



Case Study

# CHEMICAL EXPLOSION BEIRUT PORT

Technological and Biological (CBRN) Hazards

Lebanon, 2020



## GLOSSARY

BTC	Blood Transfusion Centre
BTS	Blood Transfusion Service
CBRN	Chemical, Biological, Radiological and Nuclear (Hazards)
CVA	Cash Voucher Assistance
EMT	Emergency Medical Team
HH	Household
HQ	LRC headquarters
LRC	Lebanese Red Cross
MMU	Mobile Medical Unit
MMT	Mobile Medical Team
MSNA	Multi-Sector Needs Assessment
NS	National Society

## TECHNOLOGICAL AND BIOLOGICAL (CBRN) HAZARD PREPAREDNESS PROGRAMME



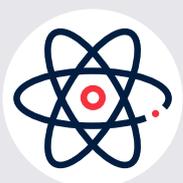
Chemical



Biological



Radiological



Nuclear



NaTech



Environmental

### © International Federation of Red Cross and Red Crescent Societies, Geneva, 2020

Any part of this publication may be cited, copied, translated into other languages or adapted to meet local needs without prior permission from the International Federation of Red Cross and Red Crescent Societies, provided that the source is clearly stated.

All photos used in this document are copyright of the IFRC and Red Cross Red Crescent National Societies.

### Contact information:

Martin Krottmayer, Senior Officer, Technological and Biological (CBRN) Hazard Preparedness, IFRC

**Address:** Chemin des Crêts 17, Petit-Saconnex, 1209 Geneva, Switzerland

**Postal address:** P.O. Box 303, 1211 Geneva 19, Switzerland

T +41 22 730 42 22 | E [secretariat@ifrc.org](mailto:secretariat@ifrc.org) | W [ifrc.org](http://ifrc.org)

## Timeline (first three months)



### August

#### 4 August

- 18h07 Explosion at Port of Beirut.
- 18h10 LRC paramedics respond.
- 18h30 EMTs mobilized.  
Evacuation of injured.  
First aid and triage set up.

#### 5 August

- Over 2,600 wounded assisted by LRC.
- State of Emergency declared.
- LRC activates Emergency Command Cell.
- Emergency relief distribution and temporary shelters set up.
- LRC expands blood donation campaigns and initiates needs assessment.
- Psycho-social support activities to affected population, staff and volunteers.
- LRC launches initial appeal.

#### 6 August

- Three LRC MMUs provide free primary health care.

#### 7 August

- LRC relief distribution for 1,000 families.
- LRC Hotlines enhanced for emergency assistance and family reunification.

#### 9 August

- IFRC issues International Appeal.

### September

#### Up to 4 September

- LRC providing primary healthcare and medicine through 4 fixed health centres and 3 MMUs. Blood transfusion services enhanced.

#### 13 September

- LRC begins CVA for 10,000 families over 6 months.

### November

#### 8 November

- LRC launches MMT initiative, to target most vulnerable at HH level.

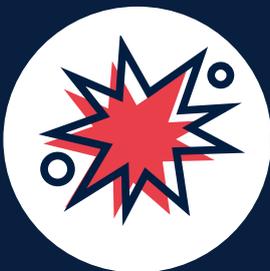
## Key Facts



© Beirut Port devastation after explosion. Lebanese Red Cross, 2020



- Over **200** deaths and **6,000** people injured.
- **300,000** people displaced due to damaged and destroyed homes across Greater Beirut.
- Surge in **COVID-19** cases post-blast <sup>1</sup>.



- **Two of five** Beirut hospitals damaged (one of which was acting as a COVID-19 facility).
- **Two** LRC branches and **three** ambulances destroyed. HQ damaged. Two BTCs damaged. Local staff and volunteers affected.

1. Worldometers: 178 cases on 4 Aug. / 1,644 cases on 4 Nov. (2020), [www.worldometers.info/coronavirus/](http://www.worldometers.info/coronavirus/). Note: limited testing post-blast likely underestimating number of cases.

## I. Overview

On 4 August 2020, a huge explosion rocked the city of Beirut, shattering glass and causing extensive damage to buildings and infrastructure within a radius of three kilometres. Hundreds were killed, and many thousands of people injured. The impact of this unprecedented explosion, which registered as a 3.3 magnitude earthquake, was felt as far away as Cyprus.

The blast occurred as a result of the accidental ignition of 2,750 tonnes of ammonium nitrate, which had been stored in the Beirut Port area for a number of years under wholly inadequate conditions.

The explosion affected a densely urbanized area which is, in many ways, the heart and soul of Beirut - a rich mix of dwellings, small shops and businesses, interspersed with the magnificent architecture of some of the city's key heritage sites that had survived the civil war.

*“There, near the skeletal husk of Warehouse 12, clumps of impossibly twisted metal and mangled concrete show how the force of the blast seemed to warp even the laws of physics. It catapulted a Toyota hatchback three feet into the air before smashing it atop a concrete barrier. It flicked a heavy Mercedes truck and trailer like a bothersome fly into one of the warehouse’s pillars. Beyond the port, entire neighbourhoods instantly became derelict, and skyscrapers turned into giant shards of jagged glass and ripped cladding.”*

Nabih Bulos, LA Times, 18 Aug. 2020

Moreover, the disaster occurred in what was already a very difficult and complicated context, at a time when Lebanon was already beset by three overlapping crises:

- **stresses due to the Syrian refugee situation;**
- **pervasive political instability and worsening economic conditions (with inflation reportedly at 70%), leading to social unrest;**
- **challenges posed by the on-going COVID-19 pandemic.**

The blast also severely damaged two of Beirut's five hospitals - one of which was a dedicated COVID-19 facility. This stretched the city's overall emergency capacity to its limits, and meant that the remaining hospitals were able to treat only the most severely wounded.

In what can be seen as a terrible reversal of the classic scenario of a nature-based disaster triggering a man-made disaster, the Beirut Port explosion led in turn to an explosion in COVID-19 cases, just as the pandemic situation was getting under control.

And, although in this particular case there may have been less structural damage and fewer immediate fatalities than following a disaster such as an earthquake, **the tragic irony is that man-made disasters can often be mitigated or prevented.**

## WHAT IS AMMONIUM NITRATE?

Ammonium nitrate is a crystal-like white solid which is made in large industrial quantities. Its biggest use is as a source of nitrogen for fertiliser, but it is also used to create explosives for mining. It is synthetic and produced all over the world. On its own, it is relatively safe to handle; but storing it in large quantities can lead to problems, and it has been associated with serious industrial accidents in the past. When ammonium nitrate explodes, it can release toxic gases including nitrogen oxides and ammonia gas. An orange plume is caused by the nitrogen dioxide, which is often associated with air pollution. (Sources: WISER / CHEMM / GESTIS) <sup>2</sup>

## NOTE ON TOXICITY FOLLOWING THE BEIRUT PORT EXPLOSION

One of the primary concerns immediately following the disaster related to the potentially toxic substances released (or in danger of release) by the explosion, and subsequent fires. Teams of CBRN and environmental experts were immediately deployed to assess the situation. The Lebanese Red Cross's dedicated CBRN team played a central role in this process. Key findings <sup>3</sup> regarding toxicity were as follows:

- Air-quality indicators quickly returned to pre-event levels, having risen sharply in the hour immediately after the explosion. Fortunately, the plume of smoke was carried downwind and out to sea, scattering pollutants into the atmosphere at concentrations below detectable limits. Larger dust particles settled on the ground, raising concerns that these could once more become airborne, if disturbed during clean-up operations.
- Additional environmental risks were the potential release of hazardous substances stored nearby (especially during subsequent outbreaks of fire), as well as from the large quantity of rubble (including hazardous waste) generated by the event. Minor chemical threats (e.g. paint, solvents, etc.) from destroyed storage facilities were also detected.
- Asbestos remains a concern which has not yet been fully assessed.
- Awareness-raising campaigns <sup>4</sup> provided guidance to clean-up teams and the general public.

---

2. Information from various sources: Wireless Information Source for Emergency Responders - WISER (<https://wiser.nlm.nih.gov/>); Chemical Hazards Emergency Medical Management - CHEMM (<https://chemm.nlm.nih.gov/wiserchemicals.htm>); GESTIS Substance database (<https://gestis-database.dguv.de/>).

3. Reports from the Environmental Emergencies Coordination Cell and the Aerosol Research Laboratory (American University of Beirut).

4. E.g.: Wearing masks, using thick gloves as protection against shattered glass, washing exposed skin several times a day, removing dust with vacuum cleaners and/or wet towels, and spraying water to help particles settle more quickly. Guidelines and flyers issued by the American University of Beirut and the World Health Organization.

## II. LRC Response (three months post-disaster)



© Staff mobilized to help the wounded people. Lebanese Red Cross, 2020.

### EMERGENCY PHASE

Within seconds of the blast, the LRC emergency hotline was inundated with thousands of calls. The reverberations from the explosion were felt throughout Beirut and beyond, and confusion reigned. No one knew what had happened, or even exactly where.

Local LRC paramedics, based near the site of the blast, immediately began providing first aid. LRC ambulances were dispatched in response to emergency calls coming in from all over the city. The actual magnitude of the disaster became clear within the first half hour: despite its extensive experience of disasters and civil war, **this situation was beyond anything LRC had ever dealt with before.**

As soon as the epicentre of the blast was linked to the Beirut Port area, additional LRC EMTs were deployed, along with search and rescue teams. In the worst affected areas, which ambulance crews were initially unable to reach, emergency responders went in on foot, setting up multiple triage and treatments centres for the wounded. Within three hours, 75 ambulances had been mobilized from LRC's national fleet to transport the injured, and evacuate patients from the two badly-damaged hospitals, one of which had been a dedicated COVID-19 facility.

Due to the unprecedented destruction of Beirut's medical facilities – with overall capacity reduced by close to 50% in an instant - the three remaining hospitals were only able to treat the most seriously injured. LRC quickly established additional first aid and triage stations in at least two city centre locations to treat people with less critical injuries. The LRC Blood Transfusion Service (BTS) initiated a series of blood drives and, crucially, was able to supply hospitals with much-needed blood units - with over 1,200 units provided to hospitals within the first 48 hours. As far as feasible, COVID-19 protocols were maintained throughout, although the main focus remained on saving lives.

In parallel, LRC Relief Teams began distributing emergency relief goods, primarily food parcels and hygiene items, including protective masks. In the worst affected areas – densely-populated urban neighbourhoods of mixed socio-economic backgrounds – local residents were also quick to organize themselves, offering each other accommodation and whatever assistance they could provide.

During the first days following the disaster, LRC began a Multi-Sector Needs Assessment (MSNA) of damaged neighbourhoods. The distribution of an unconditional cash grant of USD 300 to 1,000 households on an emergency basis started in September.



***“In the minutes following the disaster, people carried the injured on their backs, their mopeds, they came down with first aid kits to clean wounds. Seeing that distress and solidarity is both heart-breaking and magnificent: the worst and hope, together side by side.”***

French Red Cross Delegate <sup>5</sup>

5. <https://redcross.eu/latest-news/a-triple-emergency-in-lebanon-the-beirut-explosion-covid-19-and-an-economic-crisis>



## MAIN RESPONSE ACTIVITIES



© Volunteers provide assistance to people affected by the explosion. Lebanese Red Cross, 2020.

Lebanese Red Cross immediate response included:

- Treatment and transport of more than 2,600 wounded.
- Evacuation of **damaged hospitals** and transport of COVID-19 patients.
- Distribution of more than 1,200 blood units **within the first 48 hours**.
- Setting up of emergency shelters for 1,000 families.
- Distribution of ready meals, food parcels & hygiene kits to over 23,000 people.

## INITIAL RECOVERY PHASE (Data up to 9 November 2020)

The homes of many residents were destroyed or badly damaged by the blast, leaving an estimated 300,000 people without adequate shelter. Further to the emergency assistance provided over the first weeks, and based on the multi-sector assessment results, LRC increased the scope of its activities to provide direct, unconditional cash and voucher assistance (CVA) to 10,000 of the most affected families over a period of six months. The aim is to enable people to best meet their own needs, while restoring some sense of normality and dignity to their lives.

### SNAPSHOT OF ASSESSMENT RESULTS



© Danish and Lebanese Red Cross staff analyse the disaster status. Lebanese Red Cross, 2020.

Information based on 29,560 household (HH) assessments at 27 October 2020 (on-going)

- 54% female-headed HHs / 45% male-headed HHs residing in affected areas.
- 58% HHs with chronic illness requiring medication.
- 4.4% HHs with pregnant or lactating women.
- 11% HHs with physical or mental disability / 10% HHs with disaster-caused disability.
- 28% HH with collapsed or damaged balconies; 48% HHs with minor damage, closable and repairable; 64% HHs with broken and shattered glass; 8% HHs with unacceptable hygiene conditions.
- 80% HHs prioritized assistance for shelter repairs, medical care, medication, cash and food.

**Note:** Due to national banking restrictions imposed in October 2019, only 13 % of HHs reported having savings that they could access.

In addition to the CVA programme, LRC has been focusing on:

- Providing basic assistance to up to 10,000 families for at least 3 months. This includes food parcels, hygiene kits, psychosocial support, and shelter.
- Providing primary healthcare and medicine through three MMUs and four fixed primary health centres in and around the blast area.
- Providing ambulance services in the blast area, as well as maintaining regular ambulance missions and responding to the COVID-19 crisis across Lebanon.
- Collecting blood units and distributing them to hospitals.
- Restoring LRC's own contingency stocks and repairing its damaged infrastructure, in order to regain its readiness to respond rapidly to any new crisis.

LRC is supported by the IFRC, ICRC and 21 Partner National Societies, who have been working in close coordination to ensure a well-targeted and comprehensive response. An international IFRC appeal was launched on 9 August 2020, with a timeframe of 24 months to enable the Lebanese Red Cross to address the deeper and more persistent ramifications of the disaster.



## OVERVIEW OF LRC ASSISTANCE



© Volunteers organize in kind donations for households affected. Lebanese Red Cross, 2020.

Overview of LRC assistance to 8 November 2020

- **Over 250,000** people helped
- **8,278** families receiving direct cash assistance
- **43,021** household assessments completed
- **4,536** Covid missions completed.

## Overview of LRC Response (4 Aug. - 8 Nov. 2020)

Issued on November 9, 2020



### III. SPECIFIC CHALLENGES



#### Compound Disaster

The explosion occurred at a time when the country was already struggling to contain the COVID-19 pandemic. The over-riding need to save lives in the immediate aftermath of the blast meant that COVID-19 protocols could not be precisely adhered to at all times. The explosion increased the risk of transmission, as facilities providing isolation and care for confirmed cases were affected. Displaced people had to shelter in close proximity to many others, rendering physical distancing impossible. The subsequent spike in COVID-19 cases is stretching LRC ambulance and health services to capacity.



#### Disrupted Healthcare System

The healthcare system was already over-burdened due to the COVID-19 pandemic. Following the explosion, continued access to essential health services and supplies of medicines are, and will remain, critical issues. Few people in Lebanon benefit from an adequate social safety net and, as the overall economic situation deteriorates, many will be unable to afford the cost of even basic healthcare. This will further stretch LRC's resources, as demand for free primary healthcare continues to increase.



#### Complex Socio-Economic Environment

The Beirut Port explosion occurred at a time of on-going political, economic, and social instability, made worse by the COVID-19 pandemic. There is increasing concern about looming price increases, with rumours that government subsidies - which have so far shielded essential supplies from soaring inflation - may be cut. There have also been reports of shortages and hoarding, especially of medication. Furthermore, as a result of this disaster, many people have lost their possessions, homes, business premises (both large and small), and livelihoods. This has exacerbated what was an already tense and challenging situation for the majority of Lebanese, as well as for Palestinian and Syrian refugees in the country.



## LRC Resources Stretched

LRC has also felt the impact. On top of a large year-on-year increase in demand for its services (24% rise in blood supply provision to hospitals, and 23% increase in demand for health care - Dec. 2019 to Dec. 2020), and the loss of a substantial annual government contribution representing 30% of its budget, the NS must nevertheless continue to meet on-going needs, as well as those suddenly brought about by the port explosion and subsequent spike in COVID-19 cases. Taken together, these and other related factors<sup>6</sup> are straining LRC's capacity to respond, and potentially eroding the value of the assistance it is able to offer.



© Lebanese Red Cross staff members explore the area of disaster. United Nations, 2020.

6. For example, the impact on cash and voucher programmes of limits to foreign currency reserves (especially USD) and restrictions on bank withdrawals. Currency devaluation and rampant inflation are also impacting wages and LRC's ability to stock up on crucial items.

## IV. RCRC PERSPECTIVE – KEY RECOMMENDATIONS

Based on its experience to date following the Beirut Port explosion, the Lebanese Red Cross shares the following observations and recommendations:

- 1. DUTY OF CARE:** LRC benefits from a large and active base of well-trained and experienced volunteers (12,000) and staff (400), including a specialized CBRN Unit. Protocols and standard operating procedures are clearly set out. Despite this, the teams were suddenly faced with a previously unimaginable scenario - a chemical explosion in the context of a pandemic. In addition, many of LRC volunteers' families were also directly affected by the explosion. It would be useful to up-date existing RCRC guidelines on duty of care based on this most recent experience, and consider including a wider definition of care to encompass a National Society's obligations towards its own members (volunteers and staff) as potential beneficiaries in the aftermath of a disaster.
- 2. COMMUNITY BASED DISASTER RESPONSE MANAGEMENT (CBDRM):** As a rule, NSs work closely with vulnerable communities on disaster preparedness programmes. The Beirut explosion has highlighted the need to extend such programmes to local authorities, especially in places where there are known weaknesses in governance. In the aftermath of the explosion, it became apparent that municipal authorities in Beirut had very limited knowledge and experience of disaster response. This included a lack of such basics as proper databases, stakeholder mapping, or evacuation and contingency plans. LRC's DRR unit plans to work with five local authorities to enhance their disaster preparedness capacities, including multi-hazard assessment and mitigation. This is seen as crucial if similar disasters are to be avoided in future.
- 3. AREA OF HIGH URBAN DENSITY:** The historic urban centre of Beirut was the area most severely affected by the explosion. It is an area of strong cultural and social value, containing architectural heritage from many eras. It is also a densely populated area, home to a diverse population from a wide range of social, economic and ethnic backgrounds, with greatly varying resources and expectations. LRC's multi-sector needs assessment was instrumental in enabling it to target assistance according to individual families' needs - particularly important in this urban setting, where people felt embarrassed and perhaps too shy or too proud to readily participate in mass relief distributions in front of their neighbours. This led LRC to adapt its approach and provide relief distribution door-to-door, in a manner that was appropriate to the context and respected peoples' dignity.

## V. FINAL WORD

*"I've seen a lot of disasters but this one was utterly different. No one can even imagine something like this. In a fraction of a second, people lost their family, homes and work; they were injured, terrified, haggard among their blood. We all lost something from our heart that night and nothing will be like before.*

*As Red Cross, we are ready to respond and help in any crisis based on our contingency plans and continuous trainings. We share a deep common language with our community; and people trust us, as we have built this trust with our 75 years' existence and service in the country. Yet despite our dedication we, unfortunately, cannot respond to all calls - and here I quote an old Middle-Eastern saying: 'Put a stone in your pocket, so you don't fly off'.*

*Finally, we know that we have to continue training, preparing ourselves and coordinating with others to complete the work, as only together, we can reduce the risks."*



**Georges Kettaneh, Secretary General,  
Lebanese Red Cross**

## Sources:

- American Red Cross: <https://www.redcross.org/about-us/news-and-events/news/2020/beirut-explosion-red-cross-treating-the-wounded.html>
- 'Beirut blast clean-up investigation continues', Nabih Bulos, LA Times staff writer, 18 Aug. 2020 <https://www.latimes.com/world-nation/story/2020-08-18/beirut-blast-cleanup-investigation-continues>
- British Red Cross: <https://www.redcross.org.uk/stories/disasters-and-emergencies/world/beirut-emergency-appeal>
- 'Deminers of Lebanon: Destroying explosives – and returning the land to its people', Jessie Williams, The Telegraph, 26 Oct. 2020 <https://www.telegraph.co.uk/global-health/terror-and-security/deminers-lebanon-destroying-explosives-returning-land-people/>
- Environmental Agencies Coordination Cell – Beirut Blast Daily Updates, 9/ 12/13 August 2020
- IFRC Emergency Appeal, Lebanon Beirut Port Explosion, Appeal n° MDRLB009 IFRC 9 Aug. 2020 <https://media.ifrc.org/ifrc/press-release/beirut-explosion-urgent-relief-survivors-underway-ifrc-appeals-20-million-swiss-francs/>
- IFRC: <https://media.ifrc.org/ifrc/2020/09/04/beirut-port-explosions-survivors-needs-rise-normal-life-seems-far-away/>
- IOM Lebanon Situation Report #6, 15 Oct. 2020
- Lebanese Red Cross (in response to Beirut Port Explosion) <https://www.redcross.org.lb/>
  - One Year Appeal
  - Response to Beirut Port Explosion
  - Beirut Port Explosion - Crisis Response (August 2020)
  - LRC Daily Response Report - 9 Nov. 2020
- OCHA Lebanon: Beirut Port Explosion, Situation Report #14, 9 Nov. 2020
- 'Red Cross volunteers, the unknown soldiers of Lebanon's wars', Samar Kadi, Arab Weekly, 02 June 2018, <https://thearabweekly.com/red-cross-volunteers-unknown-soldiers-lebanons-wars>
- UNHCR Flash Update on Lebanon: Beirut Port Explosions, 20 Oct. 2020



Contact information

Martin Krottmayer  
Senior Officer, Technological and Biological (CBRN) Hazard Preparedness, IFRC  
martin.krottmayer@ifrc.org  
<https://media.ifrc.org/ifrc/techbiohazards/>

