

BEIRUT PORT EXPLOSIONS RESPONSE

Beirut Municipality Rapid Building-level Damage Assessment

Municipality of Beirut and UN-Habitat

October 2020

Working Version



With support from

UN HABITAT
FOR A BETTER URBAN FUTURE

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INTRODUCTION

PURPOSE OF REPORT

The Port of Beirut explosions of 4th August 2020, situated within the boundaries of the Municipality of Beirut (MoB), resulted in devastating loss of life, injury and the destruction of vast tracts of urban fabric within the municipality and beyond.

One of several initiatives undertaken in response by the MoB and the Governor of Beirut¹ was a rapid visual survey at the building level. The survey covered all building types within a 2km radius of the blast, to gain an understanding of the extent of damage and particularly structural impacts, immediately identifying buildings or building elements at risk of collapse and in need of

evacuation whilst also providing evidence for formulating early recovery measures.²

This report describes the method and early results of an ongoing survey initiated by the MoB and conducted through a collaboration between the engineering department within MoB and UN-Habitat Lebanon in its ongoing role of support to local authorities. Data was gathered via field surveyors from several volunteering engineering consultancy firms from immediately after the blast until 11 September 2020. This report will be updated with data from the remainder of the survey in due course.

ADMINISTRATIVE BOUNDARIES AND ASSESSMENT ZONES

The Port of Beirut is located within the boundaries of MoB, which is itself divided into 13 cadastres. The MoB spans just under 20 square kilometres in area, and is the heart of a larger continuously built up urban area reaching around 110 square kilometres in size (Figures 1 and 2).³

Two zones within MoB were identified for assessment purposes, together covering around half the overall area of the municipality (Figure 3).



Figure 1 Beirut Governorate within Lebanon



Figure 2 Explosion site in Municipality of Beirut / Beirut Governorate, showing Beirut continuously built-up area

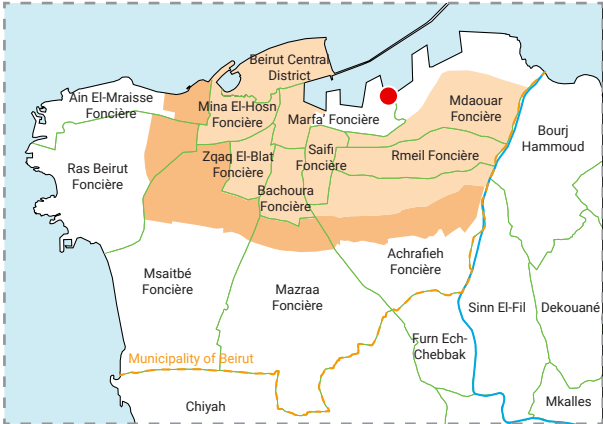


Figure 3 Assessment zones within Beirut Municipality



¹ Lebanon is divided into eight governorates. The Municipality of Beirut acts also as an independent governorate.
² The approach is complementary to other assessments conducted at household level, notably the Multisectoral Needs Assessment of the Lebanese Red Cross undertaken in conjunction with the Lebanese Armed Forces, and may be triangulated with these in due course.
³ UN-Habitat (forthcoming) "Beirut City Profile". Beirut, UN-Habitat.



The Port of Beirut explosions took place in close proximity to the city centre with its historic core, vibrant commercial districts and dense urban neighbourhoods, many of which are vulnerable. It resulted in over 200 deaths, 6,500 injured and 7 missing. The blast caused material damage to an estimated 77,000 apartments located across 10,000 buildings within a 3km radius of the blast, impacting around 300,000 people.⁴ The entry point to more than 70% of Lebanon's imports, the port blast has also affected the availability of goods in the country.

In the aftermath of the incident, there was a spontaneous proliferation of public and private actors and associated initiatives seeking to respond to needs on the ground, which underscored the need for an efficient and rationalised response. With support from local and international entities, the municipalities remain at the centre of supporting public safety whilst working towards inclusive post-disaster planning for urban recovery. In this context, a building-level damage assessment was initiated to provide an evidence basis for guiding action, alongside rubble management efforts already ongoing on the ground. The MoB requested the support of UN-Habitat in conducting this assessment, aiming to come up with a general overview of the damages affected MoB's neighbourhoods and to identify the most affected zones and buildings therein.


7
MISSING


212
DEAD


6,500
INJURED

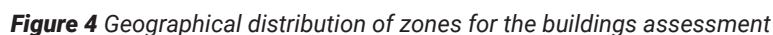

77,000
DAMAGED
HOUSING
UNITS


300,000
RESIDENTS
AFFECTED



⁴ Shelter sector dashboard (12 September 2020).

ZONING



The field assessments were launched on the 5th of August. Assessment of Zone 1 was completed on the 31st of August, while that for Zone 2 is still ongoing.



Based on the Applied Technology Council's Field Manual (ATC-20-1),⁵ the following visual inspection steps were adopted by surveyors:

1. Examine the building's exterior envelope.
2. Examine the ground and the pavement around the structure for fissures, bulged ground, or signs of slope movement.
3. Enter the building whenever the structure is not clearly visible from the outside, and in the case of suspected or confirmed problems that are non-structural (e.g. collapsed ceiling or damaged partitions). However, do not enter the building if the structure is obviously unsound.
4. Assess the structure using the visual signs of damage criteria.
5. Complete a Rapid Assessment Form (REF). Add any instances of restrictions placed on the use of the structure to the REF. Questionable buildings should be flagged for a detailed assessment.
6. Explain the significance of uninhabitable or uninhabitable structures to the building occupants if present. Where

buildings including buildings' common areas appear unsafe, advise residents to vacate immediately without causing panic whilst also expediting notice of unsafety to the municipality for taking action including in the form of serving evacuation notices. The municipality then refers cases to the High Relief Council also to humanitarian agencies working on the ground to assist evacuated residents.

Surveying was conducted using the Geopal mobile application.



Based on visual signs of damage, buildings were divided into those that were uninhabitable requiring evacuation and those that remain habitable.

Uninhabitable / Requires evacuation

- Total or partial collapse of the building.
- Major damage and deformation/deviation from the vertical axis of load-bearing structure.
- Severe damage to the beam-column joints.
- Neighbouring structure in danger of collapse onto building.
- The load-bearing elements show any deformation.
- Floor panels displaced away from original supports.
- Load-bearing shear walls show any out-of-plane deformation.
- Significant cracks (>2mm) in load-bearing elements

- Damage limited to windows, doors and non-structural items (that are not at risk of falling onto inhabitants).
- Slight cracks in walls (load bearing and/or non-load bearing), and slight separation between load-bearing and non-load bearing elements.
- Hairline non-diagonal cracks in horizontal reinforced concrete structural beams.
- Hairline cracks in load-bearing masonry walls, where the cracking covers less than 30 per cent of the wall area.



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