

Abstract

In the Indo-Pacific region, natural disasters are a common occurrence and affect millions of people each year. However, man-made disasters, including major industrial accidents, also affect the region; they impact both developed countries and lesser developed countries. As a country with a growing economy dependent on manufacturing and industry, Bangladesh has been affected by industrial accidents. These have ranged from chemical explosions and building collapses to gas and chemical leaks and, most commonly, fires. This case study looks at the most recent major industrial accident in the country, a container facility fire in Sitakunda upazila, which triggered secondary explosions and chemical fires in southeastern Bangladesh in early June 2022. It includes a review of selected international organizations engaged in prevention and response to industrial accidents.

Introduction

Natural disasters are an unfortunate reality of the Indo-Pacific region, with natural hazards in Asia and the Pacific affecting 6.9 billion people and killing more than 2 million people during the last roughly 50 years (1970-2020). Since 1970, the Asia-Pacific region has accounted for 57 percent of global fatalities from disasters and 87 percent of the global population that has been affected by natural hazards. During that same period, the average number of people affected in the region per year from natural disasters was roughly 122 million with an average of 41,373 lives lost per year.¹

Although they happen much less frequently, man-made hazards are also not foreign to the region, and affect countries throughout the Indo-Pacific. Man-made disasters include a broad number of hazards caused by humans, including industrial and environmental accidents. For the purpose of this case study, an industrial accident can be loosely defined as an event in an industrial setting that causes destruction and often results in casualties, usually occurs suddenly or over a short period of time, and directly affects the immediate area but may also spread to a much wider region. Examples include fires, explosions, chemical and gas leaks, chemical spills, release of hazardous smoke or toxic fumes, and building collapses.

An industrial accident could be considered a subset of a usually much broader category of environmental accidents or emergencies. A definition of an environmental emergency is provided by “The Environmental Emergencies Guidelines” prepared by the United Nations (UN) Office for the Coordination of Humanitarian Affairs (OCHA) and UN Environment Program (UNEP): “For the purpose of these guidelines, an environmental emergency has been defined as a sudden onset disaster or accident resulting from natural, technological or other human-induced factors, or a combination of these, that cause or threaten to cause severe environmental damage as well as loss to human lives and property. This damage includes secondary environmental consequences from natural hazards such as earthquakes, storms, floods, tsunamis, wildland fires, landslides and/or man-made disasters such as **industrial accidents**, transport accidents, chemical spills, oil spills and a multitude of other types of

¹ Asia-Pacific Disaster Report 2021, <https://www.unescap.org/kp/2021/asia-pacific-disaster-report-2021>

emergencies...”² Because of its broad definition and coverage of a multitude of topics, environmental accidents will not be discussed in depth in this paper. However, it is recommended that additional future studies be completed in this area due to the potential of additional environmental accidents occurring in the region.

Some of the largest industrial accidents in the Indo-Pacific include the Bhopal chemical leak disaster in India in 1984 which left an estimated 15,000 – 20,000 dead, and the 2013 Rana Plaza building collapse which left over one 1,100 dead in Dhaka, Bangladesh and over 2,500 others wounded. The Bhopal disaster also left an estimated 500,000 others with health problems including respiratory issues, blindness, eye issues and other ailments.³ Additionally, the March 2011 nuclear accident at Fukushima, Japan, that was triggered by the massive 9.0-magnitude Tohoku earthquake and resulting tsunami, sparked serious regional and worldwide concerns related to industrial safety. However, nuclear, radiological (and biological) accidents are also beyond the limited scope of this paper.

In addition to experiencing one of the largest industrial accidents in the Indo-Pacific region, Bangladesh as a country with a growing economy dependent on manufacturing and industry, has been affected by a variety of industrial accidents to include fires, explosions, gas leaks and building collapses. While there appears to be no official cumulative numbers available for all industrial accidents that have occurred in Bangladesh, the International Labour Organization (ILO) writes: “Since the Rana Plaza disaster, no fewer than 109 accidents have occurred. Among these, at least 35 were textile factory incidents in which 491 workers were injured and 27 lost their lives.”⁴ Local media also provides another sobering statistic: according to the Dhaka Tribune, at least 2,000 workers have died in industrial factory fires since 2005.^{5, 6}

Local media and international accounts note that in addition to preparedness issues, response efforts have also likely been hampered by the government’s limited response capability. To be clear, industrial accidents that involve fires and chemical explosions are a challenge for nearly any country to manage and respond to. However, there are varying degrees of readiness and response capabilities throughout the region. In Bangladesh, the preparedness for and capacity to address industrial safety in the country are reportedly restricted and, constrained by limited resources, training, and funding. Accidents have been responded to primarily by domestic agencies with limited support from outside entities.

Although most of the industrial accidents in Bangladesh appeared to be largely contained within its own borders, there are of course, transboundary considerations, particularly when it involves secondary effects such as air pollution and shared water bodies. Toxic fumes and smoke could easily spread across borders, and shared bodies of water may get contaminated by a spill. There are also domestic issues to consider such as occupational health and safety, legislation, and the role and responsibility of industry, including international companies, to name a few. These are all beyond the basis of this introductory paper but warrant a more thorough exploration and additional research.

The Government of Bangladesh (GoB) or other countries affected by industrial accidents may seek expert advice and specialized resources globally to manage and respond to industrial emergencies. Because accidents may involve chemicals, explosions, and spills, specialized knowledge, experience, and technical expertise may be required from the international community. Support may be provided

² The Environmental Emergencies Guidelines (2nd Edition) 2017, <https://reliefweb.int/report/world/environmental-emergencies-guidelines-2nd-edition-2017>

³ Bhopal disaster, <https://www.britannica.com/event/Bhopal-disaster>

⁴ The Rana Plaza Accident and its aftermath, https://www.ilo.org/global/topics/geip/WCMS_614394/lang--en/index.htm

⁵ The worst industrial disasters in Bangladesh since 2005, <https://www.dhakatribune.com/bangladesh/2022/06/05/the-worst-industrial-disasters-in-bangladesh-since-2005>

⁶ Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

bilaterally or multilaterally, depending on the situation and the request by the country seeking assistance. A few existing and potential international support and resources available are discussed later in this report, such as assistance from the UNEP/UNOCHA Joint Environment Unit (JEU).

In addition to discussion on the Sitakunda Container Fire, a short timeline of industrial accidents in Bangladesh over the last ten years and a brief timeline for industrial accidents in other parts of South Asia are included as an Annex to this document. The most recent of these accidents was the container explosions and fire at a container depot in Sitakunda upazila (administrative unit), Chittagong (officially Chattogram) District, southeastern Bangladesh, in June 2022. This incident is the focus of this paper.



Sitakunda Container Fire, June 2022

Overview

- On June 4, 2022, a fire broke out at a shipping container facility in Sitakunda upazila, triggering multiple secondary explosions
- Dozens were reported killed and hundreds of others were reported wounded in the accident
- A lack of hospital beds in Chattogram to take care of the wounded was reported
- Smoke and fumes from the fire affected nearby areas and an unknown number of affected residents were temporarily displaced
- Water sources and thousands of acres of arable land may have been contaminated from the incident, affecting drinking water sources, fisheries, agriculture, the environment, and livelihoods



Source: Armed Forces Division (AFD). “Regional Consultative Group Mid-Year Consultation: Bangladesh Update, 21 July 2022” PowerPoint brief

Background

On the night of June 4, 2022, a fire and multiple explosions at a container depot in Sonaichari union, Sitakunda upazila, Chittagong (officially Chattogram) District, Bangladesh left approximately 51 people dead, including 12 firefighters. Another estimated 450 others were also injured in the accident at the BM Container depot.^{7, 8, 9} Sitakunda is located some 40 kilometers (km) from the major port city of Chittagong. The fire reportedly burned intermittently in containers for several more days¹⁰ and at least 25 firefighting units were activated to fight the fire.¹¹ Bangladesh Fire Service and Civil Defence along with the Bangladesh Army brought the fire under control after approximately 65 hours of valiant efforts.¹²

The explosions were reportedly due to hydrogen peroxide containers stored at the depot, as well as other possible chemicals stored on site. According to the Dhaka Tribune, fumes and smoke extended across a 2.5 km radius, with an indirect impact up to 10 km away. The loss of the 12 firefighters is unfortunately considered the largest death toll the Bangladeshi Fire Service has suffered in a single incident, according to the Dhaka Tribune.^{13, 14}

Chittagong is the second largest city in Bangladesh with approximately 2.6 million residents and is the location of the country’s main seaport. It houses pharmaceutical, steel, and food industries as the country’s main commercial and manufacturing center.¹⁵

According to the Bangladesh Needs Assessment Working Group (NAWG), the explosions were so powerful, people living a few kilometers away reported feeling the tremors from the explosions.

7 Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

8 Sitakunda fire: 8 more bodies identified, <https://www.dhakatribune.com/bangladesh/2022/07/06/more-human-remains-found-at-bm-container-depot>

9 Armed Forces Division. “Regional Consultative Group Mid-Year Consultation: Bangladesh Update, 21 July 2022” PowerPoint brief

10 Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

11 Bangladesh, Chittagong - Fire and explosion at a private Inland Container Depot (ICD) (DG ECHO, Media) (ECHO Daily Flash of 06 June 2022), <https://reliefweb.int/report/bangladesh/bangladesh-chittagong-fire-and-explosion-private-inland-container-depot-icd-dg-echo-media-echo-daily-flash-06-june-2022>

12 Armed Forces Division. “Regional Consultative Group Mid-Year Consultation: Bangladesh Update, 21 July 2022” PowerPoint brief

13 According to an estimate based on satellite images from US-based organization Zoom Earth. “One month of Sitakunda fire: Police have no good news on arrests,” <https://www.dhakatribune.com/nation/2022/07/04/one-month-of-sitakunda-fire-police-have-no-good-news-on-arrests>

14 Sitakunda fire: 8 more bodies identified, <https://www.dhakatribune.com/bangladesh/2022/07/06/more-human-remains-found-at-bm-container-depot>

15 Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

In addition, the NAWG reported, “this fire caused such high temperature that it formed a small microclimatic environment.”¹⁶

Other effects of the accident were also far reaching. The NAWG predicted that people located as far as 10 km away from the accident may detect “a foul chemical stench and have burning sensation on their eyes.” According to the NAWG, the fire was “the biggest disaster in the 24-year history of the container depot industry in Chattogram, and the first likely caused by chemicals.”¹⁷

Primary responders were firefighting units from the Bangladesh Fire Service and Civil Defence. The Bangladesh Armed Forces Division (AFD) was also deployed to assist in rescue operations and firefighting. Search and rescue operations were hampered by toxic fumes and water shortages reportedly affected firefighting work. Bangladesh’s National Disaster Management Office, the Ministry of Disaster Management and Relief (MoDMR) staff were also on site to coordinate response.¹⁸ The AFD also assisted in protecting the sea from chemicals.¹⁹

Other first responders included the Bangladesh Red Crescent Society (BDRCS) teams who helped fire fighters. BDRCS teams provided first aid and health care for the wounded and utilized the Restoring Family Link (RFL) program. More than 200 BDRCS volunteers supported response to the incident including at hospitals.²⁰ The BDRCS also supported the recovery and management of victims, search and rescue, transport to hospitals and the disbursement of medicines.²¹



Source: Armed Forces Division (AFD). “Regional Consultative Group Mid-Year Consultation: Bangladesh Update, 21 July 2022” PowerPoint brief



Source: Armed Forces Division (AFD). “Regional Consultative Group Mid-Year Consultation: Bangladesh Update, 21 July 2022” PowerPoint brief

¹⁶ Bangladesh: Situation Report Needs Assessment Working Group (NAWG) - Sitakunda Fire, 2022 (Date: June 8, 2022), <https://reliefweb.int/report/bangladesh/bangladesh-situation-report-needs-assessment-working-group-nawg-sitkunda-fire-2022-date-june-8-2022>

¹⁷ Ibid.

¹⁸ Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

¹⁹ Bangladesh, Chittagong - Fire and explosion at a private Inland Container Depot (ICD) (DG ECHO, Media) (ECHO Daily Flash of 06 June 2022), <https://reliefweb.int/report/bangladesh/bangladesh-chittagong-fire-and-explosion-private-inland-container-depot-icd-dg-echo-media-echo-daily-flash-06-june-2022>

²⁰ Bangladesh: Situation Report Needs Assessment Working Group (NAWG) - Sitakunda Fire, 2022 (Date: June 8, 2022), <https://reliefweb.int/report/bangladesh/bangladesh-situation-report-needs-assessment-working-group-nawg-sitkunda-fire-2022-date-june-8-2022>

²¹ Fire response in Chattogram, <https://reliefweb.int/report/bangladesh/fire-response-chattogram>

According to an ACAPS briefing report, based on the location of the accident and the potential spread of fumes up to a radius of 10 km, the fire likely affected Bhatiari, Kumira, and Sonaichari unions. According to the report, the number of people affected by the fumes could have reached up to 145,000.

Second order effects

Humanitarian Assistance and Disaster Relief (HADR) issues

Health

Hospitals in Chattogram have limited capabilities and capacity and during the first two days following the accident, they reported not having enough beds to care for the injured.²² Across the country, a shortage of hospital beds limits the capacity of the health care system to respond to industrial accidents such as the container explosion. The total number of hospitals in Bangladesh is 5,206 (610 are governmental and 4,596 are private). The number of beds in hospitals are 127,360 (48,934 are in government hospitals and 78,426 are in private hospitals).²³

Industrial accidents are likely to result in potentially hundreds to thousands of injuries or deaths depending upon severity and location. The general population could be directly affected by the accident (explosion, fire, etc.) or indirectly affected (smoke, chemical residue, etc.) by the accident. Depending on the number of affected, Bangladesh's medical facilities and medical response personnel could be overwhelmed.

In the Sitakunda incident, fumes and smoke directly impacted an area 2.5 km from the site, with an indirect impact of 10 km away. Due to the population density of major cities like Chattogram and Dhaka, this can potentially impact thousands of residents during and after the accident. First responders and the health sector could likely be overburdened in a relatively short period of time.

There has been significant progress in improving health care over the past few decades, however, Bangladesh's health sector is limited by resource constraints. For instance, hospitals in Chattogram have limited capacities despite being in the country's second largest city.²⁴

Long-term effects from smoke inhalation, chemical spills and pollution are currently unknown. Provision of care to an affected population is nonetheless likely to cause increased demand on the health care sector in the future. Respiratory disease and cancer already account for 25 percent of all deaths in the country and air pollution levels are among the highest in Asia.²⁵ According to the World Health Organization (WHO), an estimated 2.3 percent of all deaths and 1.6 percent of the total disease burden were attributable to exposure to selected chemicals in 2015, not including air pollution.²⁶

National health agencies: The Ministry of Health and Family Welfare (MOHFW) heads Public Health in Bangladesh and manages general health and family planning services through district general hospitals, smaller hospitals and clinics at the sub district and community levels.²⁷

22 Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

23 Critical Care Medicine: Bangladesh Perspective, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6549198/>

24 Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

25 Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

26 The public health impact of chemicals: knowns and unknowns WHO, 2016, <https://apps.who.int/iris/handle/10665/206553>

27 Ibid.

Health staffing is a challenge due to the shortage of health care workers as well as the country's diverse geographic locations. Bangladesh has an estimated 3.05 physicians per 10,000 population and only 1.07 nurses per 10,000 population.²⁸ Among health workers, medical doctors and nurses are particularly concentrated in urban secondary and tertiary hospitals, though 70 percent of the population live in rural areas.²⁹

Displaced populations

There were reports of an unknown number of displaced people who fled the area following the Sitakunda accident to avoid the fumes, however, there are no official numbers available. People from villages of the Sonaichari union reportedly left the area and went to relatives' homes. According to initial reports, it was thought it was likely they would return once the situation stabilized.³⁰ However, it is unclear at this time if the displaced population has returned.

There appears to be no readily available numbers or estimates of people displaced or affected by industrial accidents in Bangladesh. However, the section below discusses numbers of people displaced by natural disasters in the country. Bangladesh has a significant population of Internally Displaced People (IDPs) and refugees which puts further strain on the country's limited resources. Large or multiple industrial accidents would further tax the country's HADR capabilities.

Displacement from natural disasters: Nearly 700,000 Bangladeshis have been displaced annually by natural disasters in the last decade. By 2050, as many as 13.3 million Bangladeshis could be displaced by the various impacts of climate change. As people migrate away from coastal areas, many are heading to urban slum areas, particularly in Dhaka, which sees up to 400,000 migrants every year.³¹ This of course, increases the number of at-risk individuals who are extremely vulnerable to industrial accidents. People living in congested slum areas with poor shelter and little protection from the elements, may be exposed to secondary effects from an industrial accident.

Most recent figures for displaced in Bangladesh:

- **Refugees:** 914,998 (from Myanmar) (2019)
- **Internally Displaced Persons (IDPs):** 426,000 (conflict, development, human rights violations, religious persecution, natural disasters) (2018)³²

Water

As it is with other industrial accidents, it is difficult to quantify the amount of water and water sources affected by the Sitakunda accident. Local reports stated that water sources may have been contaminated, to include canals that might be used for irrigation. Additionally, some residents had reported that residual chemicals from the accident polluted the waters of the Bay of Bengal.³³

In Chattogram, the water availability situation has already been impacted by decreased water levels in recent years. The situation is likely to worsen with additional contamination due to an industrial accident. Groundwater levels in the city and its coastal areas have dropped by as much as 2.5 meters a year, according to ACAPS. This was thought to be mostly due to the installation of private deep tube

²⁸ Ibid.

²⁹ Ibid.

³⁰ Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

³¹ Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

³² Ibid.

³³ Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

wells for agricultural and industrial use as well as plastic pollution preventing water from entering the ground.³⁴

Although the country has multiple water sources, both surface and ground water sources are contaminated with organic and inorganic pollutants including pesticides, industrial waste, and naturally occurring arsenic. Water-borne diseases are also a challenge. Water pollution due to sources such as untreated industrial effluents, improper disposal of domestic waste, and agricultural runoffs result in 8.5 percent of the total deaths in Bangladesh caused by water sanitation and hygiene (WASH) related issues. Around 60 percent of the population is already exposed to unsafe drinking water.³⁵

Pollution

Air and water in the country are already affected by pollution. High pollution levels, among the highest in Asia, contribute to the prevalence of respiratory disease in Bangladesh.³⁶ Waterborne diseases are prevalent in surface water due to water pollution, especially in fishing areas. Ground water is already contaminated by naturally occurring arsenic.³⁷

Smoke, fumes, chemical spills and chemical residue resulting in pollution to the environment may pose a health hazard to the general population depending on a variety of factors including location of the accident, elevation, winds, water sources, or type of chemical involved in the accident, etc.

In addition to the damages at the port, and the reports of water pollution, thousands of acres of land may have been contaminated. As mentioned above, fumes and smoke also directly impacted an area 2.5 km from the site, with an indirect impact of 10 km away, contributing to air pollution in the affected areas.³⁸

It is unclear how widespread the pollution was and if the polluting effects are long-term. What is relatively clear is that exposure to chemicals and smoke pollutants in the short-term are likely to result in health effects, requests for medical assistance and likely hospitalizations.

Other second order effects

Economic

According to Bangladesh Inland Container Depots Association (BICDA), early financial estimates suggest economic losses of approximately US\$110 million from the accident. About 4,300 containers were destroyed and, of those, an estimated 1,000 were holding chemicals.^{39, 40} This reportedly also included an estimated over 800 TEUs (Twenty-Foot Equivalent Units) of containers loaded with export items, around 500 imported goods-laden containers and 3,000 empty containers.⁴¹

Sitakunda has been established as an economic zone, with a large portion of Bangladesh's industries and emerging sectors in the region. Thus, loss of economic activity there is anticipated to cause far reaching financial losses. The industrial sector continues to grow, despite the need for improvements in industrial

³⁴ Ibid.

³⁵ Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

³⁶ Ibid.

³⁷ Bangladesh, <https://www.cia.gov/the-world-factbook/countries/bangladesh/>

³⁸ Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

³⁹ Ibid.

⁴⁰ Bangladesh: Situation Report Needs Assessment Working Group (NAWG) - Sitakunda Fire, 2022 (Date: June 8, 2022), <https://reliefweb.int/report/bangladesh/bangladesh-situation-report-needs-assessment-working-group-nawg-sitakunda-fire-2022-date-june-8-2022>

⁴¹ Ibid.

safety, according to ACAPS.⁴²

Additionally, the accident site is also near the Dhaka-Chattogram highway, which is a key economic driver of the country as it links the capital to the port city, according to ACAPS. It was possible fumes could have constrained traffic on the road, slowing transport and deliveries, and limiting people from getting health assistance in Dhaka if needed.⁴³

Agriculture and fisheries remain important parts of the economy, with agriculture being the largest industry. The Sitakunda incident and the potential effect on arable land could affect the livelihood for the farmers in Sonaichari union and the chemicals reportedly polluting the waters of the Bay of Bengal may also impact livelihoods of fishermen.⁴⁴

The real long-term economic costs of industrial accidents are likely understated. Recovery and rebuilding take years and sets back any economic progress made. The Inter-Agency Coordination Group for Industrial and Chemical Accidents writes in its report, “International efforts for industrial and chemical accidents prevention, preparedness and response,” “recovering from industrial accidents sets back development gains, takes time and is expensive. Many places still suffer from events that happened years before and there are the families and severely injured for which time offers no recovery at all.”⁴⁵

Garment Industry: The garment industry is considered the backbone of Bangladesh’s industrial sector and accounted for more than 80 percent of total exports in FY 2016-17.⁴⁶ The garment trade in the country is currently a US\$30 billion industry.⁴⁷ Based on reports from the Sitakunda incident, some containers that were destroyed held apparel. This may have impacted apparel exporters and the livelihoods of local people.⁴⁸ An example of an industrial accident in Bangladesh impacting the garment industry is the Rana Plaza accident described below.

Rana Plaza accident: On April 24, 2013, the Rana Plaza building in Dhaka, Bangladesh collapsed, killing 1,134 and wounding more than 2,500 others.⁴⁹ The 8-story commercial building housed five garment factories and was in Dhaka’s Savar upazila (sub-district). The building was built on swampy ground and factory workers were reportedly compelled to work that day, despite concerns over cracks that had recently appeared. The building collapsed reportedly due to poor construction and political connections undermining enforcement of building codes. It was Bangladesh’s worst industrial accident and the garment industry’s deadliest recorded incident. This event highlighted safety issues in the garment industry and put pressure on companies, including global brands, to improve working conditions.^{50, 51}

Despite the massive loss of life and injuries from the Rana Plaza accident (and another major accident at the Tazreen factory months earlier – see annex: “Timeline of recent major industrial accidents in Bangladesh” for more details) the ILO wrote that “no compensation was paid in application of the labor

42 Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

43 Ibid.

44 Ibid.

45 International efforts for industrial and chemical accidents prevention, preparedness and response, <https://www.oecd.org/chemicalsafety/chemical-accidents/Brochure-International-efforts-for-industrial-and-chemical-accidents.pdf>

46 Ibid.

47 Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

48 Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

49 The Rana Plaza Accident and its aftermath, https://www.ilo.org/global/topics/geip/WCMS_614394/lang--en/index.htm

50 Bangladesh fire: 10 deadly disasters for workers in South Asia, <https://news.trust.org/item/20220607152627-fva63/>

51 Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

code provisions on employer liability. A small number of global buyers and local players made some payments to victims in the months following the disasters, albeit on a voluntary basis.”⁵²

Since then, according to the ILO, some advancements in the protection of workers have been seen, including the involvement of local authorities and stakeholders at the national and international levels, and the involvement of organizations such as the IndustriAll Global Union and Clean Clothes Campaign, who worked to “strengthen occupational safety and health, labor inspection services, skills training and rehabilitation services.” According to the ILO, this occurred with support of the ILO and global buyers.⁵³



Source: The Rana Plaza Arrangement, <https://ranaplaza-arrangement.org/intro>

In addition, the establishment of the so-called “Rana Plaza Arrangement,” which seeks to deliver lost income payments to families impacted by the disaster, aims to further assist victims.⁵⁴ According to the ILO, this provides “a single approach to compensation consistent with ILO standards, and more specifically with the Employment Injury Benefits Convention, 1964 (No. 121).”⁵⁵

Despite these advancements however, occupational, and industrial safety must remain a high priority of all stakeholders, including local and international industry and the government. Many more advancements on industrial safety, preparedness and response need to be realized to prevent and better respond to industrial accidents in Bangladesh and the region.

Chemical use in manufacturing and industry: In Bangladesh, chemicals are widely used in the manufacturing and industrial sectors. As one of the fastest growing economies in South Asia, the growth of the ready-made garments (RMG) sector, textiles, pharmaceutical, and process industries, have all led to increased chemical usage and demand in the country.⁵⁶ According to the Daily Star, chemical imports have nearly tripled in the last decade. The garment and textile sectors garner the main usage of the imported chemicals. This is followed by pharmaceuticals, food processing, cosmetics and toiletries, leather, plastic, and other sectors.⁵⁷

Not only is chemical usage growing in Bangladesh, but regionally, chemical production is a growing industry in the Asia Pacific. From 2012 to 2020, chemical production was expected to grow by 46 percent in the Asia Pacific, according to the UN Environment’s “Global Chemicals Outlook” report. While developing countries and countries with economies in transition are seeing an increase in growth, the bulk of global production still comes from industrialized countries.⁵⁸ Of course, there are obvious

⁵² The Rana Plaza Accident and its aftermath, https://www.ilo.org/global/topics/geip/WCMS_614394/lang--en/index.htm

⁵³ Ibid.

⁵⁴ Rana Plaza Arrangement, <https://ranaplaza-arrangement.org/>

⁵⁵ The Rana Plaza Accident and its aftermath, https://www.ilo.org/global/topics/geip/WCMS_614394/lang--en/index.htm

⁵⁶ Framework for Sound Management of Chemicals: Toward a Sustainable Chemicals Industry in Bangladesh, <https://pubs.acs.org/doi/10.1021/acs.chas.0c00039>

⁵⁷ Chemical imports treble in 10yrs, <https://www.thedailystar.net/business/news/chemical-imports-treble-10yrs-1710706>

⁵⁸ International efforts for industrial and chemical accidents prevention, preparedness and response, <https://www.oecd.org/chemicalsafety/chemical-accidents/Brochure-International-efforts-for-industrial-and-chemical-accidents.pdf>

implications that the growth of this industry will increase risk to countries producing more chemicals and thus likely to come with an increased risk of industrial accidents.

According to the Inter-Agency Coordination Group for Industrial and Chemical Accidents, “developing countries and countries in transition are often at particular risk of adverse effects from chemical accidents because of limited regulations or incomplete enforcement of existing rules, reduced awareness of risks and preventive measures, and inadequate resources for prevention, preparedness, and response.”⁵⁹

The Inter-Agency Coordination Group also says that many countries still lack adequate surveillance and response capacities for chemical events, citing the WHO survey of International Health Regulations (IHR) capacities in 2015 that “has shown that the capacity status for chemical events remains low overall, with a global average of 58%*, with the European region scoring highest, with 82%*.”⁶⁰

Agriculture

It was reported that 6,000 acres of arable land may have been contaminated by the accident at Sitakunda.⁶¹ This is likely to have both short and long-term effects on the local economy, agriculture, and livelihoods in the affected area. In Bangladesh, agriculture is the main part of the economy, employing almost half of Bangladeshis, with the most important product being rice. Jute and tea are also major products, with others including wheat, pulses, sweet potatoes, oilseeds and various spices, sugarcane, tobacco, fruits, goat milk, and goat meat. Fisheries are also an important part of the economy, with aquaculture providing more than two-fifths of the fish yield.⁶²

The agriculture industry also uses 80 percent of the water that is available.⁶³ Impacts from industrial accidents to water sources used for agricultural crops could have significant impacts on the industry, affecting yields, individual livelihoods, the overall economy, and negatively impacting food security. Additionally direct exposure of chemicals and other contaminants to crops, arable land and livestock would also likely have detrimental effects on the agriculture industry.

Disaster risk

Bangladesh’s geographical location next to the Bay of Bengal and its low-lying terrain, and population density, make the country especially vulnerable to hydrometeorological hazards. The population density of Dhaka is roughly 45,000 per sq. km which is highest in the world, twice that of Manila, Philippines.⁶⁴ Storms have been the most frequent disaster to affect the country, followed by flooding. Bangladesh is also at risk of epidemics, earthquakes, droughts, and landslides.⁶⁵

Bangladesh is the country with the 27th highest risk in the world (out of 191 countries) due to natural hazards. It is considered to be in the “high” risk class according to the INFORM Global Risk Index 2022.⁶⁶

⁵⁹ Ibid.

⁶⁰ Ibid.

⁶¹ Ibid.

⁶² Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

⁶³ Ibid.

⁶⁴ Fact Sheet: Earthquake Risk to Dhaka, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=w9ZgSXWsPdk%3d&portalid=0>

⁶⁵ Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

⁶⁶ Global Risk Index 2022, <https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Risk/Country-Risk-Profile>

- **Earthquake risk:** Due to its geographic location at the junction of the Indian, Eurasian and Burma tectonic plates, Bangladesh is at risk of a major earthquake. There have been at least seven quakes of magnitude 6+ in the last 100 years. According to Nature Geoscience, researchers believe strain has been building for 400+ years and could culminate in a massive magnitude 9.0 earthquake.⁶⁷

There are several possible scenarios where a natural disaster could lead to an industrial accident. An earthquake could spark an event such as a fire or fires in factories that may require special training and response to the accident, particularly if hazardous chemicals may be involved. Responding to several industrial incidents in addition to combatting a natural disaster such as an earthquake would be extremely challenging for any country in the region. Bangladesh's growing population and some of its congested population centers also add to the overall risk should an industrial accident occur.

- **Dhaka:** The population of Dhaka has roughly doubled in 20 years to 19 million. Growing migration place additional stresses on the crowded capital.⁶⁸ Rapid urbanization and poor building codes increase risk to the capital population during industrial accidents and earthquakes.

In total, Bangladesh has been affected by more than 200 natural disasters over the last three decades.⁶⁹ The country has made significant progress in disaster preparedness and response, particularly in regard to tropical cyclones, with the death toll from cyclones shrinking drastically compared to several decades ago. Flood risk is increased during the monsoon and cyclone seasons in Bangladesh.

- **Monsoon season:** Monsoon season runs roughly from May – September, and often results in widespread flooding and damage to shelters.
- **Cyclone season:** Tropical cyclones generally strike in two seasons, March through July and September through December. The majority of storms arrive in May and October.⁷⁰

Although flooding incidents are not typically associated with causing industrial accidents, it is possible for flood incidents to potentially cause an accident, such as a chemical spill. Any spillage is likely to be quickly and possibly widely dispersed by flood waters, causing widespread contamination depending on the type and quantity of chemicals spilled.

Recent natural disaster events:

- **Floods:** Chittagong is one of the most vulnerable districts to weather events in Bangladesh. In June 2021, rainfall and floods severely affected the city.⁷¹
- **Tropical cyclone:** On 20 May 2020, Tropical Cyclone Amphan struck Bangladesh. Chittagong was one of the areas affected. As of 22 May 2020, the official death toll in Bangladesh was 17, with the UN estimating 10 million people and 19 districts affected. GoB's Early Warning system, the evacuations to cyclone shelters, and the mangrove forest of the Sundarbans contributed to reduce the impact of the cyclone and to reduce the loss of lives. According to MoDMR, 330,667 houses were damaged including 55,667 destroyed.⁷²

67 Fact Sheet: Earthquake Risk to Dhaka, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=w9ZgSXWSPdk%3d&portalid=0>

68 What will become of Bangladesh's climate migrants? <https://www.climatechangenews.com/2017/08/14/will-become-bangladeshs-climate-migrants/>

69 Ibid.

70 Tropical Cyclones, <https://bd.usembassy.gov/u-s-citizen-services/local-resources-of-u-s-citizens/living-in-bangladesh/tropical-cyclones/#:~:text=Tropical%20cyclones%20generally%20strike%20Bangladesh,arriving%20in%20May%20and%20October.>

71 Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

72 Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

Climate change

Climate change is likely to cause more frequent and intense cyclones in the Bay of Bengal, and rising sea levels are likely to worsen the effects of tropical cyclones. Additionally, rising temperatures and rainfall disruptions may result in severe flooding, while other climatic effects are all likely to exacerbate the impact of an industrial accident in Bangladesh. As a port city, Chittagong is at high risk of being affected by a cyclone. Industry in the city could be severely damaged or destroyed by cyclonic winds and rain and this could result in an industrial accident, or multiple accidents across the city. Dealing with both a natural disaster and additional industrial hazards is likely to exceed response capacity and may prompt calls for international assistance.

- The entire region of the Bay of Bengal especially Rakhine State in Myanmar and Cox's Bazar are projected to be the hardest hit areas in Asia by climate change in the next few decades. In recent years, most of the tropical cyclones that made landfall in Bangladesh were in this area.⁷³
- If greenhouse gas emissions continue at the present rate, by 2050, Cox's Bazar will be the worst-hit district in South Asia as average temperatures rise and rainfall becomes disruptive.⁷⁴

Disaster Management/Response Capacity

National disaster response capacity

The following are likely to be the major actors in disaster response/industrial accidents in Bangladesh:

- Ministry of Disaster Management and Relief (MoDMR)
- Armed Forces Division (AFD)
- Fire Services & Civil Defence
- Bangladesh Red Crescent Society (BDRCS)
- International Organizations: United Nations agencies (OCHA, WHO, ILO, UNICEF, JEU, etc.), IFRC
- International NGOs (INGOs): CARE, Catholic Relief Services, World Vision, Save the Children
- Local NGOs: Bangladesh Rural Advancement Committee (BRAC), Islamic Relief⁷⁵
- Volunteers^{76, 77}



Source: Armed Forces Division (AFD). "Regional Consultative Group Mid-Year Consultation: Bangladesh Update, 21 July 2022" PowerPoint brief

National Disaster Management Organizations

The national disaster management system in Bangladesh involves three main bodies. This includes the National Disaster Management Council (NDMC), headed by the Prime Minister, responsible for strategic decisions for disaster management; the Inter-Ministerial Disaster Management Committee

⁷³ Ahmed, et. Al. The sustainability–peace nexus in crisis contexts: how the Rohingya escaped the ethnic violence in Myanmar, but are trapped into environmental challenges in Bangladesh., <https://link.springer.com/article/10.1007/s11625-021-00955-6>

⁷⁴ Al Jazeera. Cox's Bazar: Rohingya camp to be hardest hit by climate change, <https://www.aljazeera.com/features/2018/12/19/coxs-bazar-rohingya-camp-to-be-hardest-hit-by-climate-change>

⁷⁵ Please see pg. 35, Bangladesh Disaster Management Reference Handbook for a more comprehensive list of NGOs. <https://www.cfe-dm-ha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

⁷⁶ Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

⁷⁷ Fact Sheet: Earthquake Risk to Dhaka, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=w9ZgSXWsPdk%3d&portalid=0>

(IMDMC), responsible for coordination across ministries; and the National Disaster Management Advisory Committee, responsible for policy development and advice. The NDMC is the highest-level decision-making body for disaster management. The Ministry of Disaster Management and Relief (MoDMR) has the role of Secretariat to NDMC and is the disaster response coordination mechanism.⁷⁸

Standing Orders on Disasters (SOD): The SOD was first issued in 1997, and last revised in 2019, and describes the roles and responsibilities of committees, ministries and other organizations in disaster risk reduction and emergency management. The SOD was prepared to inform relevant parties their duties and responsibilities regarding disaster management at all levels. Under the SOD all ministries, divisions/departments and agencies are expected to prepare their own Action Plans with respect to their responsibilities. Although there is no dedicated section to industrial accidents, industrial accidents are mentioned in the SOD and defined as disasters under both natural and man-made disasters.^{79, 80} It also does not appear that there is any existing response plan tailored specifically to industrial accidents.

Armed Forces Division (AFD)

The Bangladesh Armed Forces Division (AFD) plays a vital role in disaster management, working closely with the MoDMR and remaining on standby to provide disaster relief assistance for natural and man-made disasters. MoDMR in turn is the government ministry which develops requests for AFD assistance to deliver aid. A main role of AFD is to coordinate Armed Forces personnel in disaster management and relief operations.^{81, 82} AFD personnel have helped respond to many major disasters in Bangladesh including industrial accidents as evidenced by the key role the AFD played in responding to the Sitakunda container fire. Since 2010, Bangladesh has organized annual Disaster Response Exercise and Exchange (DREE) events, considered the preeminent disaster response engagement between AFD and MoDMR. Each year, there is an earthquake contingency plan prepared for each sector of Dhaka City in line with the national contingency plan and major cities outside Dhaka.⁸³



Source: Armed Forces Division (AFD). “Regional Consultative Group Mid-Year Consultation: Bangladesh Update, 21 July 2022” PowerPoint brief

Bangladesh Red Crescent Society (BDRCS)

The Bangladesh Red Crescent Society (BDRCS) is an auxiliary to the public authorities. It has played a major role in the relief, rescue, and rehabilitation of victims of natural and man-made disasters in the country and works with a wide network of volunteers and associations for disaster preparedness and response.⁸⁴ The BDRCS was a critical first responder in the Sitakunda accident and worked closely with other first responders during the response.

The BDRCS also provides medical services through various hospitals in Chittagong, Sylhet, Dinajpur, Gopalganj, Holy Family Medical College Hospital in Dhaka. The BDRCS has a tracing/restoring family link program that helps to locate family members who have been separated due to conflict and

⁷⁸ Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

⁷⁹ Ibid.

⁸⁰ Standing Orders on Disasters (SOD), 2019, https://www.adrc.asia/documents/dm_information/BGD_SOD2019_English_FINAL.pdf

⁸¹ Ibid.

⁸² Role of Armed Forces Division in Disaster Management, <https://afd.gov.bd/activities/armed-forces-division-in-disaster-management>

⁸³ Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

⁸⁴ Ibid.

disasters.⁸⁵ This function was utilized during the Sitakunda incident.

Non-Governmental Organizations (NGOs)

There are many International Non-Governmental Organizations (INGOs) and Local Non-Governmental Organizations (NGOs) that operate in and assist Bangladesh with humanitarian assistance, development, and all phases of disaster management, including relief efforts. However, there are few, if any, that have the capacity or unique capabilities in providing specialized response to industrial accidents, considering the nature of the response required. Historically, it appears industrial accidents in Bangladesh are largely responded to by first responders such as the Fire Services & Civil Defence, AFD, BDRCS and MoDMR. However, INGOs, local Bangladeshi NGOs and even local volunteers have experience and capacity in responding to a variety of natural disasters. This experience and capacity could be used to support traditional Bangladeshi first responders and disaster management authorities in a secondary role, should the accident be large-scale and exceed first responder capacity. (A comprehensive list of major INGOs and local NGOs working in Bangladesh can be found on pg. 35 of the “Bangladesh Disaster Management Reference Handbook” at <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>)

International

This section provides possible response modalities, services and support and assistance international organizations can provide to countries in the region, including Bangladesh.

United Nations (UN)

International Labour Organization (ILO)

During a disaster response or industrial accident, there are likely several UN agencies that could help respond if assistance was requested by the GoB. Major UN agencies that could provide relief support during a natural disaster in the country include UNICEF, the World Health Organization (WHO), and the World Food Program (WFP). During an industrial accident that may require additional assistance, these UN agencies may be called upon.

However, none of these are particularly specialized in workplace issues including industrial safety. From the UN system, although not a response organization, the ILO has worked with the Bangladeshi government on improving health and safety in the workplace. The ILO acknowledges that little research has taken place in Bangladesh on occupational injuries and diseases, but also stresses that: “it is internationally recognized that most occupational deaths and injuries are entirely preventable and could be avoided if employers and workers took simple initiatives to reduce hazards and risks at the workplace.”⁸⁶

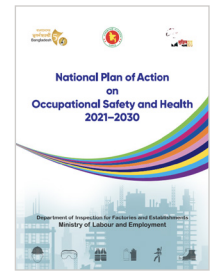
The ILO also states that “For some of the lowest wages of the world, millions of people, most of them girls and women, are exposed every day to an unsafe work environment with a high incidence of work-related accidents and deaths, as well as occupational diseases. Most of the factories do not meet standards required by building and construction legislation. As a result, deaths from fire incidents and building collapses are frequent.”⁸⁷

⁸⁵ Ibid.

⁸⁶ National Plan of Action on Occupational Safety and Health (2021-2030), https://www.ilo.org/dhaka/Whatwedo/Publications/WCMS_835885/lang-en/index.htm

⁸⁷ The Rana Plaza Accident and its aftermath, https://www.ilo.org/global/topics/geip/WCMS_614394/lang-en/index.htm

Domestically, the ILO is working with the government, employers', and workers' organizations in Bangladesh to foster a preventative safety and health culture by strengthening national occupational safety and health (OSH). As such, ILO worked with the government of Bangladesh on a "National Plan of Action on Occupational Safety and Health (2021-2030)," completed in January 2022, which can be downloaded here: https://www.ilo.org/dhaka/Whatwedo/Publications/WCMS_835885/lang--en/index.htm



According to the ILO, the National Plan of Action "is to drive key national activities to achieve improvement in work Safety and Health. It is aimed at regulators, industry, trade unions, other organizations and governments that in turn influence work and workplaces across Bangladesh. The action plan is to cover the legal framework, improving institutional capacity, information management and dissemination and promotional activities for awareness raising, advocacy and safety culture."⁸⁸

World Health Organization (WHO)

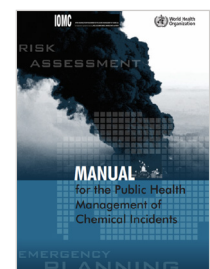
The World Health Organization (WHO) provides assistance to the government and health sector in Bangladesh, through its Country Office in Dhaka.⁸⁹ The WHO could likely assist the government in both the preparation for and response to industrial accidents in Bangladesh, although industrial incidents are just one of many public health threats the UN agency is tasked to deal with.

The WHO writes that "Disasters resulting from natural hazards such as earthquakes, hurricanes, tsunamis and floods, are increasing in intensity, frequency and impact, in part due to climate change. A natural hazard can trigger a chemical release, which, when the result of a technological accident, is called a 'Natech' (natural-hazard-triggered technological) event. Natech events can exacerbate the impact of a natural disaster on the environment and on human health because of the release of hazardous materials, fires and explosions. WHO provides guidance for the strengthening the role of public health in chemical incident and emergency prevention, preparedness, detection, alert, response and recovery, particularly for developing countries and those with economies in transition."⁹⁰

Within the WHO, the agency's Chemical Safety and Health Unit "works to establish the scientific basis for the sound management of chemicals, and to strengthen national capabilities and capacities for chemical safety." Additionally, the unit "provides support to Member States on poisons prevention, information and management as well as on chemical incidents and emergencies."⁹¹

Some specific guidance the WHO has offered to the international community can be found in publications such as the "Manual for the Public Health Management of Chemical Incidents (2009)."

According to the WHO, the purpose of this manual "is to provide a comprehensive overview of the principles and roles of public health in the management of chemical incidents and emergencies. While this information is provided for each phase of the emergency cycle, including prevention, planning and preparedness, detection and alert, response and recovery, it is recognized that the management of chemical incidents and emergencies requires a multi-disciplinary and multi-sectoral approach and that the health sector may play an influencing, complementary or a leadership role at various stages of the management process."⁹² The manual can be downloaded here: <https://www.who.int/publications/i/item/9789241598149>.



⁸⁸ Ibid.

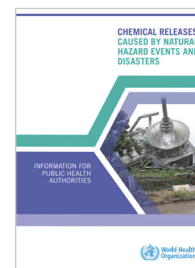
⁸⁹ Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

⁹⁰ Chemical Safety and Health, <https://www.who.int/teams/environment-climate-change-and-health/chemical-safety-and-health/incidents-poisonings/chemical-releases-caused-by-natural-hazard-events-and-disasters>

⁹¹ Chemical safety and health unit, <https://www.who.int/teams/environment-climate-change-and-health/chemical-safety-and-health/about>

⁹² Manual for the public health management of chemical incidents, <https://www.who.int/publications/i/item/9789241598149>

A related manual, released later in 2018, explores chemical accidents caused by natural disasters titled: “Chemical Releases Caused by Natural Hazard Events and Disasters: Information for Public Health Authorities.” According to the WHO, the publication gives an overview of the role and activities of the health sector at all stages of the risk-management cycle. It also provides information on chemical releases resulting from earthquakes, floods and cyclones and the subsequent health impacts, and information on response activities.⁹³ This publication can be downloaded at: <https://www.who.int/publications/i/item/9789241513395>



The WHO also offers additional publications and guidance for chemical incidents including a series of documents on “natural events and chemical incidents” by different natural hazards such as: “Chemical releases associated with cyclones,” “Chemical releases associated with floods,” and “Chemical releases associated with earthquakes.” These publications can be downloaded at: <https://www.who.int/teams/environment-climate-change-and-health/chemical-safety-and-health/incidents-poisonings/chemical-releases-caused-by-natural-hazard-events-and-disasters>

The UN Environment/OCHA Joint Unit (JEU)

The United Nations Environment Program (UNEP, or UN Environment)/UN Office for the Coordination of Humanitarian Affairs (OCHA) Joint Environment Unit (JEU) was founded in 1994 and assists UN Member States prepare for and respond to environmental emergencies, which includes industrial and technological disasters, natural hazards, or a combination of both. The JEU is housed within OCHA’s Emergency Services Branch in Geneva and helps coordinate international preparedness and response efforts. In addition, it mobilizes partners to support countries that have requested assistance to address the environmental impacts of disasters and accidents. The JEU pairs UN Environment’s environmental expertise with the OCHA-coordinated humanitarian response networks.^{94, 95, 96}

The JEU addresses environmental emergencies and “sustainability of humanitarian action,” which involves promoting “environmental issues as an integral part of all elements of humanitarian response, including across the humanitarian program cycle.”⁹⁷ When responding to a natural hazard, accident, or a combination, the JEU can mobilize technical experts at short notice and analysis equipment for deployment. These teams could work with national authorities to conduct rapid assessments, test for hazardous materials, analyze the possible impacts, and help develop response and monitoring strategies. The JEU also has the capability to provide remote support.^{98, 99} Since its establishment, the Unit has assisted almost 100 countries around the world, mobilizing over 200 missions.¹⁰⁰ However, as of this writing, it is unclear as to whether there has been a JEU response to an industrial accident in Bangladesh.

The JEU works to “strengthen adaptation to climate change in humanitarian settings, to increase collaboration between environmental and humanitarian actors and to mitigate environmental risks in humanitarian projects and programs.” JEU also offers other services, such as training experts to

⁹³ Chemical releases caused by natural hazard events and disasters <https://www.who.int/publications/i/item/9789241513395>

⁹⁴ International efforts for industrial and chemical accidents prevention, preparedness and response, <https://www.oecd.org/chemicalsafety/chemical-accidents/Brochure-International-efforts-for-industrial-and-chemical-accidents.pdf>

⁹⁵ UNEP/OCHA Joint Environment Unit (JEU), <https://eecentre.org/partners/un-environment-ocha-joint-unit/>

⁹⁶ International efforts for industrial and chemical accidents prevention, preparedness and response, <https://www.oecd.org/chemicalsafety/chemical-accidents/Brochure-International-efforts-for-industrial-and-chemical-accidents.pdf>

⁹⁷ UNEP/OCHA Joint Environment Unit (JEU), <https://eecentre.org/partners/un-environment-ocha-joint-unit/>

⁹⁸ International efforts for industrial and chemical accidents prevention, preparedness and response, <https://www.oecd.org/chemicalsafety/chemical-accidents/Brochure-International-efforts-for-industrial-and-chemical-accidents.pdf>

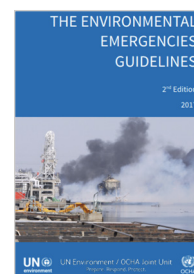
⁹⁹ UNEP/OCHA Joint Environment Unit (JEU), <https://eecentre.org/partners/un-environment-ocha-joint-unit/>

¹⁰⁰ Environmental Dimensions of Emergencies, <https://www.unocha.org/themes/environmental-dimensions-emergencies#:~:text=The%20UNEP%2FOCHA%20Joint%20Environment,countries%20that%20have%20requested%20assistance.>

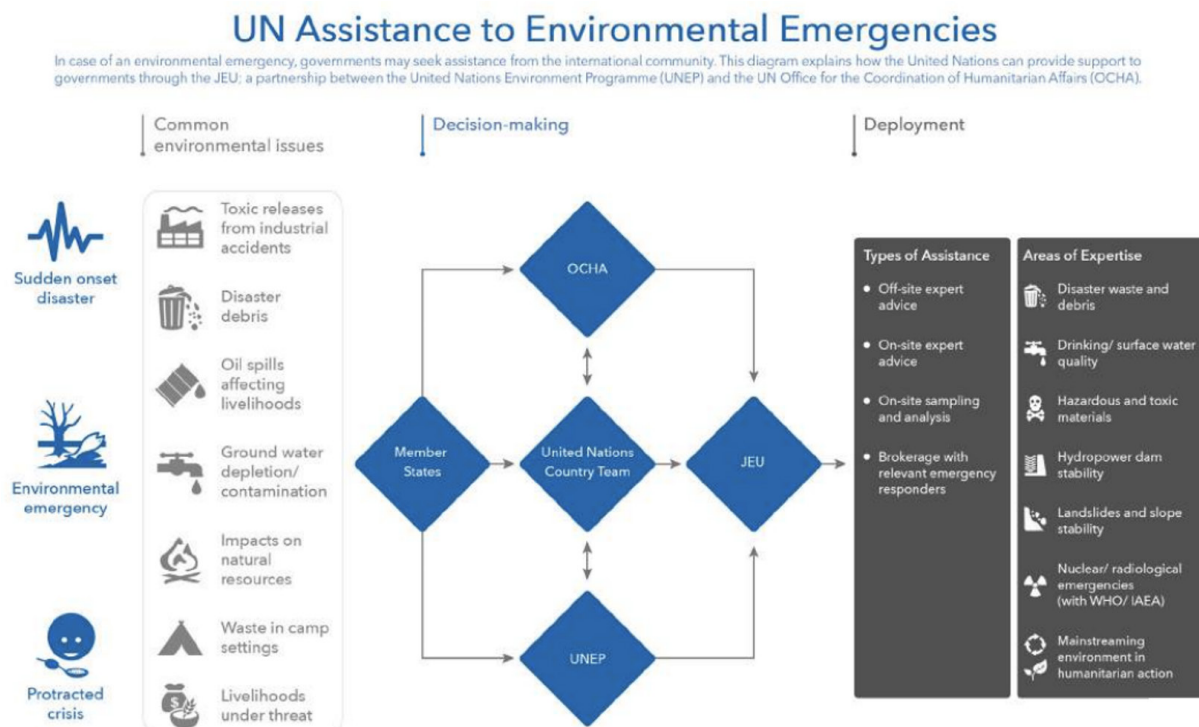
enhance readiness for deployment on environmental response missions, conducting remote assessments and analysis, strengthening interoperability between environmental, technical and humanitarian stakeholders, and promote sharing of knowledge and online trainings, including tools such as the EHA Connect digital tool and the Environmental Emergencies Centre (EEC) (<https://eecentre.org/>)¹⁰¹ The EEC is an online tool designed to strengthen the capacity of national responders to environmental emergencies. The EEC includes the “Industrial Accidents: Prevention, Preparedness and Response” eLearning module which seeks to raise awareness about industrial accidents.¹⁰²

The JEU has developed the Flash Environmental Assessment Tool (FEAT), “an assessment methodology which can be used for chemical accident preparedness as well as in response. FEAT helps to identify existing or potential acute environmental impacts that pose risks for humans, human life-support functions and ecosystems, following sudden-onset natural disasters.”¹⁰³

Another publication to assist in the management of industrial accidents published by the JEU is “The Environmental Emergencies Guidelines,” (https://resourcecenter.undac.org/wp-content/uploads/2020/12/EE_guidelines_english.pdf). These guidelines “focus specifically on the roles and responsibilities of regional and international institutions and frameworks in emergency response,” and thus may be a useful and important document to aid both assisting and affected states in emergency response.



The following infographic from a publication of the “Inter-Agency Coordination Group for Industrial and Chemical Accidents” depicts how the UN can provide assistance to governments through the JEU:



Source: Inter-Agency Coordination Group for Industrial and Chemical Accidents. “International efforts for industrial and chemical accidents prevention, preparedness and response,” <https://www.oecd.org/chemicalsafety/chemical-accidents/Brochure-International-efforts-for-industrial-and-chemical-accidents.pdf>

101 UNEP/OCHA Joint Environment Unit (JEU), <https://eecentre.org/partners/un-environment-ocha-joint-unit/>

102 International efforts for industrial and chemical accidents prevention, preparedness and response, <https://www.oecd.org/chemicalsafety/chemical-accidents/Brochure-International-efforts-for-industrial-and-chemical-accidents.pdf>

103 Ibid.

International Federation of Red Cross and Red Crescent Societies (IFRC)

The BDRCS can rely upon support during a man-made or natural disaster from the International Federation of Red Cross and Red Crescent Societies (IFRC) which provides support and promotes humanitarian activities by National Societies. Although the IFRC is not known for industrial accident response, it does have access to a wide network of 192 National Societies and an Asia Pacific regional office located in Kuala Lumpur, Malaysia, which can provide a wide variety of preparedness and response assistance. The IFRC also has a country office in Dhaka and a sub delegation office in Cox's Bazar and works in support of the humanitarian activities of the BDRCS. Among its many activities, the IFRC, through the BDRCS, administers the Cyclone Preparedness Program (CPP), in cooperation with the Disaster Management Bureau (DMB).¹⁰⁴

International response

While there appears to be no large-scale responses to industrial accidents in Bangladesh that have involved direct support from the international community, there has been at least one international response to major environmental accidents in Bangladesh--the 2014 oil spill in the Sundarbans.¹⁰⁵ We can look at this as an example of how the international community has and could help with industrial accidents if requested by the government.

2014 Sundarban oil spill: On 9 December 2014, an oil tanker accident in the Sundarbans released approximately 358,000 liters of heavy fuel oil into the river and mangrove ecosystem. From the domestic side, the response to the accident was led by the Ministry of Environment and Forests with the assistance of communities. The next day, the Government of Bangladesh (GoB) requested the United Nations Development Program (UNDP) provide technical assistance in assessing the impacts and supporting the response.¹⁰⁶ The Sundarbans Reserve Forest in southwest Bangladesh lies on the delta of the Ganges, Brahmaputra, and Meghna rivers on the Bay of Bengal. It is one of the largest mangrove forests in the world and lies next to the border of India's Sundarbans United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site. There are several wildlife sanctuaries located in the large mangrove forest.¹⁰⁷

Under the coordination of the UNDP, a Joint UN and GoB Sundarbans Oil Spill Response mission was formed, comprised of 25 experts and officials from GoB agencies and universities, the United Nations Disaster Assessment and Coordination (UNDAC) team, UNDP, United States Agency for International Development (USAID), the European Union (EU) Civil Protection Mechanism, France, and the Wildlife Conservation Society. "The objective of the mission was to strengthen the GoB's efforts in containing and cleaning up the oil spillage, as well as to provide support to assessing the situation and developing an action plan for a phased response and recovery."¹⁰⁸ The team spent six days utilizing various assessment techniques to evaluate the situation and offer recommendations.¹⁰⁹

According to the joint "Sundarbans Oil Spill Assessment: Joint United Nations/Government of Bangladesh Mission (December 2014)" report, a "number of factors, including timely tidal variations and the decision to ban tanker traffic in the river, minimized the penetration of oil into the mangrove ecosystem." The report found that: "the lack of a formal oil spill contingency plan; which among other

¹⁰⁴ Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

¹⁰⁵ 2015 Environmental Emergencies Forum Summary Document, https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/eef_summary_document.pdf

¹⁰⁶ Sundarbans Oil Spill Assessment: Joint United Nations/Government of Bangladesh Mission (December 2014), <https://reliefweb.int/report/bangladesh/sundarbans-oil-spill-assessment-joint-united-nationsgovernment-bangladesh-mission>

¹⁰⁷ The Sundarbans, <https://whc.unesco.org/en/list/798/>

¹⁰⁸ Sundarbans Oil Spill Assessment: Joint United Nations/Government of Bangladesh Mission (December 2014), <https://reliefweb.int/report/bangladesh/sundarbans-oil-spill-assessment-joint-united-nationsgovernment-bangladesh-mission>

¹⁰⁹ Ibid.

things, designates an appropriate competent authority to oversee the response as well as the limited experience and response infrastructure, made response and recovery efforts challenging. Despite these limitations, the concerted efforts of the nearby communities and the Department of Forest, reduced the impacts and led to a reported 68,200 liters of oil being collected. The lack of training, appropriate equipment and experience resulted in unintended negative impacts to the local community.”¹¹⁰

While this was an environmental accident, there are some parallels between this oil spill and industrial accidents and shows that it is likely the Bangladesh government may request international help if an accident is large-scale and goes beyond the national response capacity. It also reveals gaps in capacity such as a lack of a formal response plan, designated authority for coordination, and limited response capabilities. Specialized knowledge and experience provided by UNDP, UNDAC, USAID, the EU, and other international agencies was needed to provide adequate clean up, particularly for a sensitive ecological and wildlife sanctuary located near a World Heritage Site.

Additionally, transboundary issues are a concern for the regional and broader international community. It was beyond the focus of this paper to discuss transboundary issues and potential effects outside of Bangladesh; however, it is possible for neighboring countries to be affected by an industrial accident that occurs within Bangladesh depending on location and conditions. As this is true for many other countries in the region, it is imperative that countries look at the problem holistically and as a challenge that may affect all countries in the Indo-Pacific.

Fortunately, the situation in Bangladesh has been such that the industrial accidents have been contained by the efforts of first responders and other response agencies for the most part within the borders of the country, except for perhaps the recent Sitakunda incident and the reports of chemical leakages into the Bay of Bengal. However, considering other larger industrial accidents in the region, it is possible multiple countries could be affected by an industrial emergency depending on location and potential spread of fumes, spills, or smoke. This is an area that warrants further research on the implications for regional response preparedness, coordination, and response.

Europe and industrial accidents

The European community has developed a regional agreement and mechanism to address and notify regional countries on transboundary issues in the event of an industrial accident called the United Nations Economic Commission for Europe (UNECE) “Convention on the Transboundary Effects of Industrial Accidents,” which was created in 1992.

The Convention “is a regional instrument that seeks to protect people and the environment against industrial accidents, especially those with transboundary effects, by instituting measures to prevent, prepare for and respond to such accidents.”¹¹¹ The Convention promotes active cooperation between the parties, before, during and after an accident and applies to accidents triggered by natural disasters. The Convention entered into force in 2000 and has 41 parties including the European Union, that have signed the Convention.^{112, 113}

In addition, through the UNECE Industrial Accident Notification (IAN) website (www.unece.org/env/teia/pointsofcontact.html), countries can notify potentially affected countries and offer or request

¹¹⁰ Ibid.

¹¹¹ The Environmental Emergencies Guidelines (2nd Edition) 2017, <https://reliefweb.int/report/world/environmental-emergencies-guidelines-2nd-edition-2017>

¹¹² Ibid.

¹¹³ Manual for the public health management of chemical incidents, <https://www.who.int/publications/i/item/9789241598149>

assistance in the event of an industrial accident.¹¹⁴ The IAN system has been in operation since 2008.¹¹⁵

Another key piece of legislation was enacted after an industrial accident in the 1970s in Italy. On 10 July 1976, an explosion at a small chemical factory in Seveso, located some 20 km north of Milan, Italy exposed residents to the highest known levels of dioxin to a residential population.¹¹⁶ The accident spurred the adoption of legislation, known as the “Seveso Directive” to address major-accident hazards, which has been credited in resulting in a low frequency of major industrial accidents in the region. According to the Inter-Agency Coordination Group for Industrial and Chemical Accidents, the Directive is based on 4 main pillars: prevention, preparation, response, and lessons learned. Additionally, the group says, “the Seveso Directive is widely considered as a benchmark for industrial accident policy and has been a role model for legislation in many countries world-wide.” According to the group, “other relevant EU legislation or action complements these efforts, for example the EU Civil Protection Mechanism, the Environmental Liability Directive, the CBRN-E action plan or the Mining Waste Directive.”¹¹⁷

¹¹⁴ The Environmental Emergencies Guidelines (2nd Edition) 2017, <https://reliefweb.int/report/world/environmental-emergencies-guidelines-2nd-edition-2017>

¹¹⁵ Introduction: About the Convention, <https://unece.org/introduction-10>

¹¹⁶ The Seveso accident: A look at 40 years of health research and beyond, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6221983/>

¹¹⁷ International efforts for industrial and chemical accidents prevention, preparedness and response, <https://www.oecd.org/chemicalsafety/chemical-accidents/Brochure-International-efforts-for-industrial-and-chemical-accidents.pdf>

Conclusion

This paper provides a broad introduction to major industrial accidents in the Indo-Pacific, by looking at the most recent example in Bangladesh. There have been significant advances in preparation, relief efforts and civil-military coordination capacity in response to natural disasters in the Indo-Pacific, but much more needs to be done to improve preparedness and response efforts to man-made and industrial accidents. While international aid was not requested by Bangladesh during the response to the Sitakunda accident, or other previous industrial accidents, it is possible international assistance could be requested from the GoB or another country in the region depending on the scale, severity, or location of an accident. In the future, an international response could involve both foreign civilian and military responders that could bring specialized capabilities to an industrial accident response.

Bangladesh has made great progress in all phases of disaster management, including preparedness efforts and response. However, considering the challenges faced by all countries in responding to industrial accidents, it is likely training, preparedness efforts and other assistance from foreign countries may be welcomed by the Bangladeshi government, particularly in building health sector capacity and response capabilities. Bangladesh has in the past welcomed international assistance following major disasters such as cyclones, therefore in the face of a large industrial accident in the future, may do so again.

There is opportunity for regional partners and stakeholders to assist Bangladesh with funding and preparatory efforts such as training, and chemical and hazardous spillage handling. Regardless of the specialty, primary efforts should focus on preparation, training, and capacity building, as the Indo-Pacific is faced with multiple additional risks, such as the current ongoing global pandemic and the effects of climate change. Both are likely to exacerbate emergencies in the region, potentially delaying and limiting response capacity to all types of disasters.

While Bangladesh has experienced its share of accidents, the problem of industrial safety, preparedness and response to industrial emergencies is probably best viewed as a regional problem that requires more attention. However, it is acknowledged that improvements are needed domestically (as in most or perhaps all other regional countries), including industrial and workplace safety, legislation, and building codes enforcement, including improvements in industries such as garment and chemical manufacturing; however, these topics were beyond the scope of this paper. It is recommended more research and recommendations be completed in this area to assist the government with building capacity and enforcement to both prevent industrial accidents and strengthen national response capability.

Such research would include not only a broader review and analysis of the amount and types of accidents, but also a deeper look at the secondary HADR effects on individual countries and the region. How many people have been affected? How many have been displaced? What are some of the long-term health consequences? What have been some of the long-term effects on the environment?

There also exists a definite research gap on the long-term effects of industrial accidents—including the effect on people (e.g., long term health effects, livelihoods, effect on the economy, reconstruction, and rebuilding, etc.). Additionally, while climate change is slowly gaining attention globally as something that will make natural hazards more frequent and intense, what impact will this have when paired with an industrial accident? Will climate change fueled hazards contribute to more industrial accidents and/or worsen those that occur? Moreover, the environmental effects of an accident can be far-reaching and, in some cases, may seriously damage ecosystems with longstanding or worse yet, irreversible effects on both nature and people, polluting the air, land, and crucial water sources.

Natural disasters are and have been the impetus for the majority of disaster preparedness and response efforts in the Indo-Pacific, however, there is room for additional focus on industrial accidents, particularly in the training and preparation phase. This would include industrial safety training and proper storage of chemicals, which are probably not within the focus area or within the experience of most regional disaster management agencies and would require the assistance of specialized agencies and subject matter expertise. Part of the solution could be to look towards other regions for guidance and lessons learned, such as in Europe, where there appears to be a more cohesive regional movement towards preparation for industrial accidents, including regional agreements, legislation, and advancements in industrial safety.

Response capacity also needs to be increased; however, at this stage, there is probably more value and benefit to be found in education and training efforts. Building capacity for response to industrial accidents would take more funding and more time to build than will awareness raising. This is not to suggest that it is of a lesser priority—both preparation and response should hold equal attention. Civil-military coordination in the Indo-Pacific has also focused mainly on natural disaster relief but is another key area where regional entities can assist each other for a time when a large industrial accident warrants both regional civilian and military responders.

While regional preparation and training is still somewhat nascent regarding industrial accidents, it is imperative for regional disaster management agencies, development agencies, NGOs, UN agencies and even regional militaries to consider providing support to countries such as Bangladesh to help promote industrial safety, prevent industrial accidents and to help build response capacity through more funding, training, and preparation efforts. This would also be beneficial to all countries in the region, lifting and building regional preparation, coordination, and response to a new and necessary level. Aside from additional needed research, possible solutions may include opening regional discussions and planning for response efforts, the writing of Standard Operating Procedures (SOPs), bilateral and multilateral agreements for coordination and response, and implementing regional exercises where effective civil-military coordination in response to industrial accidents can be formulated, tested, and improved upon.

Questions for Discussion

1. *What additional, cascading effects might be expected in the days and weeks following an industrial disaster?*
2. *What other environmental threats do industrial accidents pose?*
3. *What alternatives do affected populations have?*
4. *Although there are few, if any examples globally, what role could regional militaries play in responding to an industrial accident? What kind of support could they provide?*
5. *What regional governments or militaries have specific niche capabilities (Search and Rescue, Chemical Biological Radiological and Nuclear (CBRN), Hazmat, medical, logistical, etc.) that might be brought to bear?*
6. *What regional humanitarian partners have similar niche capabilities that could be used to assist?*
7. *What kind of civil-military training or exercises could be developed to help the Indo-Pacific region better prepare for and respond to industrial accidents?*
8. *What effect, if any, will climate change have on industrial accidents in the future? (i.e., response and preparation)*
9. *How can similar events be prevented or mitigated in the future?*
10. *What are the appropriate responsibilities of government? Of the private sector? What is the proper role of the international aid community?*
11. *If you are a U.S. service member, what services/units could help respond to an industrial accident? What other DOD agencies could be involved to provide foreign assistance? What about other U.S. Government entities?*
12. *How can the U.S. military better prepare for multi-hazards including natural disasters and industrial accidents, or a combination of both in the Indo-Pacific?*

Annex

Timeline of recent major industrial accidents in Bangladesh.

- **2021: Fire at food and beverage factory in Narayanganj**
More than 50 workers were killed from a fire at a six-story factory in Narayanganj, located near Dhaka, in July 2021. Reports say an illegally locked door trapped many inside and some were forced to jump from the upper floors.^{118, 119}
- **2019: Warehouse fires in Old Dhaka**
At least 70 people were killed in Old Dhaka after a gas cylinder blast led to a huge fire in chemical warehouses.¹²⁰
- **2017: Factory boiler explosion in Gazipur**
At least 13 people were killed and over 50 others injured in July 2017 in a boiler explosion in a Gazipur factory, located in central Bangladesh.¹²¹
- **2016: Fire at factory in Dhaka**
39 people were killed, and dozens of others injured from a fire at a food and cigarette-packing factory, Tampaco Foils, located north of Dhaka, in September 2016.^{122, 123}
- **2016 Factory gas leak**
In August 2016 more than 100 people fell ill from a gas leak from a fertilizer factory in the port city of Chittagong.¹²⁴
- **2013: Rana Plaza factory collapse in Dhaka**
On 24 April 2013, at least 1,134 people were killed and over 2,500 wounded after a factory built on swampy ground near Dhaka collapsed. The 8-story Rana Plaza commercial building collapsed in Dhaka's Savar upazila (sub-district) and housed over five garment factories. It was Bangladesh's worst industrial accident.^{125, 126}
- **2012: Factory fire outside of Dhaka**
112 workers were killed and more than 150 injured from a fire at Tazreen Fashions, a garment factory on the outskirts of Dhaka in November 2012. It is considered the deadliest factory fire in Bangladesh.^{127, 128}

118 Bangladesh fire: 10 deadly disasters for workers in South Asia, <https://news.trust.org/item/20220607152627-fva63/>

119 Bangladesh: Industrial accident: depot fire in Sitakunda, <https://reliefweb.int/report/bangladesh/bangladesh-industrial-accident-depot-fire-sitakunda>

120 The worst industrial disasters in Bangladesh since 2005, <https://www.dhakatribune.com/nation/2022/07/07/sitakunda-fire-8-more-bodies-identified>

121 Ibid.

122 Bangladesh fire: 10 deadly disasters for workers in South Asia, <https://news.trust.org/item/20220607152627-fva63/>

123 The worst industrial disasters in Bangladesh since 2005, <https://www.dhakatribune.com/bangladesh/2022/06/05/the-worst-industrial-disasters-in-bangladesh-since-2005>

124 Ibid.

125 Bangladesh fire: 10 deadly disasters for workers in South Asia, <https://news.trust.org/item/20220607152627-fva63/>

126 Bangladesh Disaster Management Reference Handbook, <https://www.cfe-dmha.org/LinkClick.aspx?fileticket=htNyxly-nB0%3d&portalid=0>

127 Bangladesh fire: 10 deadly disasters for workers in South Asia, <https://news.trust.org/item/20220607152627-fva63/>

128 The worst industrial disasters in Bangladesh since 2005, <https://www.dhakatribune.com/bangladesh/2022/06/05/the-worst-industrial-disasters-in-bangladesh-since-2005>

Other recent major industrial accidents in South Asia

India

2022: Explosion at electronics factory

At least 10 people were killed and 22 injured in a chemical explosion at a factory in northern Hapur district in Uttar Pradesh state in June 2022.¹²⁹

2022: Explosion at chemical factory

At least six people were killed, and a dozen injured in an explosion in a chemical factory in Krishna district in Andra Pradesh in Southeast India in April 2022.¹³⁰

2021: Fire at chemical plant

18 people were killed at a chemical plant in June 2021 in the western city of Pune in the Indian state of Maharashtra.¹³¹

2019: Fire at toy factory

At least 43 workers were killed at a toy factory in New Delhi in 2019. The fire was blamed on a lack of workplace safety.¹³²

Pakistan

2015: Factory collapse

44 were killed when a plastic bag factory collapsed in Lahore in the province of Punjab. Survivors reportedly said the owner added a new floor to the building and ignored advice to stop building after cracks appeared.¹³³

2012: Factory fire

Almost 300 people were killed in a fire at a garment factory in Karachi, the largest city in Pakistan and the capital of the province of Sindh. Emergency exits were reportedly blocked, Reuters reported.¹³⁴

¹²⁹ Bangladesh fire: 10 deadly disasters for workers in South Asia, <https://news.trust.org/item/20220607152627-fva63/>

¹³⁰ Ibid.

¹³¹ Ibid.

¹³² Ibid.

¹³³ Ibid.

¹³⁴ Ibid.



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