increased by 25% from 6,263 ha to 7,824 ha[32].

Land cover classes of the AoI (as of 2015) are presented in Figure 4-3 and described in Table 4- 1. Figure 4-3 also indicates an outline of the footprint of Rohingya camps (as of 8th November, 2017). The diagram of land cover class areas is presented in Figure 4-4.

Apart from the degradation, this forest area still houses rich biodiversity including megafauna like the Asian elephant (Elephas maximus) and many different bird species. It has been confirmed that more than 50% of the country's wildlife species are living in the forests of Ukhia, Teknaf, Inani and Himchari within the Cox's Bazar South Forest Division.

A more detailed description of the protected area is presented below and an overview map of the protected areas located in the Cox's Bazar District is presented in Figure 4-3.

Table 4-1 Land Cover Classes in the Area of Influence (AoI)[33]

Land Cover Class	Area, ha	Area, %	Biomass[34], kg/ha
Crop	14,238.2	24%	ND
Mangrove	312.0	1%	ND
Non-vegetated or water	7,445.4	12%	NA
Residential	10,217.8	17%	NA
Plantations and orchards	1,469.3	2%	155,384
Shrub dominated area	548.7	1%	2
Shrub dominated forest	21,438.2	36%	2
Hill forest	4,662.7	8%	17,003
Total	**60,332.3**	**100%**	

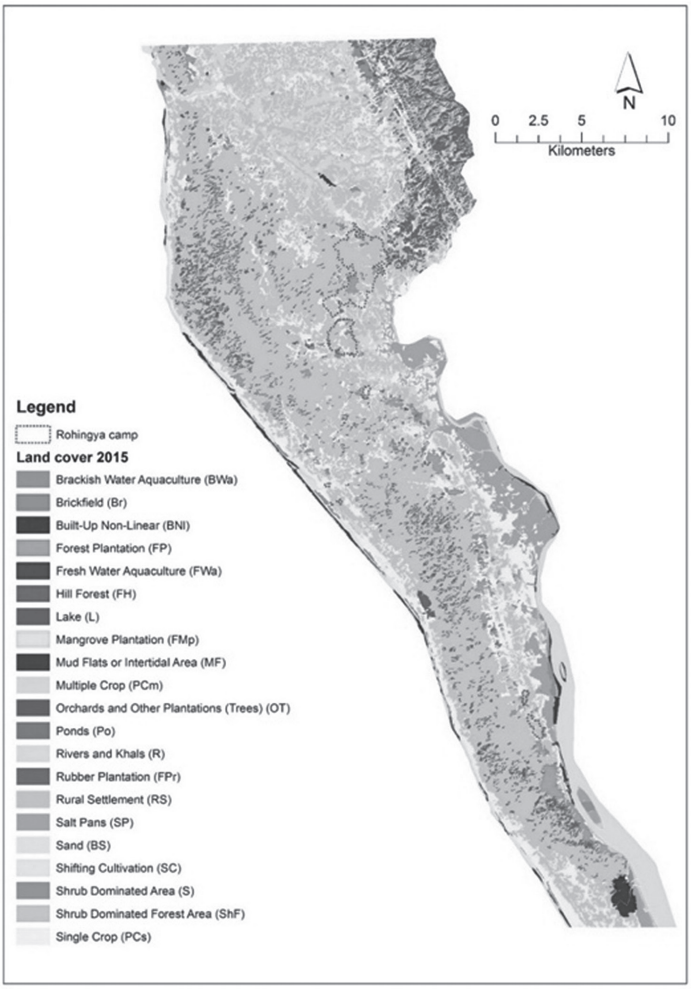
[31] IUCN Bangladesh. 2002. Bio-Ecological Zones of Bangladesh. IUCN Bangladesh Country Office, Dhaka.

[32] Arannayk Foundation. 2013. Biodiversity of Protected Areas of Bangladesh, First edition. The Arannayk Foundation, Dhaka.

[33] Land cover class calculations provided by FAO Bangladesh. Certain classes were aggregated (e.g. plantations and orchards)

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

Figure 4-3 Land Cover Classes[35]



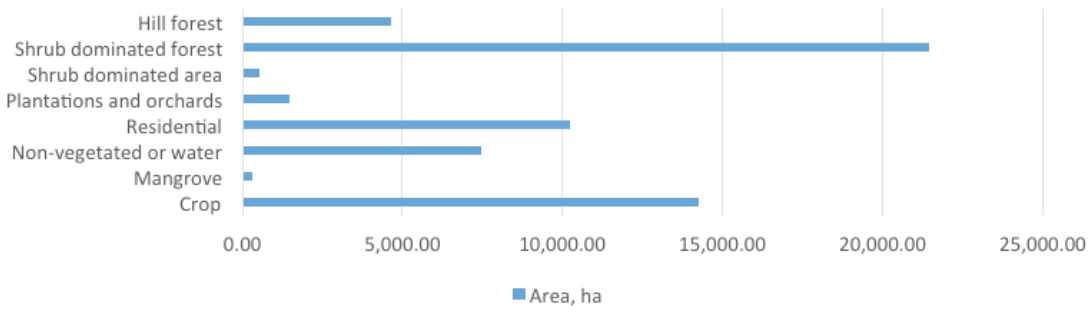
Teknaf Wildlife Sanctuary[36]

The Teknaf Wildlife Sanctuary (TWS) is the most important forest ecosystem in Bangladesh.

The sanctuary is home to the Teknaf Game Reserve which was established to focus on the conservation of the Asian Elephant, more than one hundred of which have been observed in the sanctuary.[37] In many places, the elephant corridors have been blocked by host communities and infrastructure and some of these corridors are being hampered by the Rohingya population (see Figure 5-3).

Over the last 50 years. the vegetation in the AoI has been degraded by both human and natural factors. In the period 1920 to 1990, natural forests were cleared to make way for wood lots. The Rohingya influx in 1991 and several other influxes reduced the forests of Ukhia and Teknaf substantially. Three major cyclones, in 1991, 1994 and 1997 severely affected the forest areas[38]. Conversion of many foothills and low-lying areas into paddy fields and settlements through the process of

Figure 4-4 Land Cover Class Areas in the AoI



[35] The map is provided by FAO Bangladesh. Certain non forest classes were aggregated in the report.

[36] Arannayk Foundation. 2013. Biodiversity of Protected Areas of Bangladesh, First edition. The Arannayk Foundation, Dhaka.

[37] Nishorgo Support Project. 2006. Management Plans for Teknaf Game Reserve. Dhaka, Nishorgo Support Project.

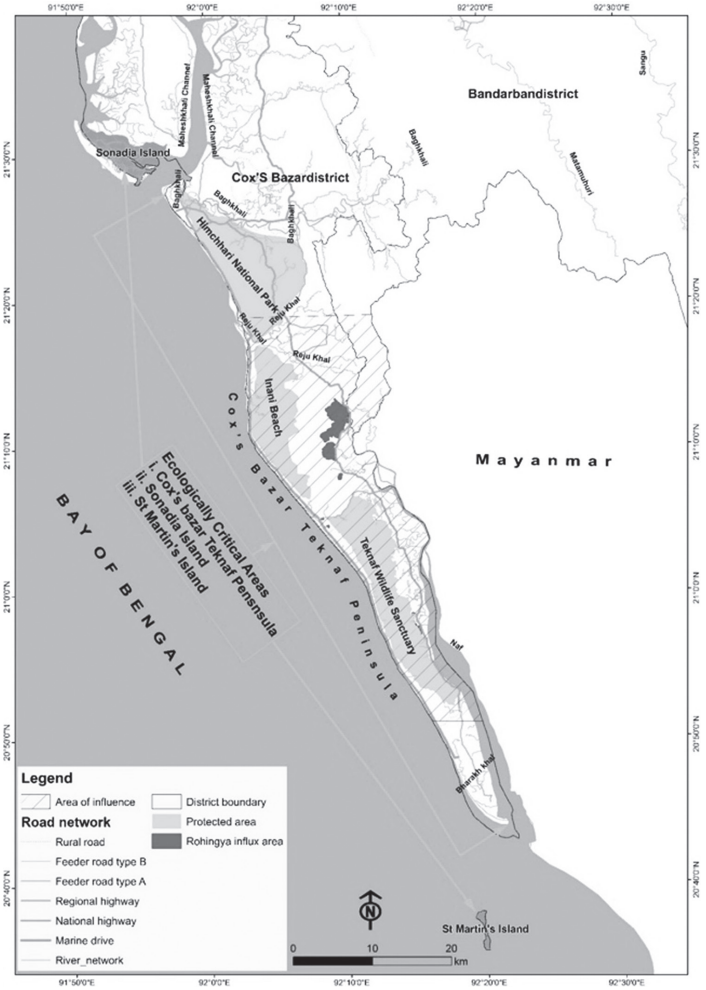
[38] Arannayk Foundation. 2013. Biodiversity of Protected Areas of Bangladesh, First edn. The Arannayk Foundation, Dhaka.

forest land encroachment has shrunk the forests severely. Inside the TWS boundary, the settlements and homestead forests were increased by 52.6%[39]. In 2012, the natural forests under the TWS covered only 10% of the area and the rest was covered by shrubs with a few scattered trees.

The Nishorgo Support Project (2006) describes eight habitats in the TWS which support rich biodiversity. They are: high forests; plantations; grasslands and bamboo; wetlands; tidal mudflats and mangrove vegetation along the Naf River to the east; sandy beaches along the Bay of Bengal to the west; cliffs and steep slopes; and cultivated fields and settlements.

Some of these habitats have been highly degraded due to anthropogenic causes. Biodiversity in the TWS covers many endangered species in Bangladesh[40] and the habitat has been declared critical.[41]

Figure 4-5 Protected areas in the Cox's Bazar District



In the 1990s the TWS housed more than half of the mammalian species of the country[42]. Since then, during the last three decades, this area has lost several faunal species due to anthropogenic pressure.

Himchari National Park

Himchari National Park, declared in 1980, is one of the most important protected areas in Bangladesh. It lies within the Cox's Bazar South Forest Division covering an area of 1729 ha. The park is home to 56 species of reptiles, 13 species of amphibians, 286 species of birds, and more than 100 species of trees, shrubs, grasses, canes, palms, ferns and herbs. The biodiversity of the park is threatened by many anthropogenic factors which have been exacerbated by the Rohingya influx as merchants illegally collect bamboo and fuelwoods from this forest and sell them to the Rohingya community.

[39] IPAC. 2011. Land Use Change Trend Analysis in Seven Protected Areas in Bangladesh Under IPAC Through Application of Landsat Imageries. Dhaka, Integrated Protected Area Co-management (IPAC)

[40] IUCN Bangladesh. 2000. Red Book of Threatened Mammals of Bangladesh. IUCN-The World Conservation Union, Dhaka.

[41] Tani M, Rahman MA. 2018. Deforestation in the Teknaf Peninsula of Bangladesh: A Study of Political Ecology. Springer, Singapore.

[42] Rashid SMA, Khan A, Khan MAR. 1990. Mammals of Cox's Bazar forest division (South), Bangladesh, with notes on their status and distribution. Journal of the Bombay Natural History Society, 1, 62-67.

Inani National Park

The Inani National Park, within the Cox's Bazar South Forest Division, covers an area of 7,700 ha of reserve forest falling under an evergreen and semi-evergreen tropical forest zone. It includes both the Inani and the Ukhia forest range. Although the Inani forest area was historically rich in biodiversity, the current vegetation consists mainly of herbs, sungrass, shrubs and bushes. The high forest has shrunk from 70% to less than 30% in the last three decades.[43] Bushes, sungrass and bamboo dominate the landscape. There are 443 plant species from 93 families in the Inani National Park. A gymnospermic tree species, Banspata (Podocarpus nerifolia), is one of the rare trees still found in this forest. Among the plant species, 140 (32% of the total) are herbs, 85 (19%) are shrubs, 151 (34%) are trees, 60 (13%) are climbers and seven (2%) are epiphytes. This forest is home to 29 species of amphibians under six families. Among the amphibians, 12 are rare, 9 are common and 8 are very common. They belong to 58 species of reptiles of which 5 are turtles and tortoises (9%), 21 are lizards (36%), and 32 are snakes (55%). The Arannayak Foundation[44] has confirmed that 34 reptiles (60%) found in the forest are rare, 18 (31%) are common and 6 (10%) are very common. It supports 253 species of bird of which 195 are residents (77%) and the remaining 58 are migratory (23%). Among the birds, 44 species (23%) are very rare, and 68 (35%) are rare. A total of 39 mammals are found in this forest. Among the mammals, 12 are carnivores, 11 are rodents, 7 are bats and 4 are primates. 61% of the total mammals of this forest belong to either rare or very rare species (Arannayk Foundation 2016). Although the current Rohingya influx does not have any direct influence on the Inani protected area, there are still some assumptions that bamboo and fuelwood are being extracted from the Inani protected areas and sold to the Rohingya community.

4.8 MARINE AND FRESH WATER ENVIRONMENT

The surface hydrology in the forest areas is regulated by rainfall and runoff from adjacent uplands and the relief pattern of the plains. The area is interspersed by valleys and gullies and crossed by 149 streams which at the eastern side flow to the Naf river and at the western side flow to the Bay of Bengal[45]. Some streams have been observed to be seasonal, drying up in the dry season. There are a few shallow depressions in the area providing wetlands to migratory birds, and fish for local livelihoods. They also house habitats for other wildlife.

A survey of the Fisheries fauna of the Naaf river estuary in the 1990s recorded[46] 123 fish species, 20 species of shrimp and prawns, 3 species of crabs and 2 species of lobster. The dominant group was represented by a few small sized fishes. Given the close proximity to the sea and the presence of backwaters, the people in the region are habituated in pisciculture and prawn culture. The people also practice salt farming.

4.9 PHYSICAL CULTURAL RESOURCES AND TOURISM

The area of influence (AoI) is archaeologically rich, prominent as a tourist spot, and popular for its beautiful beaches.

4.10 CURRENT STATE OF ENVIRONMENT AFTER ROHINGYA INFLUX

In most parts of Ukhia, especially in the areas of Kutupalong and Balukhali, land use has completely changed within a short period of time. Some of the hills have been completely denuded and deforested

[43] Arannayk Foundation. 2016. Biodiversity of Inani Protected Forest. The Arannayk Foundation, Dhaka.

[44] The same as above.

[45] Arannayk Foundation. 2013. Biodiversity of Protected Areas of Bangladesh, First edn. The Arannayk Foundation, Dhaka.

[46] Islam, M, S 1993 B- Fisheries fauna of the Naf river estuary, Bangladesh journal of fish, Mymensingh, Bangladesh

and the area is now filled with shelters. Other hills will likely face a similar fate. There are over a million Rohingya who have so far been sheltered within a few square kilometers of the influx area combining old and new makeshift camps. A set of historical satellite photos presented in Figure 4-6 demonstrates forest degradation and changes in land-use caused by makeshift camps.

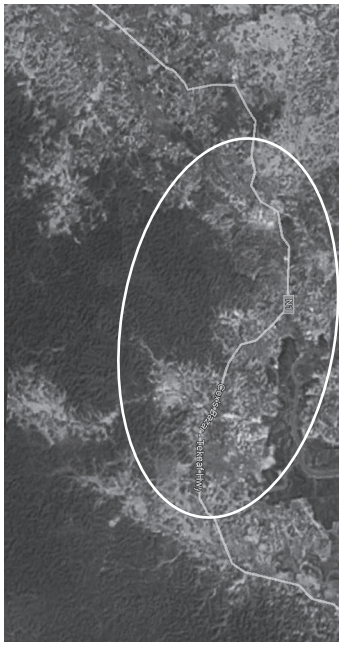
The most alarming impacts of the influx are: forest degradation and habitat loss; the fragmentation of territory for wildlife; human-wildlife conflicts, hill cutting, soil erosion and stream congestion; ground water source depletion; watershed degradation and water scarcity. Soil pollution and compaction, lighting, noise and air pollution are other areas of concern.

Forest Degradation and Habitat Loss

The Rohingya gather whatever materials they are able to in order to build their shelters. This has resulted in indiscriminate cleaning of the vegetation cover from hills and forests.

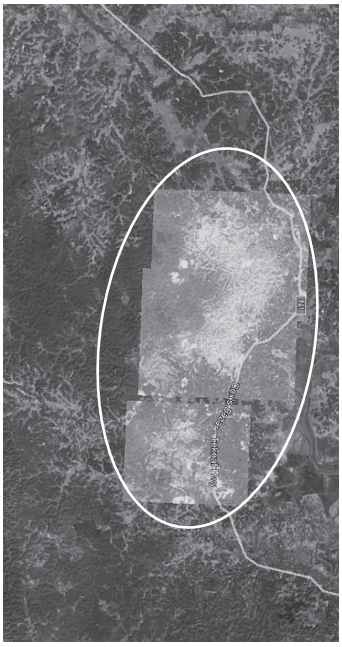
Fuelwood for daily cooking is also being collected from forests, and this is causing serious forest degradation and habitat destruction (see Section 5.2.1). A new access road to the Rohingya camps on the Cox's Bazar – Teknaf highway is under construction and this will facilitate access not only to the camps, but also to the forests and their resources.

Figure 4-6 Forest Degradation and changes in Land-use near Kutupalong- Balukhali makeshift camp (white oval)



September 07, 2002

November 12, 2009



October 26, 2017, Credite Pléiades ©CNES 2017, Distribution Airbus DS[47]

[47] https://data.humdata.org/dataset/bangladesh-satellite-image-of-kutupalong-makeshift-settlements-and-expansion-sites-zones-kml

Typical fuel wood | Photo: SDC/A. Egli

Fragmentation of Wildlife's Territory and Corridor

The area from TWS to the Himchari National Park is almost a continuous hill belt covered with degraded forest vegetation. This allows wildlife, especially the Asian elephant, to move freely from one side to the other in search of food. The elephant's habitat and corridors have become fragmented as a result of Rohingya settlement inside the forest.

Human-Wildlife Conflicts

The Teknaf-Ukhia forest area is a habitat comparatively rich in wildlife, where wild elephants, deer, wild boar, monkeys, birds, squirrels, red jungle fowl and different types of snakes still exist. The construction of Rohingya shelters inside this territory means that people and wildlife are now cohabiting.

During the movement of both wildlife and humans, there is high possibility of incidents of human-wildlife conflict; wildlife is at risk of being hunted and killed, and people are also at risk. There are reportedly incidents of deer hunting by Rohingya for meat, and some Rohingya have been killed by wild elephants[48]. In addition, local poachers may seek to exploit the situation.

Hill Cutting, Soil Erosion and Stream Congestion

To accommodate large numbers of Rohingya people, a number of hills have been cleaned and cut indiscriminately, and shelters have been set up on the hills. Steps have been cut into the slope to facilitate access to the shelters.

Hill cutting loosens the soil and can result in soil erosion, sedimentation and siltation - a washing out of the valuable fertile top soil that will make the hills unsuitable for supporting any valuable vegetation cover. The eroded soil will also cause stream congestion, which might hinder stream flow, which in turn will result in habitat loss, water pollution and water scarcity further downstream.

Hill cutting and the clearing of vegetation cover also increases the risk of hill and land slide at the time of monsoon rains. Denuded hills become dry and usually generate cracks, and in the rainy season there is more chance that water will enter into the denuded hills through the cracks. As a result, there is a high risk of local landslides which could cause the destruction of the shelters and potential causalities (see the land slide risk map of the Kutapalong makeshift camp[49]).

Watershed Degradation and Water Scarcity

Around 3,000 to 4,000 acres (1,200 – 1,600 ha) of hilly land in the Teknaf-Ukhia-Himchari watershed area have been cleared by removing vegetation cover to erect shelters for the Rohingya people. The watershed absorbs large quantities of rainwater, and holds water with the help of the vegetation cover existing on it; removing the vegetation cover of hills reduces their water retaining capacities. This capacity is already much reduced by the felling of large trees.

The watershed acts as a major source of essential fresh water in the form of a stream for local residents; it is used for drinking and other domestic

[48] https://www.reuters.com/article/us-bangladesh-rohingya-elephants/wild-elephants-trample-to-death-four-rohingya-refugees-in-bangladesh-idUSKBN1CJ0MC

[49] http://fingfx.thomsonreuters.com/gfx/rngs/MYANMAR-ROHINGYA/010051VB46G/index.html

purposes year-round. Fresh water scarcity is now a common phenomenon in the Teknaf-Ukhia areas, as most of the area is hilly, and its subsoil is rocky and impermeable, restricting boring for ground water.

Soil Pollution and Compaction

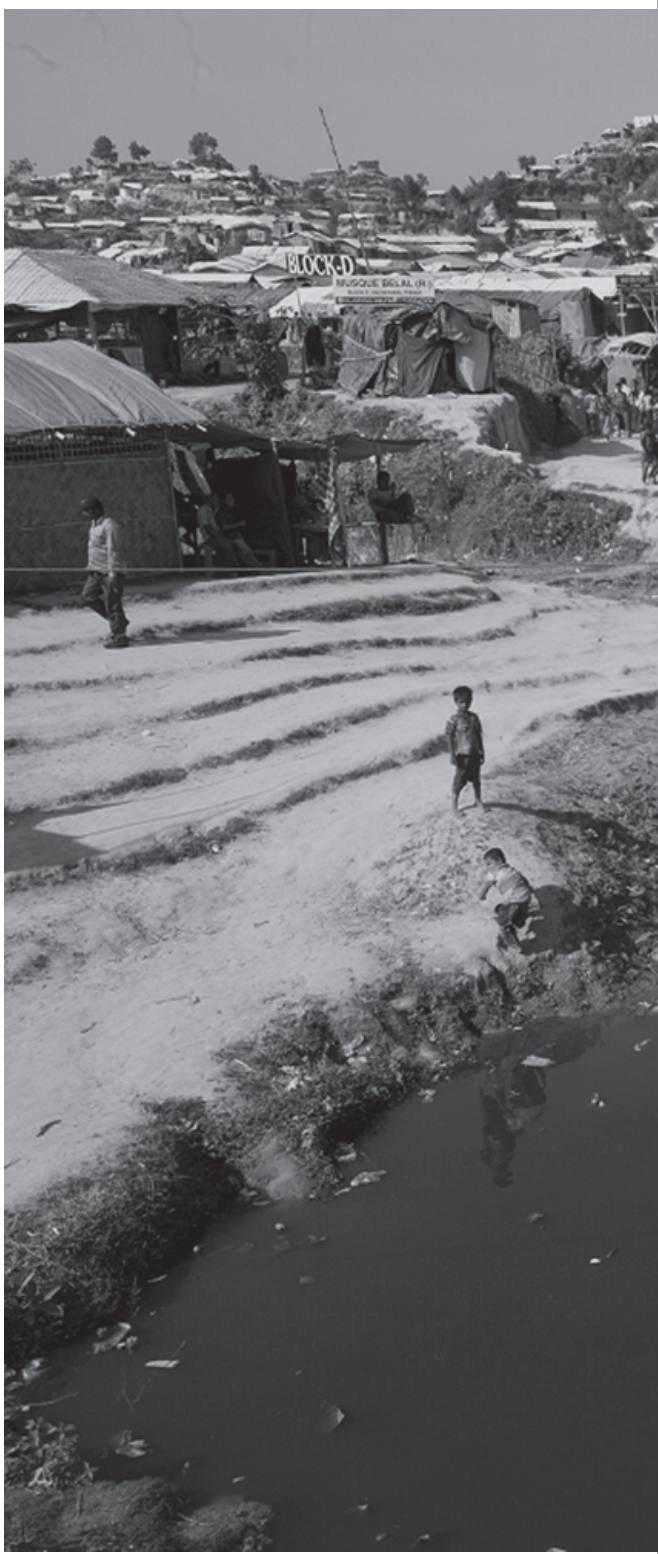
Polythene[50] sheets, synthetic ropes and nails are currently being used to make shelters for the Rohingya, and these are a source of soil pollution. Other sources of pollution are: plastic bags used for packaging relief items; polythene bags used for the distribution of cooked food for children and newcomers; plastic bottles, and used torch batteries. A proper system of waste disposal needs to be in place for these materials. Drainage systems blocked by polythene bags have been identified as a major cause of flooding in Bangladesh during the monsoon season.

Lighting and Noise Pollution

Lighting in shelters at night, and cooking inside the forest is hampering the nesting, roosting, breeding, and feeding grounds of wildlife. Noise, originating from communication among the Rohingya people, service providers, relief distributors, and from a sharp increase in vehicular movement is also disturbing wildlife.

Air and Water Pollution

Smoke and dust generated from stoves and from traffic is a source of air pollution., A lack of solid waste management in the Rohingya camps is causing water pollution in nearby streams; unmanaged human waste is being channeled to hilly streams and contaminating water, which might cause the spread of waterborne and contagious diseases among nearby localities and host communities.



[50] Polyethylene is a non-biodegradable, organic chemical compound found in common products such as polythene bags, plastic furniture and kitchen materials.

Small stream with unmanaged solid waste | Photo: UNDP Bangladesh/Arif Faisal

ASSESSMENT AND EVALUATION OF IMPACTS

5.1 PHYSICAL IMPACTS

Physical impacts relate to surface and ground water, air, soil, land use, landform/ topography, noise, vibration, geology, seismicity and other natural hazards, resource use, waste, greenhouse gases, etc.

5.1.1 Ground Water

The Teknaf peninsula coastal zone has limited ground water storage. This was not an issue when there were less people living in the area but the demand has increased manifold since the August influx and thousands of shallow tube wells have been dug in the influx area at different slopes very close to each other, particularly in the Kutupalong and Balukhali makeshift camps to accommodate the Rohingya. This has resulted in excessive withdrawals of water from the shallow aquifer and a drying up of some of the wells.

There are concerns that the shallow aquifer could be exhausted within several months. The water sector service providers are looking for deep wells, but there is no certainty yet regarding their availability.

The emergency situation has meant that no proper thought has gone into an appropriate location for or design of latrines. Thousands of latrines without proper soak pits have been installed along the contour lines of the hills close to the shelters and very close to water points. The ongoing arrival of Rohingya to the area has resulted in an increase in the population at multiple sites and an increased burden on existing facilities. Leakage, seepage and overflow from these facilities are being reported, causing ground water contamination. Large numbers of nonfunctional latrines and tube wells need to be decommissioned and repaired to reduce the public health risk.

Results of ground water samples from different camps (Kutupalong and Balukhali) for the E-coli test by the Emergency Response Unit of the International Red Cross portray an alarming picture. About 70% of the samples were observed to be heavily polluted.[51]

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

With the assistance of Chittagong Regional Laboratory of the Department of Environment (DoE), this study's team conducted tests on some physical-chemical parameters including arsenic, iron, chloride and salinity. Test results revealed that levels of arsenic were within acceptable levels but iron content was relatively high. (Appendix D). Test results of the Emergency Response Unit of the International Red Cross also confirm the findings on arsenic by the DoE.

Latrine on the top of the hill | Photo: UNDP Bangladesh/A. Chaikine

Water well in Kutupalong camp | Photo A.Chaikine, UNDP

Latrine under the eroded hill slope | Photo: UNDP Bangladesh/Arif Faisal

Indoor cooking | Photo: UNDP Bangladesh/Arif Faisal

5.1.2 Surface Water

With the exception of some small streams, the influx area has limited sources of surface water. Main water sources such as the Naf River and other big channels are at some distance and are saline and brackish especially in the lower part of the rivers. Fresh water sources are basically pond water and a few small streams originating from the hills. These ponds and streams are not capable of meeting the water needs of the population of the makeshift camps, but can be used for domestic purposes if kept clean from sewage pollution.

The study team conducted tests on the physical properties of the water with the assistance of the Cox's Bazar office of the DoE. Samples were taken from up-stream and down-stream of Gondhom Chara, Balukhali Chara, Talipara Chara, Hakimpur Khal, Palong Khali Khal, Tangkhali Khal and from a number of ponds. Tests were conducted for pH, dissolved oxygen (DO), total dissolved solids (TDS), electro conductivity (EC) and temperature. Test findings reveal that some of the streams are becoming devoid of oxygen down-stream of the camps. In some samples, EC was also observed to be high. Uncontrolled open defecation practices along the banks of the ponds and streams and the sedimentation deposits in the streams are most likely the reasons for the deteriorating water quality of the available surface water (Appendix E).

In the makeshift Leda camp where Rohingya were living before 25th August 2017, an alternate source of water has been established from the surface water pond. There, pond water is treated and supplied to the inhabitants of the camp. The population is small so this solution is manageable.

Surface water drainage in the camp | Photo: UNDP Bangladesh/Arif Faisal

Ground water depletion/contamination has been identified as a critical impact of the Rohingya influx. Surface water is limited, the shallow water aquifier is drying up (and may not be adequately replenished by rainfall) and the availability of water from the deeper aquifier remains uncertain.

5.1.3 Acoustic Environment

Increased traffic on the Cox's Bazar-Teknaf road is the main source of noise as the camps are along this road. The impact of noise generation on the settlements is not significant as most of the camps are at some distance from the road. Some internal roads have been constructed to facilitate the connectivity between the camps, but traffic on these roads is still very light.

Noise is generated at the set times when relief materials are distributed, but measures introduced by the Bangladesh Army in charge of the distribution of relief materials have kept noise levels within reasonable limits.

5.1.4 Air Quality (Indoor)

The air quality in the influx area has slightly deteriorated along the roadside areas of the camps because of increased traffic. Brick kilns in Ukhia and Teknaf may also be contributing to the problem. The study team did not notice a significant impact in the camps but inhabitants have reported that they suffer from the dust generated from the loose soil when strong winds blow; serious dust pollution during stormy winds is an issue. From a health point of view, this should not be a great concern as the size of the dust particles does not allow them to penetrate into the respiratory tract.

Indoor air pollution in the camps from cooking is a serious concern especially for women and children, and has been identified as having a severe impact. All cooking is carried out inside the poorly ventilated shelters (the only opening in an 8/8 sq. ft. space is a door at the front) and the firewood which is used as fuel produces large quantities of smoke that stays in the air long after the fire has been

extinguished. Burning firewood releases particulate matters, CO, CO2, and Sulphur oxides of sulfur which are extremely dangerous.

5.1.5 Solid Waste Management

Solid waste management refers to the collection, disposal and recycling of solid waste materials. Waste materials need to be separated before they leave the shelter but currently there are neither primary collection centres nor an organised collection centre in the camps. Solid waste management will be an issue for as long as the Rohingya remain in the camps. The study team identified the impact as moderate to severe.

Principal waste materials are the polythene bags in which relief provisions are distributed. Other waste materials include kitchen garbage, food packaging materials, batteries and plastic bottles. Of these, recycling efforts are only beginning to get underway for plastic bottles. Due to the scarcity of firewood, some families use plastic as a cooking fuel, a practice which is extremely harmful.

Awareness raising initiatives should be undertaken, an organised disposal and collection system is needed and responsible disposal, for example of batteries, needs to be encouraged.

5.1.6 Soils and Terrain

Landslide is one of the most serious and potentially destructive disasters in the Chittagong hilly region as the hills are formed of unconsolidated sedimentary rocks. Due to hill cutting in an indiscriminate manner to provide shelters for the Rohingya influx, the terrain of the hills has lost its natural setting and the vegetation cover has been removed. Weak soil structure has accelerated the process of soil erosion and the top soil and other loose soils have now become highly susceptible to being blown away in rain or in stormy winds.

When the study team visited the camps, its members noted that about 50% of the hills in the influx area had been completely denuded. Erosions in some areas are already causing drainage congestion or blockages. The hills in some places have been so severely cut that a landslide may happen at any time.

Cut of Hill Slopes | Photo: UNDP Bangladesh/Arif Faisal

Land stability is also a threat and both slopes and flat terrain are increasingly unstable. In the case of heavy rains, minerals from the soil will dissolve very quickly and the soil will turn into heavy mud. The steep slopes of the hill will not be able to carry the mass weight of the wet soil or mud and that would result in a land slide. Measures need to be taken to stabilise the slopes and terrains of the hills before the onset of the next monsoon rains. The study team has identified the issue of land stability as a severe impact.

5.1.7 Summary of Physical Impacts

All high significance risks have to be mitigated to an acceptable level. In particular the impacts on groundwater may give rise to significant social conflicts between the host communities and Rohingya over the use of water resources.

Some of the impacts, such as ground water quality and quantity, loss of soils and terrain instability appear to be irreversible in the short-term; several years may be required to restore original conditions. Most of the physical impacts are likely localised within or near the footprint of the camps and do not have the potential to act in a cumulative fashion with similar impacts from other activities in the area. The quality of surface water may be an issue outside the footprint of the camps but it is unlikely that the main water artery of the region (the Naf River) will be substantially impacted by the contaminated waters of intermittent creeks and small rivers passing through the area of the camps.

Table 5-1 summarises the levels of physical environmental impacts. These levels are equally applicable to both the current situation and to the forseeable future if the impacts remain unmitigated.

5.2 IMPACTS ON ECOSYSTEMS

These impacts relate to terrestrial and aquatic flora and fauna, habitat and ecosystems, endangered or critically endangered species, protected areas, etc.

Table 5-1 Environmental Risks for Physical Impacts

Potential Environmental Risks	Impact	Probability	Reversible	Significance
Air quality				
Impact of cooking on the indoor air quality	Severe[52]	Highly Likely	Yes	High
Dust generation from road traffic and wind erosion during the dry season	Moderate	Highly Likely	Yes	Moderate
Air pollution from transport	Minor	Highly Likely	Yes	Moderate
Acoustic Environment				
Noise from road transport	Minor	Highly Likely	Yes	Moderate
Ground water				
Ground water depletion due to water extraction for camp needs	Critical	Expected	Not in the short time	High
Ground water contamination by filtrate from latrines	Critical	Expected	Not in the short time	High
Surface water				
Changes in water hydrology caused by camp activities	Moderate	Moderately likely	Yes	Moderate
Changes in water quality caused by camp activities	Moderate	Moderately likely	Yes	Moderate
Soils and Terrain				
Soils removal and erosion	Severe	Expected	No	High
Soils diversity	Moderate	Moderately likely	Not in the short time	Moderate
Land capability	Severe	Highly Likely	Not in the short time	High
Changes in terrain that may cause land slides	Severe	Expected	No	High
Sewer Sludge Management	Critical	Expected	Yes	High
Solid Waste Management	Severe	Expected	Yes	High

[52] See definitions of impact in Section 3. Approach and Methodology.

5.2.1 Forestry

The whole forest land in the influx area of influence is assessed as 26,600 ha (or 44% of the total 60,000 ha landscape, see Table 4-1). Setting up large makeshift camps in the Kutupalong – Balukhali and other areas has made a substantial direct impact on the available forest resources in the Ukhia range (affected 3,525.2 acres or 1,427 ha, see map on Figure 4-4 and satellite photos in Figure 4-6). This causes additional stress on the Ukhia forest land that has reportedly already been cut by 30-40% by the ongoing deforestation process. In the Teknaf Range the influx has also impacted some of the plantations in the buffer zone and has reportedly started impacting the core zone of the TWS as well. However, it appears that the 'natural' forest is mostly shrubland which did not sustain a dynamic forest ecosystem before the influx.

Direct Impact on Plantations

A total of 3,713 acres (1,502 ha)[53] of forest lands under the Ukhia, Whykong and Teknaf forest range have been taken over by the Rohingya makeshift settlements. Among all the encroachments, 1,960 acres (793 ha) of natural forest land and 1,753 acres (709 ha) of plantation area have been recorded (Table 5-2).

According to the FD, the plantations that have been encroached upon were mostly established under the Social Forestry Programme. The plantations are composed of both short rotation (10 years) and long rotation (25 years) species.

With the destruction of social forest plantations, more than 1,500 participants have lost their benefits as almost all the plantations in different years have been cleared for the makeshift settlements. Minimal remnants of plantation have been seen between the camps of Hakimpara and near the Leda camp. According to Key Informant's interviews (KIIs) and Focus Group Discussion (FGDs), it is expected that what remains of the plantations may be razed at any time for the needs of newly arriving Rohingya.

Table 5-2: Impact of Rohingya influx on forest land of the Cox's Bazar South Forest Division (up to 04 Nov 2017).

Upazila	Location of the Rohingya camp			Encroached forest area			
	Forest Range	Forest Beat	Rohingya camp	Legal status	Social forestry plantation (acre)	Natural forest (acre)	Total forests (acre)
Ukhia	Ukhia	Thainkhali	Balukhalidhala	Reserve	152.70	135.3	288
			Tasnimakhola		177.5	214.5	392
			Mokkrar bill-Hakimpara, Jamtoli-Bagghona,	Reserve and protected	271	236	507
			Sofiullah Kata	Reserve	92.5	108.7	201.2
		Ukhiar ghat	Balukhali		450	359	809
		Ukhia Sadar	Kutupalong		535	793	1,328

[53] Cox's Bazar South Forest Division, November 2017.

Upazila	Location of the Rohingya camp			Encroached forest area			
Teknaf	Why-kong	Roikong	Putibunia	Protected	0	65.2	65.2
		Whykong	Karantoliy-Chakmarkul	Reserve	74.20	1.0	75.2
	Teknaf	Mochuni	Noyapara		0	31	31
			Leda	Protected	0	16	16
Total, acres					1,752.9	1,959.7	3,712.6
Total, ha					709	793	1,502

Fuelwood and Bamboo Use

It is reported by various stakeholders, including surveyed Rohingya families, and observed during the field reconnaissance, that Rohingya have been collecting fuelwood from the natural and community forests for a long time. The available information is not sufficient to estimate the sustained damage to the forest, but it is clear that continued demand for the fuelwood will inevitably push Rohingya to further encroach in the natural forest and plantations (if allowed) and expand deforestation on a substantial scale.

A rapid social survey in the Leda and Sofiullar Kata Rohingya camp shows that the average fuelwood consumption by a Rohingya family is 151.07±47.25 kg/month where the average number of family members

Table 5-3: Biomass and carbon loss from the plantation due to the makeshift settlements in the Ukhia and Teknaf forest range in Cox's Bazar South Forest Division

Forest Range	Forest Beat	Fresh biomass[54]			Total oven-dry biomass (tons/ha)[55]
			BBD (tons/ha)	Total biomass (tons/ha)	
Ukhia (n=34)	Thaingkhali	587.72±157.44	96.35±26.53	684.07±180.51	256.53±67.69
Teknaf (n=34)	Muchuni	333.48±127.33	63.70±22.79	397.18±150.07	148.95±56.28
Carbon					
		ACD (tons/ha)	BCD (tons/ha)		Total carbon[56] (tons/ha)
Ukhia (n=34)	Thaingkhali	110.2±29.52	18.07±4.97		128.26±33.84
Teknaf (n=34)	Muchuni	62.53±23.88	11.94±4.27		74.47±28.14

Notes: ABD-Aboveground biomass density; BBD-Belowground biomass density; ACD-Aboveground carbon density; BCD-Belowground carbon density.

[54] The aboveground biomass (ABD) of trees was estimated using the allometric model described by Pearson et al.(2013): Biomass (kg/tree) = exp(-2.289+2.649*lndbh-0.021*lndbh2), where lndbh is the natural logarithm of tree diameter. The belowground biomass density (BBD) was found using the Biomass (kg/tree) = exp(-1.0587+0.8836*ln(aboveground biomass)), where ln is the natural logarithm.

Latif MA, Islam SMZ. 2014. Growth, Yield, Biomass Equation and Volume Tables for Important Trees of Bangladesh. Bangladesh Forest Research Institute (BFRI), Chittagong.

Pearson T, Walker S, Brown S. 2013. Sourcebook for Land Use, Land-Use Change and Forestry Project. Washington Dc: World Bank.

[55] The fresh biomass was converted to the oven-dry matter using the factor 0.375 (Latif and Islam 2014).

[56] The biomass was then converted to carbon stock using the factor 0.5 (following Pearson et al., 2013) for estimating both aboveground carbon density (ACD) and belowground carbon density (BCD).

Table 5-4: Fuelwood and bamboo used in the Rohingya camps in Ukhia and Teknaf areas of Cox's Bazar.

Rohingya camp	Average family size	Average number of bamboo	Fresh weight of the bamboo (kg)	Average fuelwood (kg/month)
Leda (n=30)	6.54±1.94	60.69±7.75	310.78±73.31	156.92±37.06
Sofiullar Kata (n=30)	7.53±2.95	66±14.56	400.67±74.01	146±55.92
Mean	7.07±2.54	63.54±11.99	358.93±85.52	151.07±47.25

is 7.07±2.54 (Table 5-4). Fuelwood was mostly bought from the local market, but it was confirmed that all the fuelwood had been collected from the nearby forests. For the construction of settlements, bamboo was used as of 63.54±11.99 culms/family with the fresh weight 358.93±85.52 kg/family.

Fuelwood Collection

Forest degradation due to fuelwood collection has been an ongoing issue in the area for a long time. As shown in the FAO report, even before the 2017 Rohingya influx, the available biomass supply was less than the demand of the host community and of the Rohingya previously settled in the area. To assess the additional potential damage to the forest land from fuelwood collection caused by the most recent Rohingya influx this study developed two scenarios which assume collection of fuelwood within areas of 5 km and 10 km around the camps (see Figure 5-1 and Appendix F). The total monthly requirement of fuelwood, collected by Rohingya people in the forest, is currently estimated to be 6,800 tons.[57]

The area of land cover falling within the footprint of the camps and within the 5km and 10km buffers around all camps is presented in Table 5-5.[58] Baseline data refers to land cover falling in the whole AoI for 2015 (see Figure 4-4). Table 5-6 shows that approximately 50% of forest land lies in the 5km buffer and 95% of forest land is in the 10km buffer. In other words, practically all forest land remaining in the AoI will be cleared if the impact covers all of the 10km buffer. The study assumes impacts of complete clearing of forest lands in the camps' footprint (including plantations). Within the 5 km and 10 km buffer, we assume impacts on natural forest (shrub dominated areas, shrub dominated forest and hill forest). The impact on existing plantations within the 5 km and the 10km buffer is presented in a separate line of the table. Table 5-7 presents the estimated biomass available in the forest land.

As shown in the IOM and FAO (2017) report,[59] the average demand of fuelwood per day per person was 0.7kg prior to the August 2017 influx. This number correlates with the results of the field survey (see Table 5-4). As stated in the report, Rohingya collected approximately 50% of their fuel demand from the forests.

Table 5-5 Land Cover Classes in the AoI

Cover class	Baseline, ha	Footprint, ha		
		Camps	5 km buffer	10 km buffer
Crop	14,238	203	6,720	12,694
Mangrove	312	0	113	237

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

[58] Data kindly provided by FAO Bangladesh in November 2017 (See Appendix F).

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

Cover class	Baseline, ha	Footprint, ha		
		Camps	5 km buffer	10 km buffer
Non-vegetated or water	7,445	3	3,080	6,116
Plantations and orchards	1,469	101	798	1,362
Residential	10,217	344	4,744	8,499
Shrub dominated area	548	3	284	516
Shrub dominated forest	21,438	626	12,457	20,837
Hill forest	4,662	9	1,651	4,368
Total	60,332	1,289	29,848	54,632

As presented in Table 5-7, the collection of fuelwood from the natural forest within the 5km buffer around the camps will sustain fuel supply for approximately four months, but the forested area of 14,000 ha will be degraded and converted into shrub dominated areas with low biomass and productivity. If fuelwood is collected from plantations, the supply may last for an additional 11 months. Collection of fuelwood from the natural forest within the 10km buffer around the camps will sustain fuel supply for approximately one year, but the entire remaining forest land of 26,000 ha will be degraded and converted into shrub dominated areas with low biomass and productivity. There will also likely be significant losses in biodiversity (see Section 3 Baseline). If fuelwood is collected from plantations, the supply may last for an additional 31 months.

These scenarios represent an indicative assessment of the potential impact of fuelwood collection on forest land and social forest plantations. Key assumptions are based on the results and conclusions of the IOM & FAO (2017) report. The actual rate of deforestation may differ from the modeling results and has to be monitored and mitigated.

The Nishorgo network[60] found 29 stakeholders who were directly involved with forest degradation and deforestation in the TWS who were also involved in other protected areas of Bangladesh. The primary stakeholders involved fuelwood/timber collectors,

Table 5-6 Impacts on Forest Land in the AoI

Cover class	Baseline, ha	Impacted part of baseline areas		
		Camps' footprint	Footprint of 5 km buffer	Footprint of 10 km buffer
Plantations	1,469	7%	54%	93%
Shrub dominated area	548	1%	52%	94%
Shrub dominated forest	21,438	3%	58%	97%
Hill forest	4,662	0%	35%	94%

[60] Nishorgo Support Project. 2006. Management Plans for Teknaf Game Reserve. Dhaka, Nishorgo Support Project.

betel leaf growers, forest produce collectors, hunters, and fishermen. The other key agents who had an indirect influence on forest degradation and deforestation were brick field owners, timber/fuelwood merchants, and sawmill and tea stall owners[61].

Rohingya family extracts last remaining tree stump and roots from the hill slope for fuelwood | Photo: UNDP Bangladesh/Arif Faisal

Table 5-7 Available biomass and fuelwood demand in the AoI

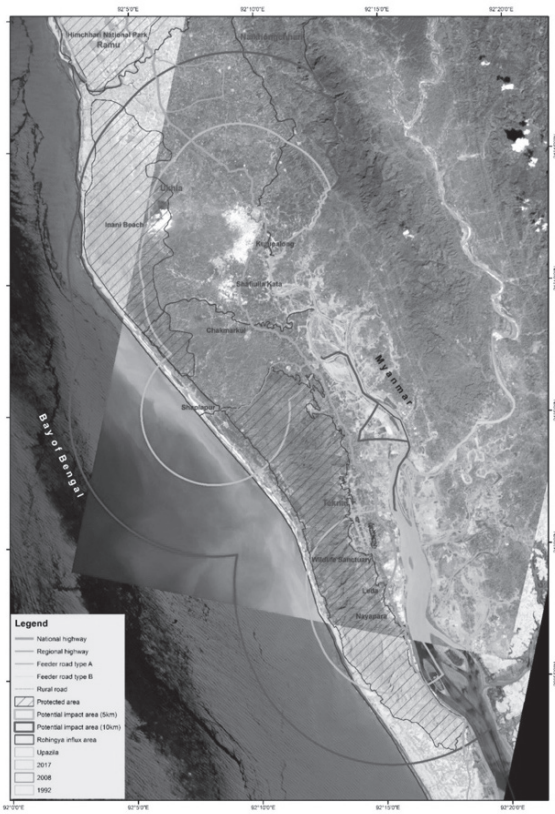
Parameter	Buffer of 5 km	Buffer of 10 km*
Total biomass available from natural forest, tons	28,100	74,300
Total biomass available from plantations, tons	124,100	211,600
Biomass required for 650,000 people, tons/month**	6,825	6,825
Time required to consume all available fuel wood from natural forest ***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

* Buffer of 10 km includes buffer of 5 km. Both buffers exclude camps' footprint

** Assuming 0.7 kg of dry fuel wood required per person a day, 650,000 people. Assume 50% of required fuel wood collected in the forest. 0.7*650,000*0.5/1000 = 6,825.

** Assuming no fuel wood is coming from outside of the AoI. Assuming zero natural rate of accumulation (forest growth) in the AoI since the pre-2017 influx consumption of fuelwood has already increased the available supply[62].

Figure 5-1 Potentially Impacted Areas



[61] Tani M, Rahman MA. 2018. Deforestation in the Teknaf Peninsula of Bangladesh: A Study of Political Ecology. Springer, Singapore.

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

5.2.2 Protected Areas and Critical Habitat

The existing Rohingya camps located in the Teknaf area continue to impact the TWS. The Rohingya camps in the Kutupalong-Balukhali and Leda-Nayapara areas do not directly impact the protected areas (Figure 5-2), but the fuelwood collection, if continued unabated, will inevitably have a substantial impact on TWS, on the proposed Inani National Park and potentially on Himchari National Park. The Himchari National Park, though located further north of the influx AoI, may be impacted by fuelwood collectors if they run out of resources near the camps. Table 5-8 presents the estimated size of the Protected Areas potentially impacted by the fuelwood collection.

5.2.3 Vegetation

To date, up to 7% of the total area occupied by plantations and orchards and 3% of shrub dominated forest in the AoI have been cleared to set up makeshift camps for the Rohingya. Potentially, and in the long-term, more than 61% of the plantations and remnants of natural forest may be degraded and converted to shrub land due to the influx. (see Table 5-6).

The IUCN[63] has already listed the forest species of Bangladesh which are threatened. This covers most of the species still found in the TWS, in the Himchari National Park and in the proposed Inani National Park in Cox's Bazar. Clearing of vegetation and degradation of the forest land has a significant impact on landscape diversity, vegetation abundance and species diversity.

5.2.4 Wildlife

The makeshift camps have a significant impact on wildlife and food shortages, shrinking habitats and disruptions in breeding grounds are affecting nocturnal, metaturnal, crepuscular and diurnal wildlife. More that 67% of the mammal wildlife are terrestrial, and of this number, around 63.8% rely on forests as a habitat. Arboreal species are also under severe threat due to the ever-decreasing natural forest area.

The globally endangered Asian Elephant (Elephas maximus) is 'critically endangered' in Bangladesh.[64] Host and Rohingya communities are encroaching on its habitat in the Cox's Bazar Forest Division, and both resident and migratory elephants are facing a continuous shrinkage of their habitat and food supply. To date, 268 resident wild elephants, 93 migratory elephants and 96 captive elephants have been recorded in Bangladesh[65].

5.2.5 Marine and Freshwater Ecosystems

The Rohingya settlements are not anticipated to affect the marine and fresh water environment directly, but there will be indirect impacts on the stream flows in future.

Table 5-7 Available biomass and fuelwood demand in the AoI

Protected Area	Baseline, ha	Projected 5 km, ha	% to Baseline	Projected 10 km, ha	% to Baseline
TWS	11,615	6375	55	11615	100
Inani National Park	7,770	1862	24	7264	93
Himchari National Park	1,729	0	0	0	0

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

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

[65] Same as above.

5.3 GENDER ISSUES AND HUMAN HEALTH

The crisis disproportionately affects women, girls and the most vulnerable and marginalised Rohingya population groups (based on gender, age, marital status, sex of household head, mental and physical disabilities, sexual orientation and gender identity) by reinforcing, perpetuating and exacerbating pre-existing, persistent gender inequalities and gender-based violence and discrimination.

The overcrowding and limited privacy at all Rohingya sites raise safety and security concerns, particularly for women and girls. In addition, increasing gender isolation and the restricted mobility of women and girls limit their access to life-saving assistance, services and information[66]. According to a 2015 gender analysis study[67], which included a focus group discussion and key informant interviews among the 3,000 Rohingya who were then living in the official Rohingya camps in Cox's Bazar, 53% believed that women should not be allowed to leave the house, while 42% of surveyed women reported spending an average of 21 to 24 hours a day inside their house. Such socio-cultural aspects need serious consideration with regards to any response/recovery effort. Lack of sufficient lighting in camps further exacerbates such risks and negatively affects the sense of safety that women and girls have.

Various assessments report that the current local market supply of fuelwood has not met the increased demand since the Rohingya influx. The self-collection of firewood from nearby forests is reportedly linked with severe safety risks, particularly for women and girls, including gender-based violence, trafficking, elephant attacks and the potential for natural resource related conflict with host communities whose livelihoods are being depleted. Women and girls, especially from female-headed households or child-headed households, are particularly vulnerable to violence and abuse while collecting firewood from the forest. Lack of sufficient cooking fuel results in households either undercooking food, or skipping meals (often to as few as 10-15 meals a month), with women and girls being the first to eat less or last within households.

Distribution of health facilities remains inequitable due to limited land availability, poor road access and high densities of Rohingya in inadequate space. The risk of communicable disease remains high due to crowded living conditions and poor water and sanitation facilities. Uncontrolled construction of latrines by different humanitarian service providers and/or private sector and/or by individuals without conforming to the standard practices and lack of awareness on the risks they are likely to pose, have created a sanitation hazard in the camps.

When latrines are quickly filled, a new set is often installed nearby, addressing sanitation needs in a most unsanitary way. In some cases, de-sludging of latrines has taken place using inappropriate disposal sites. Water points have also been set up at close proximity to latrines. There is the likelihood of leakage and seepage to the shallow aquifer from these latrines. Ideally a minimum horizontal distance of 30 m should be maintained in between water points and latrines.

The study team identified the sanitation hazard as a severe impact of the crisis. As the emergency phase settles, service providers need to rethink the whole issue of good practices regarding sanitation and drinking water from the point of view of both the environment and health. One possible solution is the promotion of pit latrines followed by the desludging of existing latrines in an appropriate manner. Proper maintenance of the water points is also needed.

The overcrowding within the camps exacerbates many risks and limits the ability of humanitarian actors to provide comprehensive protection

[66] ISCG Situation Report: Rohingya Refugee Crisis, Cox's Bazar | 29 October 2017

[67] UNHCR and UN Women Gender Assessment in Official Refugee Camps in Cox's Bazar, Bangladesh (2015)

services. Basic infrastructure including water points, lighting and WASH facilities are at considerable distance for many, that can lead to safety issues, particularly for women and girls.

A lack of natural resources limits nutritional intake and can have further adverse impacts on the health of an already weakened group. Shortage of fuelwood may result in the undercooking of food. A very high percentage of adverse health impacts is related to fecal and chemical contamination of drinking water and the ease with which disease can be transmitted in the overcrowded Rohingya camps. Dust and smoke, created by the burning of low-quality fuelwood, heightens the incidence of respiratory disease. Most of these problems tend to affect disproportionately the vulnerable groups, i.e. women, the very old or the very young.

Recent FAO, IOM, WFP and UNHCR assessments[68] indicate that securing alternative fuel and improved cooking stoves is a key practical and strategic gender issue for the well-being and empowerment of Rohingya women and girls. As a result of strict gender-defined roles, the burden of household work and highly conservative social norms, Rohingya women spend a significant amount of time inside the shelters. They report inhaling toxic emissions and suffering from the high heat from cooking inside poorly ventilated shacks as serious concerns which lead to health issues such as respiratory problems and eye infections.

[68] FAO/IOM Woodfuel & deforestation (July 2017); FAO/IOM rapid assessment after influx (October 2017); WFP Rapid Safe Access to Fuel and Energy assessment (October 2017); IOM, Save the children and UNHCR Assessment of Shelter Upgrade Needs (October 2017)

ENVIRONMENTAL MANAGEMENT **AND MITIGATION**

The following mitigation measures are proposed in order to address significant physical impacts (Table 6-1)[69].

Table 6-1 Recommendations to Mitigate Significant Physical Impacts

Impact/Risk	Impact/Risk Level	People concerned	Mitigation Measures	Recommended Actions	Beneficiaries	Partners
1. Water scarcity	Critical/ High	Host communities and Rohingya population 1.2 M	Establish facilities and feasible options for supplying drinking water to the Rohingya camps and host communities	1.1 To carry forward the Hydrogeological and Geophysical investigation to identify the potential water aquifer	1.2 M	UNICEF, IOM, Red Cross, NGOs, Private Sector
		1.2 M		1.2. Protect of all sources of water from excreta pollution	1.2 M	
		1.2 M		1.3. Develop treatment facilities for disinfecting pond water through flocculation and chlorination	1.2 M	
		1.2 M		1.4. Develop piped water supply network in view of the availability of water from deep aquifer and surface sources	850,000	
2. Sanitation	Severe/High	1.2 M	Promotion of pit latrines and augmentation of water supply.	2.1. Non-functional latrines need to be decommissioned followed by desludging in appropriate sites	600,000	UNICEF, IOM, Red Cross, UN Women, NGOs, Private Sector
		1.2 M		2.2. Test water quality testing of all water points	1.2 M	
		1.2 M		2.3. Promote pit latrines in Care and Maintenance Phase by replacing the emergency latrines	600,000	
		100,000		2.4. Promote bio-gas production from fecal sludge and using of the produced gas in cooking	100,000 17,000 installations	

[69] Role of communities in mitigation presented in http://www.unhcr.org/4a97aaa49.html

Impact/Risk	Impact/Risk Level	People concerned	Mitigation Measures	Recommended Actions	Beneficiaries	Partners
3. Indoor air pollution due to conventional cooking stoves, kitchen design and fuelwood	Severe/ High	Host Communities and Rohingya population 1.2 M	Awareness raising campaign	3.1. Shelter cluster should focus on proper ventilation while developing improved housing design for the Rohingya. Also need to communicate the importance of and proper use of safe cooking stoves, e.g. ICS, LPG stoves. Community kitchens could be another option. These will benefit the health of women and children as indoor pollution will be substantially reduced and direct exposure of women and children to emissions will be significantly minimised. Finally, the likelihood of fire is high in dry season, so safety measures for cooking indoors should be well propagated.	1.2	UN Women, FAO, UNHCR, Red Cross
4. Site congestion and landslides	Critical / High (no comparative evaluation has been made in the site selection)	Rohingya in Kutupalong and Balukhali camps 500,000	Relocation from the overcrowded sites and measures against landslides	4.1. Preparation of a contingency plan for emergencies such as fire, landslide, heavy rainfall, cyclone and/or non-availability of water	1.2 M	ISCG CXP, GoB
				4.2. Urgent need to decongest the main site as life is not sustainable at the current concentrations	400,000	
				4,3. Urgent actions to stabilise the steep slopes of the hills to minimise risks of landslides (engineering and biological reinstatement of soils and terrain). Replant deep root light trees, grass and bushes to stabilise slopes. Construct retaining wall in foothill.	50,000	
				4.4. Arrangements for fire prevention and safety Human settlements should respect a 50m buffer zone around streams and wetland ecosystems.	250,000	
5. Lack of toilets and bathing facilities	Severe/High	Women in Kutupalong and Balukhali makeshift camps 300'000	Improvement of toilets and bathing facilities for women in the makeshift camps	5.1 Set up make-shift bathrooms with tube-wells at convenient distances for the women to be able to regularly use the facility. 5.2. Set up separate toilet blocks for women at convenient distances 5.3 Ensure adequate lighting at the toilets for protection measures	300,000	SCG CXP, GoB

Impact/Risk	Impact/Risk Level	People concerned	Mitigation Measures	Recommended Actions	Beneficiaries	Partners
6. Solid waste management	Moderate to Severe/ High	Host Communities and Rohingya population 1.2 M		6.1. Implementation of solid waste collection and disposition: composting, recycling and landfilling	Host Communities and Rohingya 1.2 M	SCG CXP, GoB, UNDP, International and National NGOs
7. Communicable disease	Severe/ High	20% of Host Communities and Rohingya population 250,000		7.1. Ensuring adequate water for bathing and sanitation services	Host Communities and Rohingya 1.2 M	Red Cross, WHO, International NGOs
				7.2. Provide full vaccination coverage		
				7.3. Relocation from overcrowded places		

The following mitigation measures are proposed to address significant impacts on ecosystems (Table 6-2).

Table 6-2 Recommendations to Mitigate Significant Impacts on Ecosystems

Impact/Risk	Impact/Risk Level	People concerned	Mitigation Measures	Recommended Actions	Beneficiaries	Partners
8. Degradation of forests and Deforestation	Critical/ High	Host Communities and Rohingya population 1.2 M as of 26 Nov 2017 Potentially more than 50% (10,000-25,000 ha) of remaining forest degraded in the area.	Afforestation and reforestation through Social Forestry and Agroforestry. Increase wood productivity.	8.1. Wood supply and extraction; organizing controlled access to fuelwood from the natural forests and village forests.	350,000	
				8.2. Support fuelwood substitution actions through coordination of various aid organizations (an ongoing process) and promote community cooking with briquettes and Liquefied Petroleum Gas (LPG)	Briq 85,000 LPG 315'000	
				8.4. Set up tree plantations in wood lots on shrub and barren land (e.g. abandoned sites), along roads, pathways, river banks, embarkments and fences)	650,000	
				8.5. Introduce social forestry plantation, community forestry and agroforestry	50,000	

Impact/Risk	Impact/Risk Level	People concerned	Mitigation Measures	Recommended Actions	Beneficiaries	Partners
				8.6. Designated areas for bamboo afforestation should be declared, and bamboo regeneration and propagation projects should be addressed.	1.2 M	
				8.7. Afforestation along the coastal line with casuarina equisetifolia (Jau tree) and other fast growing native species and suitable mangrove; introduce social forestry wood lots or community forestry, agroforestry for host communities	1.2 M 2,400 ha	
				8.8. Reforestation at Cox's Bazar South and North Forest Division for compensation of lost forest areas in the area where the Rohingya live. Initiate community forestry/social forestry and agroforestry practices.	2.0 M 10,000 ha	
				8.9. Elaboration of a comprehensive development forestation plan/plantation programme for the next five years.	1.2 M	
				8.10. Develop and implement closure and reclamation plans for abandoned camps, including landscaping, drainage, soil restoration, stabilisation and reforestation.	500,000	
				8.11. Work with potential development partners to gain synergy on pipeline forestation projects - World Bank plans to start such a project (SUFAL) and FD is designing a project (SUROKSHA) in the Chittagong Hill Tracts and Cox's Bazar by mid 2018.		

Impact/Risk	Impact/Risk Level	People concerned	Mitigation Measures	Recommended Actions	Beneficiaries	Partners
9. Vegetation and wildlife diversity and abundancy losses in Protected Areas, and other forest land	Critical/ High	Host Communities 450,000	Conservation of protected area and its enhancement. Declaring protected areas and enhancing the surveillance of the existing PA	9.1. Effectively protect the Teknaf Wildlife Sanctuary (TWS), Himchari National Park, and proposed Inani National Park with needed resources to enforce the national legal requirement for resource use in the protected areas (e.g. strict ban on wood cutting, felling, vegetation destruction /clearance and fuelwood collection from and village forests).	Host Communities 450,000	GoB, International and local NGOs, IUCN, Local Communities UNDP.
				9.2. Protected areas such as TWS should step up the surveillance of their geographical boundaries.		
				9.3. Support of Community Patrol Groups.		
				9.4. Establish an Environmental Coordination Unit together with humanitarian aid community for the area where Rohingya live; ask NGOs dealing with environmental management to recruit professional staff who will work with FD and DoE to conserve and manage natural resources and activate co-management committee/community conservation group		
				9.5. Develop a biodiversity conservation plan, including enhancement of natural and critical habitat in Cox's Bazar district		
				9.6. Establish Inani National Park as quickly as possible and ensure availability of funds and resources for its operation.		
				9.7. Support the existing project 'Strengthening and Consolidation of Community Based Adaptation (CBA) in Ecologically Critical Areas through Biodiversity Conservation and Social Protection'.		
				9.8. Support the 'Conservation, Management and Development of Sonadia Island' project.		

Impact/Risk	Impact/Risk Level	People concerned	Mitigation Measures	Recommended Actions	Beneficiaries	Partners
10. Habitat fragmentation for elephants	Severe/High	Host Communities and Rohingya population	Improving the habitat Protection of Rohingya from intrusions by elephants. Management of human-elephant conflict.	10.1. Plant fodder plants in the forest to ensure food for elephants.	25 Elephants and 850,000 Rohingya	GoB, International and local NGOs, IUCN, Local Communities UNDP
				10.2. Ensure protection of Rohingya from elephant intrusions with combined fences (trees, bamboo and solar powered electrical fences near the camp areas in Ukhia and Teknaf	25 km of fence	
11. Mortality risks for wildlife	Severe/ High	Host Communities and Rohingya population	Mitigation and protection	11.1. Monitor wildlife movement, conduct an awareness campaign to avoid animal/human conflicts over resources and areas. Enforcement of Wildlife Protection Act	25 Elephants and 850,000 Rohingya	GoB, International and local NGOs, IUCN, Local Communities.
12. Impact on fresh and marine water ecosystems	Moderate/ Moderate	Host Communities 450,000	Enforcement	12.1. Enforce compliance with fishing requirements. Ensure water flow in streams.	Host communities 450,000	GoB, International and local NGOs, IUCN, Local Communities UNDP.
13. Impact on marine ecosystems	Moderate/ Moderate	National and global biodiversity issue	Conservation Protection of breeding ground and migration corridor	13.1 Monitor movement of marine turtle and conserve corridor and breeding ground of marine turtle; conserve dune vegetation	The whole country and the world	
13. Livelihood	Moderate/ Moderate	Host Communities and Rohingya population	Development	13.1. Support livelihood improvement in host communities and in areas where Rohingya live	450,000	GoB, International and local NGOs, Host Communities Rohingya population

The following mitigation measures are proposed to address significant impacts on gender based issues and health (Table 6-3).

Table 6-3 Recommendations to mitigate Significant Impacts on Gender Issues and Health

Impact/Risk	Impact/ Risk Level	Mitigation Measures	Recommendations/Action Plan	Comment
14. Women and children having respiratory problems due to inhaling smoke from cooking inside ventilation-less shelters	Severe/ High	Introduce improved cooking stoves; alternative fuel; community kitchens	14.1. Distribute improved cooking stoves to the Rohingya women as per the recommendations in the joint assessment carried out by the Shelter and Non Food Item (NFI) sector of ISCG. 14.2. Provide orientation training to the Rohingya women on the safe and efficient use of the cooking stoves or use of improved cooking stoves (ICS). 14.3. Distribute alternative fuel (BRH, LPG, etc.) to the Rohingya women. 14.4. Set up and promote community kitchens for women and children to avoid cooking inside shelters where possible (given the cultural barrier of women going outside)	Addressed in line #3 above
15. Due to excessive felling of trees and excessive demand, fuelwood has become scarce and costly for local women	Severe/ High	Introduce improved cooking stove and alternative fuel	15.1. Distribute improved cooking stoves to local households. 15.2. Distribute alternative fuel (BRH, LPG, etc.) to local women. 15.3. Support host communities to set up shops on alternative fuel in the vicinity of the shelters to cater to the needs of the Rohingya.	Addressed in line #8 above
16. Rohingya women are hesitant to use common toilets and to bathe outside/on tube-well platforms, and so use a corner in the shelter as their toilet and bathing space, thus making the shelter unhygienic	Severe/ High	Set up separate bathing spaces and separate toilets.	16.1. Set up make-shift bathrooms with tube-wells at convenient distances for women to be able to regularly use the facility. 16.2. Set up separate toilet blocks for women only at convenient distances 16.3. Ensure adequate lighting at the toilets for protection measures	Addressed in line #5 above

The following training activities are proposed (Table 6-4).

Table 6-4 Environmental awareness and training activities

Impact/Risk	Impact/ Risk Level	People concerned	Mitigation Measures	Recommended Actions	Beneficiaries
17. Sanitation	Severe/ High	Host communities and Rohingya population 1.2 M	Promotion of pit latrines and augmentation of water supply.	2.5. Undertaking environmental training and awareness programmes.	1.2 M
18. Degradation of forests	Critical/ High		Extension of forested areas. Increase wood productivity.	Develop training programmes to educate local and Rohingya communities about the impact of forest extraction und improved cooking methods.	850,000
19. Respiratory problems due to inhaling smoke from cooking indoors	Severe/ High		Introduce improved cooking stoves; alternative fuel; community kitchens.	Provide orientation training to Rohingya women on the safe and efficient use of the cooking stoves.	850,000

PROPOSED **MONITORING PLAN**

The proposed monitoring program will:

- Confirm, where appropriate, that mitigation measures are functioning as predicted;
- Detect changes and trends in the environment;
- Establish a periodic ecological monitoring system in the forest ecosystem and wildlife habitat areas;
- Identify cause-effect relationships for detected changes and trends in the environment;
- Allow for adaptive management to address impacts that have not been properly mitigated or offset.

PHYSICAL IMPACTS

A list of physical parameters to be tested, sample sites, sample numbers and sampling frequencies are provided in Table 7-1 below.

Table 7-1 Monitoring Program for Physical Impacts

Environmental component	Parameters	Sampling sites	Sampling frequency	Remarks
Ambient air quality	PM_{10}, $PM_{2.5}$, SO_2 and NO_x	20 samples covering road sides, old camp and new camp surroundings in Kutupalong area. 10 samples in Balukhali camp surroundings. 2 samples each in other makeshift camp surroundings.	4 times a year	MoEF may ask DoE to conduct the monitoring on a periodic basis
Indoor air quality	CO_2, CO, Formaldehyde, Ozone, VOC, PM_{10}, $PM_{2.5}$	20 samples in Kutupalong area. 10 samples in Balukhali area. 2 samples each in other makeshift camps.	4 times a year	MoEF may ask DoE to conduct the periodic monitoring
Noise	dBA	20 samples in Kutupalong area. 10 samples in Balukhali area. 2 samples each in other makeshift camp surroundings.	4 times a year	MoEF may ask DoE to conduct the regular monitoring
Ground water	E-Coli	E-coli test for water in each well to be carried out.	Not applicable	International Red Cross to continue its regular monitoring of ground water. DPHE could also initiate regular testing of ground water
	pH, EC, Arsenic, Iron. Phosphate, Chloride, Salinity	20 samples from wells of different levels covering old camps and new camps in Kutupalong area. 10 samples from wells of different levels covering old camps and new camps in Balukhali area. 2 samples from wells of different levels from each of the other makeshift camp areas.	4 times a year	MoEF and/or DPHE may ask DoE to conduct monitoring on physic-chemical parameters

Environmental component	Parameters	Sampling sites	Sampling frequency	Remarks
Surface water	pH, DO, BOD, TS, TDS, EC, Alkalinity	Upstream and downstream of all major streams passing through the Rohingya influx area.	4 times a year	MoEF may ask DoE and or DPHE to conduct monitoring on physic-chemical parameters
Soil quality	Nutrient availability, Organic carbon, Labille carbon, Texture, Water holding capacity, Soil structure, Maximum rooting depth, Salinity, Acidity, Alkalinity	An investigative monitoring is to be carried out covering the entire influx area.	Not applicable	MoEF may request SRDI through the Ministry of Agriculture to carry out the investigative monitoring.

IMPACTS ON ECOSYSTEMS

The proposed ecosystem monitoring programme is presented in Table 7-2 below.

Table 7-2 Monitoring of Impacts on Forest Ecosystems under the Cox's Bazar South Forest Division[70]

Environmental Component	Indicator	Variable	Sampling sites[71]	Sampling frequency	Methods
Production	Growing stock	M3/ha of wood	TWS, IPA, HNP	Once a year	Satellite imageries, LiDAR, ground plots
	Non-timber forest products	Monetary value, number/year	TWS, IPA, HNP	Once a year	Questionnaire survey
Biodiversity	Ecosystem state	Area of forest	TWS, IPA, HNP	Once every two years	Satellite imageries, aerial photography, Aerial or ground surveys
	Fragmenta-tion	Area fragmented	TWS, IPA, HNP	Once every two years	Satellite imageries, aerial photography, Aerial or ground surveys
	Species	Presence/absence population density, relative abundance	TWS IPA, HNP	Once every two years	Aerial or ground survey
Unusual disturbance	Fire	Area affected	TWS, IPA, HNP	Once a year	Satellite imageries, aerial photography

[70] Adopted from Thompson, I. D., M. R. Guariguata, K. Okabe, C. Bahamondez, R. Nasi, V. Heymell, and C. Sabogal. 2013. An operational framework for defining and monitoring forest degradation. Ecology and Society 18(2): 20.

[71] TWS-Teknaf Wildlife Sanctuary, IPA-Inani Protected Area, HNP-Himchari National Park

Environmental Component	Indicator	Variable	Sampling sites[71]	Sampling frequency	Methods
Protective function	Soil erosion	Area affected	TWS, IPA, HNP	Once every two years	Satellite imageries, aerial photography
	Water volume or flow	Flow rate	Streams of TWS, IPA, HNP	Once every two years	Stream flow meters
Carbon storage	Stored carbon	Biomass/ha	TWS, IPA, HNP	Once a year	Satellite imageries, ground plots
		Tree density Relative abundance	TWS, IPA, HNP	Once a year	Ground plots, aerial photography

Indiscriminate cutting of hill at Cox's Bazar Forest Division | Photo: UNDP Bangladesh/Arif Faisal

CONCLUSIONS

The 2017 Rohingya influx has had major impacts on the environment of Cox's Bazar District that require the implementation of a mitigation programme and offsets to prevent the environment from significant degradation. Significant adverse impacts on various environmental components have been caused both by the direct footprint of the Rohingya camps and by increased anthropogenic pressure far beyond the boundaries of the area of the camps.

If the environmental impacts of the influx continue unmitigated, the already heavily degraded protected ecosystems will soon suffer significant conversion and degradation, substantially reducing the habitat's ability to maintain viable populations of its native species and losing its ability to sustain its ecosystem. The disturbed landscape will have reduced water retention capacity which may impact ground and surface water in the area.

The GoB strategy is to group the Rohingya in a set of large camps (in the Kutupalong and Balukhali area) and relocate part of the Rohingya to Bhashan Char[72], rather than deal with a multitude of small camps located across the Teknaf and Ukhia upazilas. This strategy appears feasible from the management point of view, but it will be a major challenge to sustain the operation of large camps located in the vicinity of environmentally sensitive areas which have limited water and forest resources. The best option to avoid the environmental impacts of the influx would be a relocation of the makeshift camp to a less environmentally sensitive area and a disintegration of the mega camps into smaller units settled at some distance from protected areas and critical habitats. This however is not likely to be a feasible solution in current conditions.

The proposed mitigation addresses two key bottlenecks that threaten the very existence of the makeshift camps: access to potable water and fuel for cooking. Both issues can be resolved if proper alternatives prove to be feasible in the short term (one to three months).

Sanitation, indoor air quality, terrain stability, solid waste and fecal waste management are all major risks to human health in the camps. These issues can be addressed by better planning, resettling and improvement of minimal living standards.

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

Protection of natural and critical habitats is important even though the immediate impact on the ecosystems is of a cumulative nature and is less visible immediately. The proposed mitigation requires addressing land and resource use patterns by both the host communities and the Rohingya. Forest degradation has been a longstanding issue in the area and it has been exacerbated by the Rohingya influx. Enforcement of strict rules of resource use in the protected areas and establishing the proposed Inani National Park will mitigate unregulated and illegal access to fuelwood. The confirmation and enforcement of the ban on fuelwood, wood and bamboo collection from the protected forest should complement the alternative fuel programme in the area both for host communities and the Rohingya people.

Protection of the Rohingya from elephant intrusions needs to be ensured. Combined fences (trees, bamboo and electrical fences and light watch towers) should be installed near the camp areas in Ukhia and Teknaf.

Proposed actions to address the issue of the degraded forest habitat and compensate for the lost forest areas under the camps' footprint are:

- Protection of natural forests;
- assistance to community forestry;
- reforestation of shrub-dominated areas and abandoned camps;
- afforestation along the coastal line; and
- agroforestry.

Plans are also needed: to restore the livelihood of the beneficiaries of social forestry programmes; to develop and implement closure and reclamation plans for abandoned camps; to establish designated areas for bamboo regeneration; and to consider the enhancement of natural habitats in other areas of Bangladesh to ensure no net loss in biodiversity.

Current experience with managing influxes shows that when asylum seekers become repatriated or integrated, there are limited funds remaining for the closure and reclamation of the abandoned camps and associated facilities, reforestation of the degraded lands and conservation of wildlife habitat. The GoB should secure adequate resources to ensure that the restoration of the eco-system in the wake of the Rohingya influx is adequately supported.

Extensive environmental management and detailed long-term monitoring programmes are recommended to confirm and quantitatively define the results of this indicative Rapid Assessment Study, and mitigate the environmental damage and loss and damage from the influx. The programmes should be integrated into the UN Humanitarian Response Plan process and led by the MoEF, MoDMR and other relevant ministries and line agencies.

APPENDICES

APPENDIX A.
Rapid Environmental Assessment Check List

An example of a Rapid Environmental Assessment checklist typically[72] used for the screening of projects by an International Financing Organization.

Country/Project Title: Bangladesh. Rohingya influx, 2017

Screening Questions	Yes	No	Remarks
A. Project site: Is the project area adjacent to or within any of the following environmentally sensitive areas?	X		
Cultural heritage sites		X	Unlikely
Legally protected area (core zone or buffer zone)	X		Teknaf Wildlife Sanctuary and proposed Inani National Park
Wetland		X	No major wetlands in the area
Mangrove	X		Some mangrove forest along long beach (alongside the Bay of Bengal) and estuary of Naaf river
Estuarine	X		Estuary of Naf river
Special area for protecting biodiversity	X		Proposed Inani National Park and long beach (alongside the Bay of Bengal)
See for example: https://www.adb.org/sites/default/files/project-document/222541/49377-001-iee-04b.pdf	X		
Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to physical cultural resources	X		Cutting natural slopes for the construction of the shelters Visual impact

[72] See for example: https://www.adb.org/sites/default/files/project-document/222541/49377-001-iee-04b.pdf

Screening Questions	Yes	No	Remarks
Disturbance to precious ecology (e.g. sensitive or protected areas)	X		Disturbance of ecologically sensitive areas and fragmentation of elephant's habitat
Alteration of surface water hydrology of waterways resulting in increased sediment in streams affected by increased soil erosion at construction site	X		Setting up the Rohingya camps involves vegetation and soil removal, and hill cutting will cause soil erosion and changes in local hydrology.
Deterioration of surface water quality due to silt runoff and sanitary wastes from the camps and chemicals used in construction	X		Biological contamination of surface and ground water by sanitary waste from latrines
Increased air pollution due to project construction and operation	X		Mostly indoor air pollution from cooking. Some dust and gas emission from traffic
Noise and vibration due to project construction or operation		X	Some noise from traffic on the main roads
Involuntary resettlement of people (physical displacement and/or economic displacement)	X		Massive relocation of Rohingya from Myanmar
Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups	X		Vulnerable groups of Rohingya face the most difficult relocation problems
Poor sanitation and solid waste disposal in camps and work sites, and possible transmission of communicable diseases (such as STIs and HIV/AIDS) from Rohingya to local populations	X		Massive construction of the shelters closely located causes improper sanitation and waste dumping
Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents	X		Standing water ponds are breeding habitat for mosquitoes
Social conflicts if Rohingya are hired for work	X		Competition for low wage work with host communities
Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)	X		Major influx impact on the infrastructure and services of Cox's Bazar district

Screening Questions	Yes	No	Remarks
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation	X		Occupational Health and Safety issues related to biological contamination of the potable water. Occupation hazard from indoor air pollution (cooking)
Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation		X	Unlikely
Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning	X		Hill cutting may cause terrain instability and landslides during the monsoon season. Improperly constructed shelters will not protect Rohingya from cyclones.
Generation of solid waste and/or hazardous waste	X		Dumping of solid waste. Filtration of human waste from latrines
Use of chemicals		X	
Generation of wastewater during construction or operation	X		Poor drainage and waste water collection / treatment

Responses to the screening questions indicate that the Rohingya influx to the Cox's Bazar District of Bangladesh has caused or will cause most of the indicated environmental impacts. These environmental impacts are diverse, unprecedented and, in some cases, irreversible.

Selling of fuelwood by Rohingya in village market near camp | Photo: UNDP Bangladesh/Arif Faisal

APPENDIX B.
Field Reconnaissance Observations Checklist

CHECKLIST 1 – SITUATION ANALYSIS

- **Where is this event taking place?**

Country	Bangladesh
District	Cox's Bazar
Sub-districts	Ukhia, Teknaf

- **Is the REA being carried out before or after the population influx?**

Before	
After	X
During	X
Unknown	

- **Has this area previously hosted refugees? If "Yes" what were the impacts and what actions were taken to address these?**

Yes. The Rohingya camps were established in the area in the 1970s with a total registered Rohingya population of approximately 40,000, of whom 33,000 have been residents of registered camps in Teknaf and Ukhia since 1992. Approximately 70,000 Rohingya arrived between October 2016 and February 2017. The total number of registered and unregistered Undocumented Myanmar Nationals (UMN) in Bangladesh is estimated to be as much as 650,000 (ISCG site report of 26 November) and the main makeshift settlements are located at Kutupalong (North) and Leda (South)

- **Define the physical boundary of this REA, e.g. does it include local villages or distant areas that might be used to source natural resources?**

Approximate size	10 square km plus
GPS co-ordinates	TBD
Main physical delimitation (e.g. river, altitude, slope, rainfall), if obvious	Hilly area with small creeks mostly dry in winter season. Some rice fields and small water ponds observed

- **Ratio of Rohingya people to local population (within a defined geographical limit for villages**

Estimated number of Rohingya people	838,000 (26.11.2017)
Estimated number of local population	300'000 in Ukhia, 200'000 in Teknaf
Ratio of Rohingya to local population	Approx. 2:1

- **What is the predominant environmental situation?**

Small relicts of Rainforest of Dipterocarpaceae	West of Coast Range in Teknaf and Ukhia
Dry forest	No
Savannah	No
Barren land	In Ukhia on abandoned camp sites
Agricultural land	In Ukhia and Teknaf: Rice, betel palm and betel leaf in green houses; home gardens with various fruit trees and vegetables
Other (please describe)	Cattle, goats, sheep

- **When is the REA being carried out?**

Month	November 2017
Wet or dry season (e.g. monsoon)	End of a late rainy season

- **Have any environmental threats/concerns been identified?**
- **Yes.**

Contamination of ground water by human waste from latrines

Surface water pollution

Lack of drainage

Soil and vegetation removal

Fuelwood collection from the forests, trees, roots extraction in the abandoned camps (left side of the Road #1 in Balukhali)

Indoor air pollution due to wood fire cooking in the shelters

Loss of terrain stability due to hill slope cutting to set up shelters

Soil erosion - potential for landslide in rainy season (heavy monsoon rains)

Omnipresent dispersed solid waste, fly dumping in ravines

Fire hazard due to close proximity of the shelters

Unhealthy odour due to setting up of makeshift latrines and bathing spaces inside shelter

Noise and dust from road traffic

- **What type(s) of fuel(s) are used or are likely to be used for the following applications?**

Application	Local inhabitants	Rohingya people	Comments (e.g. source of fuel)
Cooking	LPG / fuel wood	fuel wood / rice husk briquettes / LPG /biogas	Fuelwood mainly from forestland in the vicinity of the camps, briquettes provided by aid agencies/ biogas kitchens installed by aid agencies in old camps/ LPG from local market
Heating	No	No	
Income generation	Cropping for host and Rohingya community, production of goods and services in demand by aid organisations, restaurant, market activities	Rohingya people sell NFI and collected fuel wood	Rohingya people are not yet allowed to be employed for financial gain
Industry	Production of baked bricks	No	With coal and fuelwood
Road construction	Waste rags from the textile industry		To produce tarmac cover

- **What type(s) of construction materials are used or are likely to be used for the following applications?**

Material	Local inhabitants	Rohingya people	Comments
Household structures	Baked bricks, bamboo; concrete	Bamboo sticks from Acacia sp. bamboo slits and plastic sheets for walls	

Material	Local inhabitants	Rohingya people	Comments
Other shelters	Bamboo		
Roofing materials	Corrugated steel, plastic sheeting	Tarpaulin, plastic sheeting, cardboard, dry leaves and branches, green climber plants	Not very robust against strong wind
Compound fences	Bamboo, wood sticks	No fences yet around family settlements	
Other			National NGOs and international NGOs build fences around their compounds - bamboo, wire, plastic sheeting, or a combination of all of these

- **How will social customs or practices of the Rohingya people and the local population impact the environment?**

Water withdrawal from shallow water wells will deplete the aquifer.

Close proximity of the latrines to the water wells will cause biological contamination of ground water.

Collection of fuelwood and construction will likely affect forest ecosystems.

Cooking using fuelwood and briquettes impacts health via indoor air pollution, especially that of the Rohingya women and children.

Conservatism of the Rohingya population prevents women from bathing in the open, and may restrict their use of common latrines, resulting in women dealing with their toilet and bathing needs inside shelters in unhygienic conditions and creating health hazards for themselves and other family members.

Encroaching on wildlife habitats may lead to conflicts between people and wildlife.

Possible further biodiversity losses in critical habitats.

- **Has any Local Environmental Expertise been identified? If so, please describe.**

The Forest Department of Cox's Bazar South is very active in the area where the Rohingya live.

Several environmental analyses (e.g. that on biodiversity) were carried out by government bodies and local NGOs before the first Rohingya arrived in the area.

Numerous UN agencies, governmental organisations and NGOs are working in the area. Many of those present are dealing with environmental issues within the camp's footprint as well as outside of the camps.

- **Are there any required environmental assessments to be carried out (i.e. according to national laws, international laws, donor requirements)? If so, where are these recorded?**

No. National regulation does not appear to require a formal EIA for the influx.

There are at least three recent reports on the EIA providing baseline information for the Kutupalong makeshift camp area:

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. University Centre of the Westfjords, Iceland, October 2017, 61 pages;

IOM & FAO (2017). Assessment of fuelwood supply and demand in displacement settings and surrounding areas in Cox's Bazaar District, Dhaka, Bangladesh; and

WFP (2017). SAFE Assessment. November 2017, 13 pages.

- **Potential Implementing Partners**

It is important to identify qualified implementing partners as early as possible. Using the form below, select those categories that seem to most accurately qualify the organisation's areas of expertise and possible intervention.

Name of Organisation	Type of Organisation (Government, International, National NGO; Academic, etc.)	Areas of Possible Intervention									
		Conservation	Forestry	Agriculture	Livestock	Domestic Energy	Environmental Education	Capacity building	Environmental Assessment	Environmental Coordination	Water
DoF	Government	x	x						x	x	
DoE	Government						x		x	x	x
DoA	Government			x							
UN	IOM, UNICEF										x
UN	UNHCR, FAO								x	x	
UNDP	UN	x	x			x	x	x	x	x	x
UN Women						x					
FAO		x	x	x	x	x	x				
Red Cross											x
BRAC	NGO			x	x	x	x	x	x		
Arannayk Foundation	NGO	x		x	x		x	x	x		
IUCN	Membership Union	x					x	x	x	x	

- **Any other general observations:**

Dealing with betel leaf and commonly used nuts.

CHECKLIST 1 – SITUATION ANALYSIS SUMMARY		
Priority Issues Emerging from Notes	**Comments**	**Action and Timeframe (immediate, further investigation required, no action needed)**
Propose effective replacement or reduction of fuelwood use for cooking	Introduction of improved cooking stoves; distribution of small ration of fuelwood from controlled sources; production and distribution of rice husk briquettes; substitute fuelwood with other energy sources. Awareness-raising programmes on different topics. IGA could be introduced to promote efficient stoves.	Has started; must be extended as rapidly as possible

CHECKLIST 1 – SITUATION ANALYSIS SUMMARY		
Priority Issues Emerging from Notes	**Comments**	**Action and Timeframe (immediate, further investigation required, no action needed)**
Find a more reliable water supply	Past experience, especially in the Teknaf Region leads to the expectation that the shallow water well will dry out before the end of dry season.	Has to be addressed by WASH specialist; possibilities: water trucking, desalinization facilities
Introduce efficient solid and human waste management	Risk of epidemic infectious disease	Medium term, has to be addressed within 6 months – 1 year
Start reforestation programme to re-instate soils and vegetation in abandoned camp sites	Soil erosion and siltation, visual impact. Improvement of land capability	Further investigation may be required to scope the programme
Protect and enhance critical habitats (Himchari National Park, planned Inani National Park and Teknaf Wildlife Sanctuary	Ensure no more net loss of biodiversity in the area	Further investigation may be required to scope the programme

CHECKLIST 2 – INFLUENCING FACTORS

- **What are the key aggravating factors?**

Aggravating Factors	Rating	Environmental Implications
Separation of Rohingya people from home resources and traditional resource-use systems.	M	The longer the Rohingya people are separated from (or denied access to) their homes, the greater the potential impact on the environment as they are likely to depend more on natural resources.
Likelihood of recurrent natural disasters such as droughts, floods, wild fires or strong winds.	H	High likelihood of recurrent environmental hazards may mean that the environment is already stressed, at high risk or fragile.
Ungoverned access to natural resources.	H	If the Rohingya people have free and uncontrolled access to natural resources such as trees, land, and water, the situation may quickly and irreversibly get out of control, resulting in e.g. deforestation, ground water depletion, soil erosion and loss of livelihood for themselves and for the host communities.
Poor local governance.	M	If local government or community law is unable to restrict uncontrolled access to natural resources, and no steps are taken to mitigate this situation, negative environmental impacts can be anticipated.
Lack of self-sufficiency.	M	Rohingya people who are already self-sufficient will normally have a lower impact on the environment; those unable, to reach self-sufficiency will be a burden.
Lack of supplies, resources or saleable skills among Rohingya or returnees.	M	Lack of resources or skills can easily result in environmental damage through natural resource extraction. Note that subsistence skills or the keeping of livestock other than as a short-term supply of meat should be considered carefully, as both may potentially involve additional natural resource extraction.
Lack of cultural homogeneity: The degree to which Rohingya people hold similar cultural beliefs and practices among themselves and with local populations.	L	A lack of common cultural structure may result in disagreement over natural resource use.
Lack of social solidarity among the Rohingya and between Rohingya people and local populations.	L	Low solidarity may indicate the likelihood of conflict over resources and limits to the ability of Rohingya people to meet their needs.
Lack of capacity to absorb waste: The environmental, social and physical structures available to handle waste produced by camps operations.	M	Low waste absorptive capacity may lead to environmental degradation.

Aggravating Factors	Rating	Environmental Implications
Poor environmental resilience: Ability of an ecosystem to recover from additional environmental stress or damage.	H	Low resilience likely means high fragility and greater possibility of environmental damage. Here H means potentially high environmental resilience of the area due to high level of precipitation, fertile soils and tropical climate.
Other		

CHECKLIST 2 – SUMMARY OF KEY INFLUENCING FACTORS

Priority Issues Emerging from Notes	Comments	Action and Timeframe
1 Poor environmental resilience	Sensitive environmental areas in the camp's area of interest	Immediate restriction of access to the sensitive environmental areas
2 Ungoverned access to natural resources	Poor enforcement of ban on entering the protected areas	Medium term. After finding an alternative to wood fuel.
3 Density of Rohingya people	Shelters are very close to each other leaving small breaks	Medium term.
4 Likelihood of recurrent natural disasters such as floods	Main camps are not in the flood zone but camps may suffer landslides in monsoon season	Medium term.

CHECKLIST 3 – ENVIRONMENTAL SITUATION

Natural Resources and Habitats	Presence and Condition (describe location, quality, quantity, status and condition)	Primary Users (describe groups, gender, approx. numbers)	Information Source	Strength of Local Rules on Resource Use? (H/M/L)	Current Threat Level? (H/M/L)	Culturally Important? (H/M/L)	Economic Value? (H/M/L)	Total Score (add row, e.g. HHML)
VEGETATION								
Dominant Tree Species								
Albizzia alongside the roads	Single trees		Visual observation	H	M	M	L	HHML
Some trees left in the camp area	Single trees & Social Forestry plantations		Visual observation	H	M	M	L	HMML
Betel nut palm planted	Wood lot & Single trees home gardens	150,000	Visual observation	M	L	H	H	MLHH
Shrub and Climber Species								
Betel leaves	Climber	150,000	Visual observation	M	L	H	H	MLHH
Grass Species								
Rice		Locals 500,000		M	L	H	H	MLHH
WILDLIFE								
Elephants	Migration Corridor near the camps		Reported by DoF	M	H	M	M	MHMM
Wild boar	rare		Reported by DoF	M	H	M	M	MHMM
Deer	rare		Visual observation	M	H	M	M	MHMM

Natural Resources and Habitats	Presence and Condition (describe location, quality, quantity, status and condition)	Primary Users (describe groups, gender, approx. numbers)	Information Source	Strength of Local Rules on Resource Use? (H/M/L)	Current Threat Level? (H/M/L)	Culturally Important? (H/M/L)	Economic Value? (H/M/L)	Total Score (add row, e.g. HHML)
WATER RESOURCES								
Surface Resources								
Small creeks	Several temporary creeks	Locals and Rohingya	Visual observation	L	H	M	H	LHMH
Small surface ponds	Numerous ponds made by the Rohingya population	Locals and Rohingya	Visual observation	L	H	M	H	LHMH
Medium size ponds	Few large ponds polluted	Locals and Rohingya people	Visual observation	L	H	M	H	LHMH
Ground Water Resources								
1.Shallow aquifer	Numerous water wells with pumps. Biologically contaminated E-Coli	Locals and Rohingya people	Visual observation Reports from Red Cross	M	H	H	H	MHHH
Other Water Resources								
1. Deep aquifer	An international team of expert investigates							
2. Rain water	In rainy season only							
SOILS								
1. Topsoil	Mostly destroyed in camp area	Rohingya people	Visual observation	L	M	L	L	LMLL
2. Agricultural fields	In good shape	Locals	Visual observation	M	L	H	H	MLHH

Natural Resources and Habitats	Presence and Condition (describe location, quality, quantity, status and condition)	Primary Users (describe groups, gender, approx. numbers)	Information Source	Strength of Local Rules on Resource Use? (H/M/L)	Current Threat Level? (H/M/L)	Culturally Important? (H/M/L)	Economic Value? (H/M/L)	Total Score (add row, e.g. HHML)
3. Hill sides (terrain)	Landslides possible in rainy season	Rohingya people	Visual observation	L	H	L	L	
PROTECTED AREAS AND VULNERABLE SITES								
Legally/Gazetted Protected Areas								
1.Teknaf wildlife sanctuary	Mainly degraded forest some relicts of Dipterocarpacea species	Locals and Rohingya people	Visual observation	H	H	M	M	HHMM
2.Himchari National Park	Mainly degraded forest	Locals and some of the Rohingya people	Visual observation	H	M	M	M	HMMM
3.Inani National Park	Mainly degraded forest some relicts of Dipterocarpacea species	Locals and Rohingya people	Visual observation	L	H	M	M	LHMM
Ecologically Sensitive Areas								
1. The Bay of Bengal Long Beach	Old Casuarina sp. and cocos nucifera L. plantation discontinued;	Locals & Rohingya people	Visual observation	M	H	M	M	MHMM
2.Mangrove	Good conditions in some areas	Locals	Visual observation	M	M	M	M	MMMM
3.Elephant habitat	Partially Fragmented	Rohingya people & Locals	Reported by the DoF	M	H	M	M	MHMM

Natural Resources and Habitats	Presence and Condition (describe location, quality, quantity, status and condition)	Primary Users (describe groups, gender, approx. numbers)	Information Source	Strength of Local Rules on Resource Use? (H/M/L)	Current Threat Level? (H/M/L)	Culturally Important? (H/M/L)	Economic Value? (H/M/L)	Total Score (add row, e.g. HHML)
Culturally Important Sites								
1. There are few religious temples, pagoda, mosques nearby.		Locals						

- **Additional observations or comments: .....**

CHECKLIST 3 – SUMMARY OF ENVIRONMENTAL SITUATION		
Priority Issues Emerging from Notes	**Comments**	**Action and Timeframe (immediate, further investigation required, no action needed…)**
1 Heavily degraded forestland Ukhia and Teknaf	Degradation will continue if area not protected	Ensure efficient protection of the protected areas and enforce ban on fuelwood collection in the protected areas
2 Partial fragmentation of elephant's habitat	Incidents and casualties	Further investigation may be required to scope the action plan
3 Reduced biodiversity of vegetation and wildlife	Reduction will continue if protected areas are not efficiently protected	Further investigation may be required to scope the biodiversity management plan
4 Proposed Inani national park	Degradation expected if not protected	Ensure protection mechanism

CHECKLIST 4 – ENVIRONMENTAL IMPACTS OF RELIEF ACTIVITIES

Relief Activity	Environmental standard or "best practice"	Possible environmental impact	Severity of impact	Permanence of impact	Extent of impact	Probability of occurrence	Urgency	Total Score
SITE IDENTIFICATION								
Camp/ settlement location	At least 15 km from ecologically sensitive or protected areas, and between camps / settlements. Above flood prone areas, preferably on gently slopes (2-4%). Avoid slopes steeper than 10% gradient	Encroachment on protected areas	H	H	H	H	H	HHHHH
		Encroachment on sensitive areas	H	H	H	H	H	HHHHH
		Disturbance of migration routes	H	H	H	H	H	HHHHH
		Deforestation	H	H	H	H	H	HHHHH
		Flooding	L	L	L	M	L	LLLML
		Erosion	H	M	M	H	M	HMMHM
		Others (please list)						
CAMP PLANNING/CONSTRUCTION								
Camp size	Preferably less than 20,000 people and 30-45m2 of land per person	Natural resource depletion	H	H	H	H	H	HHHHH
		Others (please list) Fire hazard	H	H	H	H	H	HHHHH
Ground cover and top soil removal	Minimal: avoid indiscriminate bulldozing	Lack of shade	M	M	M	H	M	MMMHM
		Dust	M	M	M	H	M	MMMHM
		Erosion	H	M	M	H	M	HMMHM
		Others (please list)						
Camp layout (shelter orientation)	Minimum disturbance of natural drainage pattern. Clustered layout to facilitate shared cooking	Erosion	H	M	M	M	M	HMMMM
		Flooding	L	L	L	L	L	LLLLL
		Firewood consumption	H	H	H	H	H	HHHHH
		Others (please list)						

Relief Activity	Environmental standard or "best practice"	Possible environmental impact	Severity of impact	Permanence of impact	Extent of impact	Probability of occurrence	Urgency	Total Score
Road construction	Along contour lines – not up and down slopes	Drainage problems	H	H	H	H	H	HHHHH
		Erosion	H	M	M	M	M	HMMMM
		Flooding	L	L	L	L	L	LLLLL
		Increased trafficking of natural resources	H	H	H	H	M	HHHHM
		Others (please list)						
SHELTER								
Use of poles in shelter construction	If feasible, use soil-construction or other alternative materials	Deforestation	M	M	M	M	LH	MMMML
		Excavation pits	H	M	M	M	M	HMMMM
		Others (please list)						
Sourcing of shelter materials from natural surrounding environment and from outside the area	Mostly bamboo, very abundant in and outside of the area where Rohingya people live, grows rapidly, Control of access to and use of harvesting areas. Apply rotation harvesting	Natural resource depletion	M	M	M	M	L	MMMML
		Deforestation: NB: not because of shelter material; rather because of fuelwood need	M	M	M	M	L	MMMML
		Others (please list)						
WATER								
Water supply	Water source sustainable – management plan in place for surface and groundwater sources	Depletion of source (surface or ground water)	H	H	H	H	H	HHHHH
		Disturbance of watershed	H	H	H	H	H	HHHHH
		Increased population density	H	H	H	H	H	HHHHH
		Others (please list)						
Water treatment	Safe disposal of chemicals	Contamination	H	L	H	L	H	HLHLH
		Others (please list)						

Relief Activity	Environmental standard or "best practice"	Possible environmental impact	Severity of impact	Permanence of impact	Extent of impact	Probability of occurrence	Urgency	Total Score
Water points construction	Drained and protected from waste, livestock and pollution	Mosquito breeding grounds	H	H	H	H	H	HHHHH
		Pollution (water)	H	H	H	H	H	HHHHH
		Others (please list)						
SANITATION								
Latrines	Minimum of 30m horizontal distance to water sources. Bottom of pit should be a minimum of 2m over groundwater table.	Contamination of groundwater	H	H	H	H	H	HHHHH
		Contamination of other water sources	H	H	H	H	H	HHHHH
		Others (please list)						
Drainage system	Maintain natural drainage patterns as far as possible. Drain along contour lines.	Downstream pollution (other communities)	H	H	M	M	H	HHMMH
		Erosion	H	M	M	M	L	HMMML
		Flooding	M	L	L	M	L	MLLML
		Others (please list)						
		Pollution (soil, water, air)	H	H	H	H	H	HHHHH
		Erosion	H	M	M	M	L	HMMML
		Others (please list)						

Relief Activity	Environmental standard or "best practice"	Possible environmental impact	Severity of impact	Permanence of impact	Extent of impact	Probability of occurrence	Urgency	Total Score
Solid waste management systems	Maximise reuse and recycling. Collection point (100l per 10-15 families. Impermeable landfills to protect ground water. Incinerate hazardous waste.	Pollution (soil, water, air)	M	H	H	H	M	MHHHM
		Pollution of living environment	M	H	H	H	M	MHHHM
		Increased disease transmission: NB: yes, on account of low water quality and because people live so close to each other	H	H	H	H	H	HHHHH
		Others (please list)						
LOGISTICS								
Transport of relief materials	Avoids damage to infrastructure	Roads and/or bridges damaged	H	H	M	H	H	HHMHH
		Erosion	H	M	M	M	L	HMMML
Procurement	Prioritise recyclable and/or easily disposable materials. Reduce packaging	Excessive solid waste	L	M	M	M	L	LMMML
		Pollution (soil, water, air)	M	M	L	L	L	MMLLL
		Others (please list)						
FOOD								
Food distribution and change in cooking practices	Promote fast-cooking foods. Promote energy-saving (pre- soaking, milling, use lids, double cooking and improved stoves)	Deforestation	L	L	L	L	H	LLLLH
		Conflict with local communities	L	L	L	L	H	LLLLH
		Air pollution	L	L	L	L	H	LLLLH
Firewood distribution	Only in exceptional cases (except vulnerable) and in return for Rohingya work. Household energy needs must be assessed	Deforestation at considerable distance	H	H	H	H	H	HHHHH
		Tension with local authorities	H	H	H	H	H	HHHHH
		Others (please list)						

Relief Activity	Environmental standard or "best practice"	Possible environmental impact	Severity of impact	Permanence of impact	Extent of impact	Probability of occurrence	Urgency	Total Score
AGRICULTURE								
Expansion of area or type of farming often supported by seeds and tools distribution.	Sustainable farming practices encouraged. Land-use plan agreed by stakeholders.	Loss of habitats and biodiversity						
		Deforestation	M	L	L	L	L	MLLLL
		Land degradation/erosion	M	H	L	L	L	MHLLL
		Shortened fallow period						
		Invasive species	H	M	M	M	M	HMMMM
		Disturbance of traditional seed management	L	L	L	L	L	LLLLL
		Others (please list)						
Use of fertilizers and/ or pesticides	Minimal – avoid soil nutrient overload and contamination of watercourses.	Contamination (soil, water)	M	M	H	M	M	MMHMM
		Increased resource extraction						
		Others (please list)						
LIVESTOCK								
Livestock keeping practiced or expended	Sustainable numbers with adequate fodder and separate water sources. Slaughter sites located at periphery, away or downstream from watercourses. Land-use plan agreed by stakeholders.	Loss of habitat and biodiversity	L	L	L	L	L	LLLLL
		Introduction/expansion of animal diseases NB: no domestic animals came with the Rohingya	L	L	L	L	L	LLLLL
		Land degradation/erosion	L	L	L	L	L	LLLLL
		Pollution from slaughter sites	M	M	L	M	L	MMLML
		Conflict over grazing rights	L	L	L	L	L	LLLLL
		Others (please list)						

Relief Activity	Environmental standard or "best practice"	Possible environmental impact	Severity of impact	Permanence of impact	Extent of impact	Probability of occurrence	Urgency	Total Score
FORESTRY								
Tree planting	Natural regeneration encouraged.	Conversion of farm land	L	L	L	L	L	LLLLL
	Promote native over exotic species in mixed forests.	Monocultures, loss of habitats and/or species NB: only wood lot and single tree plantations	L	L	L	L	L	LLLLL
		Others (please list)						
Wood harvesting from surroundings	Available forest resources assessed. Management plan agreed by stakeholders.	Deforestation	H	H	H	H	H	HHHHH
		Conflicts with existing users of forests	H	H	H	H	H	HHHHH
		Others (please list)						
		Waste (solid, liquid)	H	H	H	H	H	HHHHH
		Pollution (soil, water, air)	H	H	H	H	H	HHHHH
		Others (please list)						

H = High, M = Modarate, L = Low

CHECKLIST 4 – SUMMARY OF ENVIRONMENTAL IMPACTS OF RELIEF ACTIVITIES

Priority Issues Emerging from Notes	Comments	Action and Timeframe (immediate, further investigation required, no action needed)
Encroachment on protected and sensitive areas	Quick degradation expected if not protected	Immediate
Deforestation	Degradation expected if not managed properly	Immediate
Disturbance of migration routes of elephants	Incidents and casualties	More investigation required
Natural resources depletion (water, soils)	Further degradation expected if not managed properly	More investigation required

STEP 5 – REA RESULT SUMMARY

Country: Bangladesh

Rohingya people camp/Settlement: Kutupalong and Balukhali

Dates on which the REA was conducted: 1st -5th and 18th -28th November, 2017

REA Team Leader: Alex Chaikine

CHECKLIST 1 – SITUATION ANALYSIS

Priority Issues Emerging from Notes	Comments	Action and Timeframe
1. Propose effective replacement and/or reduction of fuelwood use for cooking	Could be an improved cooking stove; rice husk, or LPG. Use of alternative fuel would save forests and wildlife habitats.	Immediate, has to be addressed in less than 6 months. Awareness raising and education program are needed.
2. Find an alternative water supply	Shallow water well will be dry in a few months as the dry season develops.	Immediate, has to be addressed in less than 6 months
3. Introduce efficient solid and human waste management	Risk of epidemic infectious disease	Medium term, has to be addressed within 6 months – 1 year
4. Start reforestation program to reinstate soils and vegetation in abandoned camps	Soil erosion and siltation, visual impact. Improvement of land capability	More investigation may be required to scope the programe
5. Protect and enhance critical habitats like Inani National Park and TWS	Ensure no net loss of biodiversity in the area	More investigation may be required to scope the programe
6. Improve slope stability in the camps	Risk of landslides	Immediate, has to be addressed in less than 6 months

CHECKLIST 2 – KEY INFLUENCING FACTORS

Priority Issues Emerging from Notes	Comments	Action and Timeframe
1 Ungoverned access to natural resources	Poor enforcement of ban on entering the protected areas	Medium term. After finding an alternative to fuelwood.
2 Density of shelters	Closely arranged leaving little or no space between	Decongestion is needed as soon as possible
3 Likelihood of recurrent natural disasters such as floods, or cyclones	Main camps are not in the flood zone. Camps may suffer landslides in monsoon season and cyclonic storms during the cyclone seasons	Before next rainy season

CHECKLIST 3 – SUMMARY OF ENVIRONMENTAL SITUATION

Priority Issues Emerging from Notes	Comments	Action and Timeframe
1 Natural Forest Habitat in Ukhia and Teknaf	Quick degradation expected if not protected	Immediately ensure protection and enforce ban on fuelwood collection in the protected areas
2 Fragmentation of elephant's habitat	Incidents and casualties	Further investigation may be required to scope the action plan
3 Reduced biodiversity of vegetation and wildlife	Reduction continues if protected areas are not efficiently protected	Further investigation may be required to scope the biodiversity management plan

CHECKLIST 4 – ENVIRONMENTAL IMPACTS OF RELIEF ACTIVITIES

Priority Issues Emerging from Notes	Comments	Action and Timeframe
1. Encroachment on protected and sensitive areas	Quick degradation expected if not protected	Immediate
2. Deforestation	Degradation expected if not protected	Immediate
3. Disturbance of migration routes of elephants	Incidents and casualties	Further investigation required
4. Natural resources depletion (water, soils)	Quick degradation expected if not protected	Immediate

- **OTHER OBSERVATIONS (including any unresolved discrepancies that arose in discussions)**

FINAL RECOMMENDATIONS FOR ACTION
1 Afforestation, reforestation in adjacent areas to offset the loss of forestry.
2 Protection of people from elephant rampages.
3 Protection of remaining forests in the influx area by lessening the demand for wood and bamboo.
4 Stabilsation of slopes of the hills before the next monsoon rains.
5 Finding out stable source for potable water supply.
6 Solid waste management: collection and disposal of solid waste. Fecal sludge management.
7 Livelihood improvements in host communities and camps.
8 Conservation and enhancement of protected areas to ensure no net loss in biodiversity.
9 Improve indoor air quality by promoting use of LPG and high-efficiency stoves and community cooking outdoors.
10 Set up make-shift bathrooms with tube-wells at convenient distances for women to be able to use the facilities regularly. Set up separate toilet blocks for women only at convenient distances. Arrange adequate lighting at the toilets for safety measures.

- **Next Steps**

UNDP will decide how they want to contribute to the next Humanitarian Response Plan from March to December 2018.

- **Persons/groups consulted for the REA (e.g., UNHCR staff, government representatives, local authorities, traditional authorities, local stakeholders)**

Federation of Red Cross, UNHCR, UNICEF, FAO, Site planners and WASH Experts from SDC-SHA, Dept. of Forest, (i) NGO, MoEF, MoDMR, RRRC, COX'S BAZAR IUCN, ARRONYAK FOUNDATION, IUCN.

- **Who participated in the REA mission:**

Name	Function	Institution
Alex Chaikine	REIA Team Lead	UNDP
Dilruba Haider	Gender Specialist	UN Women
Mohammad Reaz Uddin	REIA Environmental Specialist	UNDP
Md. Sajidur Rahman	GIS Specialist	UNDP
Arnold Egli	REIA Forestry Specialist	UNDP / SDC - SHA
Md. Danesh Miah	REIA Environmental Specialist	UNDP
Arif Mohammad Faisal	REIA Coordinator	UNDP
Md. Anwar Hossain	National Consultant-Natural Resource Management and Climate Change Adaptation	UNDP
Abdul Malek	National Consultant-Natural Resource Management and Climate Change Adaptation	UNDP

APPENDIX C.
Stakeholders Consultations

Meetings in Dhaka

Meeting	Date	Participants	Discussion Agenda	Key issues identified/ discoursed
Meeting with MoDMR	25th October, 2017	Mr. Mohsin, Joint Secretary, MoDMR	Briefing about the Rohingya situation and expectation from the study	The Rohingya influx after 25th August 2017 has been continuous and on a large scale. The Government, with the help of UN agencies and bilateral support of other supporting countries, is addressing the problem. Forestry and the environment have been victims of the circumstances. Expectation from the study team is to get an understanding about the reversible and irreversible damages and the means to contain/offset them.
Meeting with MoEF	26th October, 2017	Additional Secretary Joint Secretary (Environment)	Concerns about forestry damage. Concerns about contamination of ground water and surface water.	Concerns about forestry damage both natural forest and plantation, concerns about ECAs and Protected Areas. Expectation from the study team is to get an understanding about the loss and damage in the forestry sector and means for restoration. Concerns also include contamination of ground water and surface water and about their likely cleaning operation.
Expert Consultation	28th October 2017	BFD, DoE, MoEF, FAO, UN WOMEN, NGOs	Informing and updating all relevant ministries and line agencies, experts and key stakeholders about the REA, identifying info and knowledge gaps and gathering views and advice to design a robust environment impact assessment and mitigation plan.	Hill-cutting, tree-felling for fuelwood, withdrawals of huge amounts of ground water, and pollution from fecal sludge. Key factors for health and environmental concerns include the polythene wastes from relief operations and increased dust particles in the air from increased traffic. Some Rohingya have settled in areas that are likely to face landslides in next year's rainy season. It is critical to learn the resource-use behavior of the Rohingya to determine the types and extent of the future environmental impact. Gender aspects of the crisis are very important to consider as the majority of the Rohingya are women and children. Determining the role of Rohingya women in impacting the communities and environment is very important. Rohingya women stay in their houses most of the time, so the REIA teams should visit the households to collect data and build relationships.

Meeting	Date	Participants	Discussion Agenda	Key issues identified/ discoursed
Meeting with FAO	16 November 2017	FAO, REA team	Status of 2015 Land cover map Recap of UNDP REA and of IOM & FAO Fuelwood Assessment Overview of planned FAOBD activities in the Rohingya area (Bangladesh Forest Inventory, land delineation, participatory monitoring, etc.)	1.The IOM&FAO assessment defined an AOI and the UNDP Assessment may use a different AOI. Therefore, it should be noted the different results may occur from the different UN organizations. It is helpful to be consistent whenever possible. For example, using the same AOI and building from results already reported in the IOM & FAO assessment. 2. Unlike the Landcover map, the Bangladesh Forest Department tree cover map is finalised and shareable. 3. Follow up may include further collaboration around the points discussed above.
Meeting with Arannayk Foundation	14 November 2017	REA team, Dr Farid Uddin Ahmed, Director, Arannayk Foundation	Biodiversity of Ukhia and Teknaf Region	Conservation and livelihood improvement. Protected areas and threatened species, conservation and habitat enhancement. Elephant migration routes. Mitigation for habitat fragmentation.
Meeting with IUCN	14 November 2017	REA team, Dr Ishtiaq Uddin Ahmed, Country Representative, IUCN	Elephant corridor	Protected areas and threatened species, conservation and habitat enhancement. Elephant migration routes. Mitigation for habitat fragmentation.

Meetings at Cox's Bazar

Meeting	Date	Participants	Discussion Agenda	Key issues identified/ discoursed
Meeting with RRRC at his office	November 01, 2017	Mr. Mohsin, Joint Secretary, MoDMR RRRC Commissioner and his colleagues ADC CXB UNDP teams (Env, Social and Early Recovery)	First-hand briefing about the situation. Info about the old and new shelters, reception facilities, Site management, Involvement of UN agencies, NGOs and the overall coordination mechanism	Rohingya first came in the '70s, then in the '90s, and in 2016. Since August 25, 2017, the influx has surpassed all records. Over half a million Rohingya have arrived in this short period. The government is providing humanitarian assistance. The problems are addressed with the support of UN agencies. About 4,000 Acres of land / forestry have been sacrificed. Not a single Rohingya person is suffering from starvation. Every family has been provided with shelter. 3 Brigade of Army and over 2,600 government officers and staff are now engaged in the site management and its operation.

Meeting	Date	Participants	Discussion Agenda	Key issues identified/ discoursed
Meeting with DOE (Cox's Bazar office)	01 Nov, 2017	Mr. Syful Islam, Assistant Director	Capacity in terms of monitoring. Manpower	• CXB office has a miniature lab, capable of monitoring Physico chemical parameters of water and waste water. • Trained laboratory assistants are available. • They are willing to conduct the required field monitoring.
Meeting with DoF (South) of Forest Department	02 Nov, 2017	Mr. Ali Kabir	Availability of maps Info on plantation programme and coverage. Loss and damage of forestation in hectares	• Updated maps covering the extent of damage are not available. • Around 3500 Acres of hill forests have been completely lost. • All the plantation forest in the footprint area has gone.
Meeting with International Red Cross (Water Emergency Unit)	03 Nov, 2017	Mr. Gavin	Discussion on water and sanitation	• Shallow wells are around 20 metres deep. These wells may survive for another 2 to 3 months maximum. • Test results of well water show around 70% are contaminated with E-coli • No arsenic found • Need to find deep aquifer. Plan to dig a huge deep tube well to draw water
Meeting with WASH sector group	04 Nov, 2017	Sector coordinator and other members	Area of work Concerns	• Ground water has iron as natural contaminant. Microbial water quality is also a concern • Uncontrolled use of ground water • Inappropriate management of waste and sludge Construction of latrines without proper design • Improper desludging and landfill
Meeting with KII, Teknaf and Ukhia range	24 Nov, 2017	i. Mohammad Ali Zinna, The Daily star ii. Tofail Ahmed, The Kaler Kantha iii. Ruhul Kuddos Rana, The Prothom-Alo; Md. Ali Kabir, Cox's Bazar South Forest Division, DoF	Rohingya influx and its impacts	• Rohingya influx and their impacts on forests in Ukhia and Teknaf. • The amount of forest area Rohingya have occupied in Ukhia and in Teknaf up to this influx. The list of plantations they destroyed range wise. What were the plantation years and what were the species? At what age were the plantations cleared up. How much natural forest land did they occupy?
Ministry of Environment and Forests	06 December 2017	Mr. Muhammad Ziaur Rahman, Additional Secretary (Admin), MoEF specialists	Presentation of key findings and recommendations on the REIA study	• Presentation of key findings and recommendations on the REIA study, including physical impacts and impacts on ecosystems in the area. Mitigation measures and proposed programmes. Discussed the disclosure plan for the report.

List of people and organizations met and consulted with during UNDP missions

Meeting	Date	Participants
Arannayk Foundation	Farid Uddin Ahmed	Executive Director
Brac, Dhaka in CXB	Sirajul Islam, Md., PhD	Programme Head Agriculture and Food Security
CXB North Forest Division	Hoq Mahub Morshed	Divisional Forest Officer
CXB South Forest Division	Ali Kabar Haider	Deputy Conservator of Forests
Embassy of Switzerland, Dhaka	Anindya Dutta	Programme Officer
Embassy of Switzerland, Dhaka	Elsässer, Beate K.	Deputy Head of Mission
Embassy of Switzerland, Dhaka	Holenstein, René	Ambassador, Head of Mission
Embassy of Switzerland, Dhaka	Weiersmueller, Martin	Humanitarian Emergency Coordinator
FAO Dhaka	Johnson, Kristopher	Forest Inventory and Carbon Assessment
FAO, CXB	Agnew, Peter	Emergency Programme Coordinator
FAO Rome	Henry, Matieu	N/A
Helvetas, Zurich	Cippa, Andrea	WASH Expert
IOM / OCHA	Baars, Margot@	Coordination
ISCG / OCHA	Belanger, Julie	ISCG NGO Coordination and Support Team
IUCN Dhaka	Haseeb Md. Irfanullah	Programme Coordinator
IUCN Dhaka	Mohammad Abdul Motaleb	Programme Officer
IUCN Dhaka	Ishtiaq Uddin Ahmad	Country Representative
Red Cross Federation	Reynolds, Gavin	Environment specialist
Prog for Helpless and Lagged Societies (PHALS), CXB	Abu Murshed Chowdhury (Khoka)	Chairman & CEO
Swiss Humanitarian Aid	Broger, Mikhail	Site planner with UNHCR
Swiss Humanitarian Aid	Keller, Hans	WASH / Site planning with IOM
Swiss Humanitarian Aid	Keusen, Robert	Logistic Hospital CXB
Swiss Humanitarian Aid	Geeser, Frederic	WASH / UNICEF
UNHCR Geneva in CXB	Quigley, Paul	Energy Specialist
UNHCR Geneva in CXB	Dekrout, Andrea	Environment Specialist
UN Women, Bangkok	Pettersson, Marie	Coordination Analyst

APPENDIX D. Ground Water Quality Test Results

Government of The People's Republic of Bangladesh.
Department of Environment
Chittagong Laboratory
Zakir Hossain Road, Khulshi, Chittagong
www.doe.gov.bd

Analysis sheet of Drinking water Sample of Balukhali Rohinga Camp, Kotopalong Rohinga Camp.Ukia,Cox'sbazar

Sampling Points	Sample Location (GPS Location)	Lab code	Date	P[H]	TDS mg/l	Chloride mg/l	Iron mg/l	Arsenic mg/l	Salinity %0	Remarks
Sample No-1	92°9'6.6"E 21°9'23.35"N	73	04.11.2017	6.52	28.9	18	4.5	ND	0.03	Shafiuallah Kata,Balukhali Camp
Sample No-2	92°9'4.94"E 21°9'24.2"N	74	04.11.2017	6.52	57.3	34	6.00	ND	0.06	Shafiuallah Kata,Balukhali Camp
Sample No-3	92°9'3.33"E 21°9'26.38"N	75	04.11.2017	6.49	92.4	50	6.60	ND	0.09	Shafiuallah Kata,Balukhali Camp
Sample No-4	92°8'48.53"E 21°9'20.35"N	76	04.11.2017	6.48	84.0	44	5.02	ND	0.08	Shafiuallah Kata,Balukhali Camp
Sample No-5	92°8'39.72"E 21°9'25.25"N	77	04.11.2017	5.92	17.81	12	0.42	ND	0.02	Bagghona,Balukhali Camp
Sample No-6	92°8'39.29"E 21°9'30.59"N	78	04.11.2017	6.17	48.0	28	4.60	ND	0.05	Jamtol,Balukhali Camp
Sample No-7	92°8'39.43"E 21°9'30.63"N	79	04.11.2017	6.18	15.74	5.6	1.16	ND	0.01	Jamtol,Balukhali Camp
Sample No-8	92°9'36.87"E 21°12'47.38"N	80	04.11.2017	6.21	19.62	12	1.02	ND	0.02	Kotopalong Camp
Sample No-9	92°9'36.25"E 21°12'46.75"N	81	04.11.2017	6.34	30.0	16	3.92	ND	0.03	Kotopalong Camp
Sample No-10	92°9'33.66"E 21°12'48.48"N	82	04.11.2017	7.45	161.0	84	0.37	ND	0.15	Kotopalong Camp
Sample No-11	92°9'31.25"E 21°12'.25"N	83	04.11.2017	5.33	18.84	12	1.52	ND	0.02	Kotopalong Camp
Sample No-12	92°9'37.99"E 21°12'41.03"N	84	04.11.2017	6.91	46.5	27	3.87	ND	0.05	Kotopalong Camp
Sample No-13	92°9'40.23"E 21°12'41.74"N	85	04.11.2017	8.29	224	122	0.33	ND	0.22	Kotopalong Camp
Standard as per ECR1997 in Bangladesh.				6.5-8.5	Below 1000	150-600	Below 1.0	Below 0.05	-	-

Note. 1. ND-Not Detectable

09.11.2017
Chandan Biswas
Sample Collector

09.11.17
Jannatul Ferdush
Junior Chemist

09.11.17
MD. KAMRUL HASSAN
Sr. Chemist

Jamir Uddin
Deputy Dierctor

Md. Mokbul Hossain
Director (Joint Secretary)
Chittagong Laboratory
Department of Environment

APPENDIX E.

Surface Water Sampling and Test Results[74]

Sampling Point	Location	Parameters	Remarks
point-1	Near TV tower, Amgachtola, Kutupalong Rohingya Camp, Ukhia, Cox's Bazar.	pH- out of range. DO-1.56 mg/l TDS-198.7 mg/l EC-429 µS/cm Tem: 27° C	Sampling point's location is downstream of Kutupalong camp.
point-2	Rastar Matha, north side of Kotopalong High School, Ukhia, Cox's Bz.	pH- out of range. DO-8.17 mg/l TDS-40.7 mg/l EC-545.9 µS/cm Tem: 27.6° C	Sampling point's location is north side of Kutupalong camp.
point-3	Gomdhom Chara, near kachubania Road, Ukhia, Cox's Bz.	pH- out of range. DO-1.56 mg/l TDS-198.7 mg/l EC-429 µS/cm Tem: 27° C	Sampling point's location is east side of Kutupalong camp.
point-4	MachKharia Deva, lambasia khojbania, Ukhia, Cox's Bz.	pH- out of range. DO-6.53 mg/l TDS-44.7 mg/l EC-543 µS/cm Tem: 28.9° C	Sampling point's location is west side of Kutupalong camp.
point-5	Near Ukiagahat beat office, Talipara chara, Ukhia, Cox's Bz.	pH- out of range. DO-4.61 mg/l TDS-38.7 mg/l EC-85.7 µS/cm Tem: 26.9° C	Sampling point's location is south side of Kutupalong camp.
point-6	Ghora bridge khal, near Balukhali Camp, Ukhia, Cox's Bz.	pH- out of range. DO-1.56 mg/l TDS-198.7 mg/l EC-429 µS/cm Tem: 27° C	Sampling point's location is east side of Balukhali camp.
point-7	Balukhali khal, Ukhia, Cox's Bz.	pH- out of range. DO-1.56 mg/l TDS-198.7 mg/l EC-429 µS/cm Tem: 27° C	Sampling point's location is east side of Balukhali camp.
point-8	Thaingkhali Khal, Ukhia, Cox's Bz.	pH- out of range. DO-7.30 mg/l TDS-34.5 mg/l EC-77 µS/cm Tem: 27° C	Sampling point's location is South side of Balukhali camp.
point-9	Hakimpur Khal, Ukhia, Cox's Bz.	pH- out of range. DO-5.33 mg/l TDS-63.4 mg/l EC-143.8 µS/cm Tem: 28.5° C	Sampling point's location is South side of Balukhali camp.
point-10	Palongkhali khal, Ukhia, Cox's Bz.	pH- out of range. DO-7.65 mg/l TDS-27.3 mg/l EC-61.2 µS/cm Tem: 27.6° C	Sampling point's location is South side of Balukhali camp.

[74] Surface water sampling and tests conducted by DoE, Cox's Bazar office.

APPENDIX F.
Land Cover Data

Data provided by FAO Bangladesh

CLASS Agg	Baseline, ha	Current, ha	Projected 5km, ha	Projected 10km, ha
Crop	14238.2	203.1	6720.0	12694.0
Hill Forest	4662.7	8.8	1651.4	4368.6
Mangrove	312.0	0.0	113.0	237.7
Non vegetated or water	7445.4	2.9	3080.7	6116.8
Plantations and Orchards	1469.3	101.1	798.5	1362.1
Residential (host communities)	10217.8	343.8	4743.6	8499.3
Shrub Dominated Area	548.7	3.4	284.3	516.6
Shrub Dominated Forest Area	21438.2	626.1	12456.8	20837.8

- CLASS_Agg means aggregated land cover classes, e.g. Forest Plantation, Orchards and Other Plantations (Trees) and Rubber Plantation. These were aggregated in one class - Plantations and Orchards.
- Baseline means the total area of certain land cover class in the AoI
- Current means the total area of certain land cover class within the new camps' footprint.
- Projected 5 km means total area of certain land cover class in the 5 km buffer zone around the new camps, excluding camps footprint.
- Projected 10 km means total area of certain land cover class in the 10 km buffer zone around the new camps, excluding camps' footprint, but including 5 km buffer.

Biomass calculation

Cover class	Biomass kg/ ha	Area of		Total biomass in the area of	
		5 km buffer	10 km buffer	5 km buffer	10 km buffer
Plantations	155,384	798	1362	124,067	211,645
Shrub dominated area	2	284	516	0.6	1.0
Shrub dominated forest	2	12,457	20,838	24.9	41.7
Hill forest	17,003	1651	4,369	28,079	74,279

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