Geospatial Technologies and Human Rights Project

Assessing the status of medical facilities in Syria

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Introduction

At the request of Physicians for Human Rights (PHR), the Geospatial Technologies and Human Rights Project of the American Association for the Advancement of Science (AAAS) undertook an assessment of high-resolution satellite imagery to examine medical facilities in several cities across Syria: Aleppo, Douma (a suburb of Damascus), Homs, Idlib, and Tafas (north of Dar’a) (Figure 1). The purpose of the assessment was to verify reports of damage and destruction to the facilities. These reports had been gathered through traditional news media, social media, and PHR’s network of on-the-ground contacts. Due to the high levels of conflict occurring across the country, it is difficult to verify both the location and dates of damage reports. Satellite imagery analysis provides a means to perform this verification remotely.

Figure 1: Medical facility sites

Data and Methods

AAAS attempted to acquire high-resolution satellite imagery covering each of the five sites identified by PHR to align with reported attack dates. Imagery was available at four of the five sites: Aleppo, Douma, Homs, and Tafas; no appropriately timed imagery was available for Idlib. The imagery used was collected by satellites owned and operated by DigitalGlobe and the relevant acquisition information is listed in Table 1.
**Table 1: Satellite imagery acquired**

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<th>Location</th>
<th>Date</th>
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<td></td>
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<td>4 April 2012</td>
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<td>Tafas</td>
<td>5 January 2014</td>
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</table>

*All imagery acquired via DigitalGlobe, NextView license*

**Results**

**Aleppo: Zahri Azrak Hospital**

Information provided by PHR indicated that Zahri Azrak Hospital, located in the Trab al-Helok neighborhood in northern Aleppo, was attacked on 25 August 2012. AAAS obtained imagery of the hospital that was collected on 18 August 2012 and 1 September 2012, just days before and after the reported attack. Figure 2 clearly shows damage to the rear entrance of the southern wing of the hospital. The damage observed is consistent with shelling.
Figure 2: Zahri Azrak Hospital

On 18 August 2012, Zahri Azrak Hospital shows no signs of damage (top). By 1 September 2012, a portion of the southern wing of the hospital has been heavily damaged (bottom). Coordinates: 36.230772 N, 37.171317 E. Image ©2014, DigitalGlobe, NextView License | Analysis AAAS.
Douma: Hamdan Hospital

PHR reporting indicated that Hamdan Hospital was the target of multiple attacks, which occurred on 31 August 2012 and in November 2012. The hospital is situated less than 200 meters west of the Al-Masjid Al Kabeer Mosque. AAAS analyzed images of the hospital and surrounding areas that were collected on 30 August 2012, 2 September 2012, and 29 November 2012. No damage was visible to the hospital in the three images acquired. This does not rule out possible damage to the sides of the building, such as damage from ground-level fighting, which would not be visible with high-resolution imagery. However, significant damage was observed across the street from the hospital in the 29 November image (Figure 3).

Figure 3: Hamdan Hospital
While no signs of damage to Hamdan Hospital are visible in satellite imagery from 30 August 2012 (top), 2 September 2012 (middle), or 29 November 2012 (bottom), significant damage is seen to multiple buildings across the street from the hospital on 29 November (red arrow). Coordinates: 33.5706111 N, 36.3989174 E. Image ©2014, DigitalGlobe, NextView License | Analysis AAAS.

Homs: Amal Hospital

Information from PHR indicated that the Jouret al-Shayah neighborhood of Homs, where the Amal Hospital is located, had possibly been the focus of numerous attacks during 2012 and 2013. Attacks were reported: April 9, 2012; June 15, 2012; July 20, 2012; October 17, 2012; January 23, 2013. AAAS acquired imagery as close to each attack date as possible (see Table 1) in order to narrow down the timeline of events in
the area. The first image examined, from 4 April 2012, shows a large building billowing black smoke that is blowing south toward the hospital (Figure 4). Similarly, on 13 April 2012, an obstruction can be seen burning in the street approximately 0.75km north of the hospital, and the only unusual phenomenon observed (Figure 5).
In this image from 4 April 2012, smoke can be seen billowing from a building just north of Amal Hospital. Coordinates: 34.7357627 N, 36.708954 E. Image ©2014, DigitalGlobe, NextView License | Analysis AAAS.
Figure 5: An object burns north of Amal Hospital

An unidentified object burns in the street (red arrow) north of Amal Hospital (white box) on 13 April 2012. Coordinates: 34.7357627 N, 36.708954 E. Image ©2014, DigitalGlobe, NextView License | Analysis AAAS.
By 16 July 2012, the entire block of buildings in which Amal Hospital is located is completely destroyed (Figure 6). This block contained at least five multi-story buildings. In addition, heavy damage was sustained to buildings in close proximity to the hospital - at least three large buildings across the street to the north and two across the street to the east.

In order to better constrain the timeframe for this destruction, AAAS obtained an image from 16 June 2012. Analysis of the image showed no visible damage. The acquisition of this image occurred closer in time to the massive destruction observed on 16 July 2012, allowing the time frame of the attack to be narrowed to a four-week period between 16 June and 16 July 2012.
Figure 6: Complete destruction of Amal Hospital

By 16 July 2012, Amal Hospital has been completely destroyed (red box), as have many buildings in the surrounding neighborhood (red arrows). The destruction is oriented in a roughly north-south line. Smoke can be seen billowing from a building in the northern portion of the image. Coordinates: 34.7357627 N, 36.708954 E. Image ©2014, DigitalGlobe, NextView License | Analysis AAAS.
Although the hospital was found to be completely destroyed on 16 July 2012, additional imagery was obtained to monitor the status of the neighborhood over the following weeks, as sources compiled by PHR indicated that attacks in the neighborhood were ongoing. On 29 July, at another nearby hospital, one building in the complex has a hole in its roof around which black scorch marks are visible (Figure 7). An image from 31 July showed no additional signs of damage. On 29 August, however, further damage was observed to a building across the street from Amal Hospital, and smoke was seen rising from a building in the vicinity of the hospital (Figure 8).

*Figure 7: Damage to nearby hospital*

Another hospital in Jouret al-Shayah is undamaged on 16 July (top) but has been damaged by 29 July (red arrow, bottom). Coordinates: 34.74 N, 36.71 E. Image ©2014, DigitalGlobe, NextView License | Analysis AAAS.
Figure 8: Additional destruction near Amal Hospital

By 29 August 2013 (bottom), an additional building across the street from the site of Amal Hospital has been destroyed (red arrow) and smoke can be seen rising from a nearby building (blue arrow).

Coordinates: 34.7357627 N, 36.708954 E. Image ©2014, DigitalGlobe, NextView License | Analysis AAAS.
Tafas: National Hospital

As with Hamdan Hospital, National Hospital in Tafas, near Dar’a, was reported to have been attacked on two dates: 7 September 2013 and 18 September 2013. Satellite imagery acquired on 5 January 2014 reveals no visible signs of damage to the hospital, although damage to the sides of buildings remains a possibility (Figure 4).

Figure 9: National Hospital

National Hospital in Tafaas, near Dar’a, does not exhibit signs of damage on 5 January 2014. Coordinates: 32.729639 N, 36.058435 E. Image ©2014, DigitalGlobe, NextView License | Analysis AAAS.

Conclusions

Physicians for Human Rights requested that the Geospatial Technologies and Human Rights Project of AAAS investigate the veracity of reports indicating attacks on hospitals in five cities across Syria. AAAS acquired imagery of hospitals in the cities of Aleppo, Douma, Homs, and Tafas. The most severe damage observed occurred to Amal Hospital, located in the city of Homs, which has been one of the cities most affected by the ongoing civil war. Damage was apparent in the area surrounding the hospital in the months prior to its complete destruction in July 2012 and further damage to the area was observed afterward. The other hospital that AAAS was able to confirm sustained damage was Zahri Azrak Hospital in Aleppo, another city heavily impacted by the ongoing conflict. Satellite imagery confirmed reports of damage to this hospital. While no damage was visible to Hamdan Hospital in Douma, imagery revealed severe damage to buildings across the street from the hospital. Finally, AAAS was not able to confirm
reports of damage to the National Hospital located in Tafas or to assess the status of the hospital in Idlib, due to insufficient imagery.