

# Cyclones background

## Rohingya crisis

Organisations working on the Rohingya response are preparing for the cyclone season. This brief provides background on cyclones in Bangladesh and an overview of their impact, to put the emergency preparedness planning into a wider perspective. The 2018 cyclone seasons will be different from those in the past. The influx of over 650,000 refugees residing in temporary shelters and who are not included in national preparedness and early warning mechanisms creates a significantly different level of vulnerability.

- **Cyclones make landfall in Bangladesh almost every year.** There are two cyclone seasons; May–April and October–November.
- Between 1877–2017, Bangladesh was hit by 154 cyclones, including 53 severe cyclonic storms, 43 cyclonic storms, and 68 tropical depressions. At least 17 hit Cox’s Bazar (Khan & Damen; World Bank 2010).
- The effects of climate change may be making the country more cyclone prone, with an annual increase of 0.05 cyclones per year between 1985–2009 (WFP & HKI 07/2015).
- **Cyclone mortality has decreased.** Over time fewer people have died as a result of cyclones as Bangladesh has focused on resilience-building, preparedness and early warning measures.
- In 1991 cyclone Gorky killed 139,000 people in Cox’s Bazar and Chittagong (Saha 2017). Fewer than 25 people have been killed in each cyclone since 2015. However, cyclones in the last three years have been much less severe than the cyclones the country has experienced in the past.
- It is difficult to make direct comparisons between cyclones because, in addition to differing severity, the impact of a cyclone is determined by time of day, location and tide level.
- **Cyclones are characterised by high winds, rains and storm surges.** Storm surges are the difference between water level under the influence of a disturbance (storm tide) and the normal level that would have been reached in the absence of the disturbance.
- Protection against storm surges is provided by coastal embankments.
- Storm surges can last in duration from a few minutes to a few days and may cause inundation, the scale of which is dependent on the size of the waves (ACAPS SDR 2014; ADPC 1991, Bangladesh Disaster Management Reference Handbook 06/2017; World Bank 2010).
- **Storm surges are the main cause of death during a cyclone** (ACAPS SDR 2014). During severe cyclones, storm surges can reach up to 8 metres. The average tidal range in the Bay of Bengal is about 3.5–4 metres. The height of the storm surge is dependent on the intensity of the cyclonic winds, high/low tides and the meteorological tide (such as lunar high tide).

- Storm surges on average reach the following heights and distance inland, although this can be impacted by high or low tides at the time of a cyclone

(Khan):

Table 1: Storm Inundation Rates

Wind speed (km/h)	Storm surge height (m)	Limit to inundation (km) from the coastline
85	1.5	1.0
115	2.5	1.0
135	3.0	1.5
165	3.5	2.0
195	4.8	4.0
225	6.0	4.5
235	6.5	5.0
260	7.8	5.5

- The Standing Orders on Disasters (2010), outline two types of cyclone classifications. One is the categorisation on a scale of 1–5, a slight adaption from the Saffir-Simpson scale. Yet, **when disseminating messages on cyclones to people in Bangladesh, the following terms are used:**

Table 2: Bangladesh Storm Categorisation

Type	Wind speed
Depression	50km/h
Deep depression	51-61km/h
Cyclonic storm	62-88km/h
Severe cyclonic storm	89-117km/h
Cyclonic storm of hurricane intensity	more than 118 km/h

## Cyclones overview

Table 3: Cyclones in Bangladesh 2007– 2017

Name	Date	Speed	Deaths	Total affected <sup>1</sup>	Main affected area
<b>Sidr</b>	15/11/07	240km/h	3,300	18.7 mln (55,000 injured)	Khulna & Barisal divisions
<b>Aila</b>	25/05/09	120km/h	190	3.9 mln	Khulna & Barisal divisions
<b>Mahasen</b>	16/05/13	85km/h	17	1.04 mln	Barguna, Bhola, Patuakhali districts
<b>Komen</b>	30/07/15	90 km/h	4	2.6 mln	Cox's Bazar, Chittagong, Noakhali districts
<b>Roanu</b>	21/05/16	100km/h	24	1.3 mln	Chittagong, Cox's Bazar, Barguna, Noakhali districts
<b>Mora</b>	30/05/17	130km/h	7	3.3 mln	Chittagong, Cox's Bazar, Rangamati, Bandarban districts

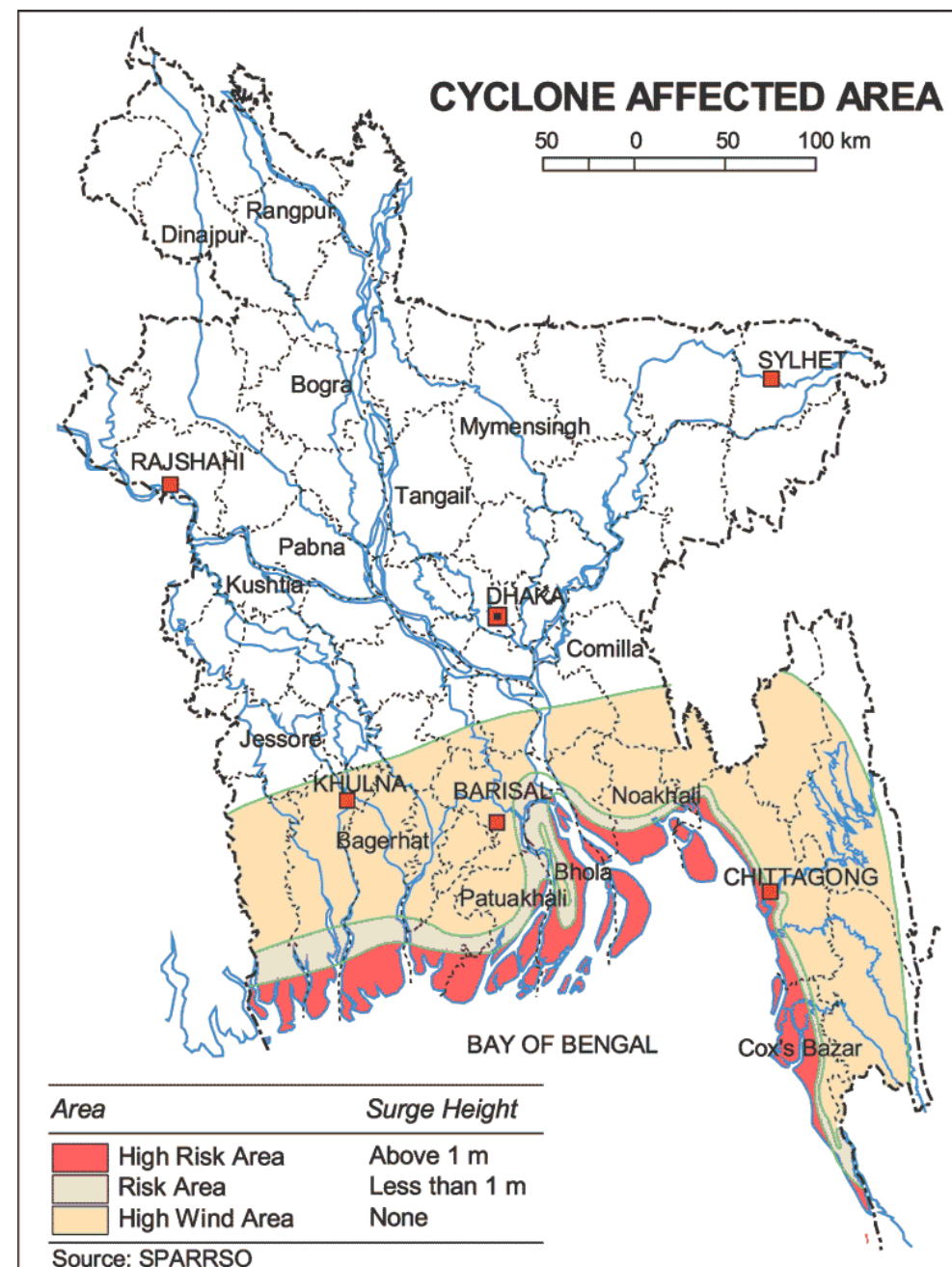
- The above table illustrates the scale and geographic scope of cyclones in the last ten years. A cyclone which affects Cox's Bazar is likely to impact other parts of Bangladesh and or Myanmar.
- The most recent severe cyclone (category 4) was cyclone Sidr in 2007. Sidr did not affect Cox's Bazar, rather making landfall to the far east of the coast. **In the last three years Cox's Bazar has been impacted by a severe storm each year however none of these have been stronger than a cyclonic storm** (more than 88km/h or a category 1 cyclone).

## The impact of cyclones in Cox's Bazar

Assessments for camp and host communities have not been carried out together in the past, creating a disjointed understanding of the impact of cyclones in Cox's Bazar.

Cyclones in the past three years have had a greater impact on Teknaf than Ukhiya.

<sup>1</sup>There is no systematic way of counting the number of people affected; numbers may differ in other reports.



Cyclones in Cox’s Bazar have resulted in high food needs among the Bangladeshi host community as crops and food stocks were destroyed. Homes and shelters have been affected by strong winds as houses are built of materials that are not resistant to strong winds.

If a cyclone hits Ukhia and Teknaf shelter is expected to be one of the main priorities due to the temporary nature of the shelters in the camps and settlements combined with the environmental degradation which has been a result of the rapidly constructed camps.

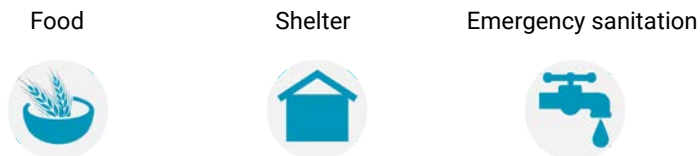
Specific needs assessment data for the camp populations exists for Mora, but not for Komen or Roanu. Therefore, it is not possible to compare impact on the Rohingya population across the three cyclones.

### Cyclone Komen, July 2015

Total affected	2.6 million
Affected in Cox’s Bazar District	1.1 million (42% of total)
Upazilas affected	7
Funding Request <sup>2</sup>	\$6.3 million

- An estimated 500,000 people were in need of assistance in the district.
- Teknaf was affected and Ukhia was not.

#### Priority needs (based on JNA)



- The needs assessment available on Komen does not include the camp or makeshift Rohingya population of the district, so findings are limited to host communities.
- Shelter needs in Cox’s Bazar district were higher than in other districts; this is thought to be because of flooding that preceded the cyclone in June, making shelter more vulnerable (HCTT 19/08/2015).

<sup>2</sup> OCHA 24/08/2015

<sup>3</sup> HCTT 01/06/2016

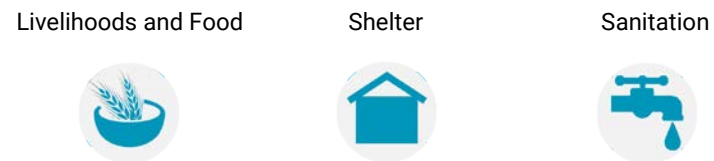
- Separate assessments from partners in the refugee camps and settlements, indicated that the impact of cyclone Komen on the Rohingya population was minimal (HCTT 19/08/2015; Saha 2017; Saha and James 12/2016).

### Cyclone Roanu, May 2016

Total affected	1.3 million
Affected in Cox’s Bazar District	530,000 (41% of total)
Upazilas affected	5
Funding Request <sup>3</sup>	\$12.1 million

- Teknaf was affected and Ukhia was not.
- Approximately 24% of the population in Teknaf was affected by the cyclone; this does not take into account the Rohingya population (then estimated at 232,000 (ECHO 05/2016).

#### Priority needs (based on JNA)



### Cyclone Mora, May 2017

Total affected	3.3 million
Affected in Cox’s Bazar District	355,000 (11%)
Upazilas affected	8
Funding Request <sup>4</sup>	\$6.75 million

<sup>4</sup> ISCG 05/06/2017

- Teknaf and Ukhia were both ranked as severely affected by cyclone Mora. **Mora appears to have had the greatest impact on the Rohingya population compared to the other two cyclones.**
- Teknaf was more affected than Ukhia; damages in Ukhia primarily occurred in the camps and makeshift settlements. Nhilla union, with approximately 30,000 Rohingya refugees in host communities, was amongst the worst affected in terms of shelter (WFP 03/06/2017; IOM NPM Round 3 06/2017).

### Priority needs (based on ISCG figures)

#### Food



#### Shelter



#### Water



- In the camps and makeshift settlements, an estimated **70% of shelters and between 70% and 80% of latrines were damaged.** In Kutupalong and Balukhali, 20% of shelters were severely damaged (UNICEF 20/06/2017; Daily Star 09/06/2017; WFP 03/06/2017; IOM 06/2017).
- Some of the Rohingya population took shelter in houses of the local host community, or nearby schools and madrassas (IRIN 20/12/2017).

## Post-influx situation

- The impact of a cyclone of any intensity will have a serious impact on the Rohingya population in camps and settlements.
- Given the increase in population numbers since August 25, 2017, the size of the settlements and the population density, a cyclonic event would be more similar to an urban disaster, making it very different from previous cyclones in Cox's Bazar.
- The vulnerability of the land on which the Rohingya population reside has increased. Many camps have little vegetation, which would have helped prevent flooding, waterlogging, and landslides.
- Access will be challenging, as muddy roads will become increasingly unsurpassable because of the rains that come with storms.
- Shelters are inadequate to withstand cyclones.
- Heavy winds could carry shelter materials causing injuries and possibly deaths.

- **Storm surges could reach Shamlapur in Teknaf** as it is in close proximity to the coast. A tidal surge of 3.7m hit Jalia Palong union (Ukhia), close to Shamlapur in Teknaf in 1991.
- As the Kutupalong–Balukhali expansion is located further from the coast, and there are hilly areas between the site and the coastline, it is not considered at risk of storm surge (Ukhia Disaster Management Plan 2014). The Naf river could experience a tidal bore (a tidal phenomenon in which the leading edge of the incoming tide forms a wave (or waves) of water that travels up a river or narrow bay against the direction of the river or bay's current), which could lead to storm surges in camps close to the river.

## Disaster coordination

- A cyclone which impacts Cox's Bazar is likely to impact other districts of Bangladesh and upazilas in Cox's Bazar which are not currently hosting Rohingya refugees. These areas will be covered by the national disaster management and early warning systems. For a full description of these see the ACAPS Cyclones Secondary Data Review 2014.
- In the event of a cyclone a Joint Needs Assessments (JNA) will be triggered by the ISCG. This is a coordinated needs assessment, which is adapted from the national JNA approach.

## Cyclone Resilience

### Embankments

- An extensive system of coastal embankments have been constructed in Bangladesh since the 1960s to protect the coastline.
- Due to poor maintenance and erosion, many areas of embankment are damaged and no longer fulfil their role (World Bank 2005; Paul 2008). **The risk of inundation increases due to the weak state of embankments.** As strong winds can push waters, embankments may breach and cause flooding and inundation.
- There is 47.6km of flood control dams along the Naf river, as well as 46 water extraction infrastructures. These were damaged by cyclones, floods, and rain in 1991, 2007, 2008 and 2010 (Dhaka Tribune 23/01/2018).

## Afforestation

- Afforestation programmes across Bangladesh plant trees that form a natural barrier against tidal surge and wind. However clearing of forests still takes place, undermining the effectiveness (Paul 2008).
- Jhau trees are planted along the coastal lines as part of afforestation initiatives; 183ha in Cox's Bazar is planted with trees.
- Jhau trees appear not to help winds and combat tidal surges, as the trees are prone to damage themselves, harming sand dunes when ripped out of the soil or preventing natural sand dunes to grow. Around 100ha of Jhau trees previously planted has already been destroyed. (Dhaka Tribune 18/05/2017).
- The influx of Rohingya population since 25 August 2017 has contributed to deforestation in Ukhia and Teknaf. The removal of natural barriers increases the population's vulnerability to cyclones, as well as its aftermaths of floods and landslides.

## Early warning and preparedness measures

Cyclones can be observed in the Bay of Bengal at least six days before they make landfall (ACAPS SDR 2014). There have been significant improvements in cyclone preparedness, resulting in reduced mortality rates, but areas throughout coastal Bangladesh are still at risk and people remain vulnerable. Cyclone preparedness measures have not historically been extended to the Rohingya population, who face limited or no access to these early warning and preparedness initiatives. Early warning systems have been in place in Bangladesh since the 90s. Most of these activities have been implemented through the national Cyclone Preparedness Programme (CPP).

As of mid-March, the following coordination structures are being adapted and planned to address cyclone preparedness in the camps and sites:

- Camp safety volunteer units consisting of 50 people are being established by IOM, UNHCR, and Site Management actors. The units will be trained in fire safety, first aid, and other preparedness measures, and will operate in sites.
- Within the camp safety volunteer units, **20 people will be further trained in the Cyclone Preparedness Program (CPP)**. There will be around **24 units in Ukhia**, the number of units in Teknaf is currently still being discussed. As with the national CPP program, this will be government-led, and training will be done by the Bangladeshi Red Crescent Society.

- CPP units will be trained in early warning, shelter, search and rescue, first aid, and relief. Teams will support the Camp in Charge (CiCs) in disseminating early warning messages, and if needed, relocating people, supporting search and rescue operations, delivering first aid trainings, and working on dead body management. Messaging will be done through megaphones, radios, or hand sirens.
- **In Ukhia, each CPP unit will have to cover a camp.** Camp populations can be as large as 44,000 people. In comparison, under the nationwide CPP program, units consist of 15 people who aim to cover around 2,000–2,500 people in around 2.5km<sup>2</sup> (IFRC 2010).
- Messages disseminated by the CPP will be contextualised for the camp setting. **These messages will not focus on evacuation but will mostly focus on the reinforcement of shelters ahead of a cyclone.**
- Community-level disaster management systems may not be clear or familiar to the Rohingya population. In a 2015 survey, 13% of respondents across five townships in northern Rakhine state, indicated having a community disaster management committee. Only 6% said their community has a plan for dealing with disaster, and only 5% ever participated in a preparedness drill. A further 42% of respondents said they did not have any indication at all of who is performing what functions in a disaster (REACH KAP 2015). Although agencies are working with the CWC working group to disseminate cyclone and flood messaging, this indicates that there is limited baseline knowledge for them to build upon.

## Cyclone shelters and evacuation

- **There are no plans to evacuate the Rohingya refugees** to cyclone shelters. Discussions on access to cyclone shelters for the most vulnerable Rohingya population are ongoing. This will only be an option for few people.
- Even without the Rohingya population there are insufficient cyclone shelters to cover the host communities.
- As of March 2018, 60 cyclone shelters in Teknaf are operational with a capacity for 65,200 people. This covers 21% of the upazila population.
- In Ukhia if all shelters are useable, they service around 47,600 people, covering approximately 20% of the population (based on population projections for 2017) (DDM 2014).

- Due to a lack of land in the camps and settlements, the possibility for relocating the Rohingya population is very limited and challenging (IRIN 20/12/2017). **The humanitarian community does not advise people to shelter in community buildings, TLCs or mosques and madrassas.** This does not mean people will not go to these buildings in the event of a disaster, especially if they are perceived as structurally stronger than existing shelters (IRIN 20/12/2017).
- During cyclone Mora, some of the Rohingya population took shelter in houses of the local host community, or nearby schools and madrassas (IRIN 20/12/2017). **Given the increase in population since the influx this is an unlikely option for the majority of the Rohingya population.** Whether this option is available to the Rohingya population likely depends on household level relationships with the local community.
- Given that evacuation is not an option, **spontaneous displacement is a possibility in the event of a cyclone.** The Rohingya population will be at risk if they decide to spontaneously relocate or move when a cyclone is about to hit, as there are no designated safe places for them to go.
- Whether and to what extent the vulnerable Rohingya population might be given access to cyclone shelters.
- Whether and what type of mitigation actions the Rohingya population is taking to prepare for cyclones.

## Information gaps and needs

- At the time of writing it remains unclear how the armed forces will be utilized in the Rohingya camps and settlements in the case of a cyclone.
- Limited information is available on the impact of past disasters specifically on the Rohingya population in Cox's Bazar because in the past the camps and informal settlements were not covered by the same coordination structures as the rest of the country and thus no JNA assessments could be carried out there.
- Several upazilas in Cox's Bazar district have experienced successive disasters, such as flash floods in 2012 and 2015, landslides in 2012 and 2017, and cyclones from 2015–2017. There are no comprehensive studies on the impact of these recurrent disasters.
- The number and coverage of the CPP units in Teknaf.
- The intended actions of the Rohingya population in the event of a cyclone.
- The preparedness measures such as shelter reinforcement and “bunker down” instructions that will be provided for the Rohingya.
- The messages that will be disseminated to the Rohingya population have not yet been officially approved or made public.

This document has been written based on secondary data available on the Rohingya refugee influx and cyclones in Cox's Bazar, complemented by informal discussions with key stakeholders. Any feedback or information that may complement this report is welcome. For all other products on the Rohingya influx by the NPM-ACAPS Analysis Hub, including a Pre-monsoon Brief, Historical Review, and a Review on Host Communities, [click here](#).

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