INTERNATIONAL HUMANITARIAN LAW & THE AERIAL BOMBARDMENT OF YEMEN

A study of the contribution of online open source investigations

A joint publication from Global Legal Action Network (GLAN) and Bellingcat
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Siobhán Allen, Dearbhla Minogue, Ioannis Kalpouzos

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Bellingcat is an independent international non-profit collective of researchers, investigators and citizen journalists that specialises in online investigations, specifically fact-checking and analysing open source information including audio-visual content. https://www.bellingcat.com/

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# TABLE OF CONTENTS

**Executive Summary** .......................................................................................................................... 1

**I. Introduction** ...................................................................................................................................... 2
   A. This Report in Context .......................................................................................................................... 3
   B. Information About the Yemen Project: Phase I ................................................................................. 4
   C. Information About the Yemen Project: Phase II ................................................................................. 5

**II. What is OOSI?** ............................................................................................................................... 7
   A. Terminology ......................................................................................................................................... 7
   B. Verification Techniques ......................................................................................................................... 9
   C. Uses for OOSI ....................................................................................................................................... 12

**III. International Humanitarian Law** ................................................................................................. 13
   A. Principles ............................................................................................................................................ 13
      i. Distinction ...................................................................................................................................... 14
         People ........................................................................................................................................... 15
         Objects ......................................................................................................................................... 16
         Direct or Indiscriminate Attacks ................................................................................................. 18
      ii. Proportionality .............................................................................................................................. 18
      iii. Precautions ................................................................................................................................. 19
   B. The Use of OOSI Analysis in Assessing Compliance With These Principles ................................... 21
      i. Objective Facts ............................................................................................................................. 22
      ii. Subjective Facts .......................................................................................................................... 25
   C. Temporal Advantages ....................................................................................................................... 29

**IV. Case Studies** ................................................................................................................................... 30
Assessment of whether aerial attacks have complied with international humanitarian law (IHL) is notoriously difficult without access to classified information from the attacking forces. Through the use of case studies in Yemen, this report demonstrates how online open source investigation (OOSI) involving audio-visual content can contribute critical information capable of advancing external assessments about IHL compliance.
1. Online open source investigation (OOSI) is rapidly becoming a standard component of investigations into violations of human rights and other rules of international law. This report concerns OOSI as a method of fact-finding to aid legal analysis of aerial explosives attacks. Specifically, it explores the information OOSI can contribute to an assessment of whether an attack violated the body of law governing armed conflict — international humanitarian law (IHL).

When it comes to “democratising” representation in accountability efforts, OOSI can be a double-edged sword. On the one hand, it allows any person filming and posting content online to contribute to the evidence base around a given incident. In that sense, it allows for greater representation of ordinary, self-selected people in the evidence generation process. However, on the other hand, OOSI when carried out from centres of privilege far from the affected place by people with no connection to that region or country can risk exacerbating an already extremely serious problem of lack of representation of affected people in their own fight for accountability – to give it its blunt characterisation, “white saviourism.” It would be morally wrong and logically absurd to think that OOSI conducted by outsiders could or should be considered an alternative, or even an equivalent, to on-site documentation by trained investigators from the region in question with their knowledge of the language and culture and, more importantly, their ownership over their own accountability efforts.

For the avoidance of doubt therefore, we wish to be clear that nothing in this report is intended to suggest that OOSI can replace or eclipse actual on-the-ground investigation or to diminish the wholly central and primary role of local investigators in documenting events in their own countries. Equally, we recognise that OOSI is of use to local investigators as well as international ones, either to supplement on-site investigations or where access is made impossible due to the hostilities.
A. This Report in Context

2. The armed conflict in Yemen, which is still ongoing, has caused one of the world’s gravest humanitarian crises. It has led to a significant loss of life, the extensive destruction of civilian property, the widespread collapse of the country’s economy, and starvation. The war is being fought primarily between the internationally recognised government of Yemen under the leadership of Abdrabbuh Mansour Hadi and the Houthi military forces (also known as Ansar Allah).

3. A campaign of aerial bombardment, ongoing since March 2015, has significantly contributed to the humanitarian crisis. The air campaign is conducted by a group of mostly Arab states, forming what is usually referred to as the Saudi- and UAE-led coalition (SELC/the Coalition), on behalf of the Yemeni government. The SELC has been supported by third states, including the United States of America and the United Kingdom, through arms sales, technical assistance, refueling, intelligence-sharing and training.

4. The extent of the aerial bombardment, its grave consequences and the actors involved render it an important case study on how open source information can contribute to the investigation of potential violations of applicable international law. This is not least because the States involved in the transfer of weapons to the SELC are signatories to the Arms Trade Treaty (ATT). The ATT requires that contracting States refrain from authorising weapons exports where the State determines that there is an “overriding risk” of the weapons being used to commit or facilitate “a serious violation of international humanitarian law.”

5. The SELC’s failure to comply with IHL has been documented by a range of credible local and international human rights groups, who have investigated hundreds of incidents in which civilians were killed and injured and in which civilian property was destroyed and damaged.

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2. The United Nations Security Council’s Panel of Experts on Yemen has published yearly reports which are available at: https://www.un.org/securitycouncil/sanctions/2140/panel-of-experts/work-and-mandate/reports; A United Nations Group of Eminent International and Regional Experts on Yemen also presented yearly reports to the Human Rights Council between 2018 and 2021, see: https://www.ohchr.org/Documents/HRBodies/HRCouncil/GEE-Yemen/A_HRC_42_CRP.1.PDF, at paragraph 912 and https://www.ohchr.org/Documents/HRBodies/HRCouncil/GEE-Yemen/A_HRC_45_CRP.7-en.pdf, at paragraph 61. See also The Starvation Makers and the reporting of Mwatana generally at www.Mwatana.org; Civilian causalities and air raids classed according to their status before the war are monitored on an ongoing basis by the Yemen Data Project (available at https://yemendataproject.org/).

3. See, for example, The Starvation Makers; background section on the current conflict begins at p. 52.


5. The Coalition is comprised of Saudi Arabia, the United Arab Emirates, Bahrain, Sudan, Kuwait, Qatar (until 2017), Egypt, Jordan and Morocco.


7. The USA has signed, but not ratified, the Treaty.


10. See footnote 4.
Yet, efforts to secure arms trade suspensions under the ATT have been hampered by States’ reliance on the fact that, as shall be seen below, alleging civilian harm is only one component of establishing a violation of IHL.  

**B. Information About the Yemen Project: Phase I**

6. In 2018, GLAN commenced a project aimed at promoting accountability for Western involvement in alleged serious violations of IHL in Yemen. In addition to working with Yemeni human rights investigators to develop and deploy legal strategies, a significant focus within this work was the exploration of the evidentiary potential of open source digital content. Around the same time, Bellingcat had decided to focus resources on investigating alleged atrocities taking place in Yemen, in addition to harbouring an interest in ensuring that their work was fit for judicial fora. The two organisations thus established the Yemen Project, an exercise aimed at developing a replicable methodology for locating and preserving open source material which could be of evidentiary significance in the fight for legal accountability for atrocities in Yemen. GLAN contributed legal analysis and recommendations, while Bellingcat was to be responsible for carrying out the investigations.

7. The project’s inaugural event took place in January 2019. Supported by the *New York Times* and Channel 4, a four day “hackathon” took place at the King’s College Policy Institute in London. Over thirty investigators, experts in OOSI, followed a draft methodology of online discovery and preservation to begin investigating dozens of selected airstrikes that took place in Yemen, starting from the beginning of the current hostilities in 2015. The project’s objectives were two-fold: firstly, to develop and trial this dedicated methodology which would increase the reliability of the information as evidence in legal processes; secondly, to generate useful, informative data on the conduct of the conflict in Yemen. Online investigators trialed the methodology of online discovery and preservation and began investigating dozens of airstrikes, starting from the beginning of the SELC’s intervention in the war. Over the following year, Bellingcat analysts gradually continued the work that began with the hackathon, releasing public reports of individual strikes on a dedicated website.

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11. See, for example, the Divisional Court judgment in *R (Campaign Against Arms Trade) v. Secretary of State for International Trade* [2017] EWHC 1726 (QB). The judgment was overturned on appeal for other reasons, (see [2019] EWCA Civ 1020) but the Court’s deference to the Defendant on the basis of the government’s access to classified information would persist in any later litigation, available at: https://caat.org.uk/wp-content/uploads/2020/09/2017-07-10.judgment.pdf.

12. GLAN’s Yemen case page is available at: https://www.glanlaw.org/yemen.

13. See: https://www.glanlaw.org/single-post/2019/02/03/GLAN-and-Bellingcat-run-open-source-intelligence-hackathon-on-air-strikes-in-Yemen and https://www.glanlaw.org/opensourceyemen. The event was attended by a range of world-leading open source investigators who devoted their time and skills to trial the methodology and investigate incidents which caused civilian harm.
C. Information About the Yemen Project: Phase II

8. As noted above, the methodology, hackathon and Yemen Project reports were part of an exploratory exercise to establish a practicable system for Bellingcat investigators to ensure their investigations could, in the future, contribute to justice and accountability efforts. The second phase has involved the following components:

- A comprehensive and wide-reaching review by student members of Harvard Law School’s Advocates for Human Rights, under the direction of Dr Ioannis Kalpouzos, of the reports and what they reveal about OOSI’s potential to contribute facts to IHL investigations (OSI & IHL Review).
- A retrospective review of the methodology and the reports, taking into account the OSI & IHL Review findings, in conjunction with legal practitioners in the United Kingdom (the Internal Review), as a result of which some amendments to the methodology were made.
- The methodology and many other aspects of the project were tested as part of a mock court exercise which litigated the admissibility in the English courts of a piece of video evidence located by Bellingcat (the Mock Hearing). Some final amendments were made to the methodology to reflect what was learned through the Mock Hearing. As noted above, the updated methodology is now available online and preparations are in progress for a second round of investigations to be conducted according to the revised methodology.

14. Dr Ioannis Kalpouzos is a co-founder of GLAN and a Visiting Professor at Harvard Law School specialising in public international law, international law, the law of war and human rights law. The students participating in the review were Anoush Baghdassarian, Ryen Bani-Hashemi, Allison Beeman, Niku Jafarnia, Delphine Rodrik, Madhulika Srikumar, Clara von Thungen and Parker White.

15. See Putting Principles into Practice: Mock Admissibility Hearing on Open Source Evidence – Part 1, The Hearing, 19 February 2021, available at: https://www.youtube.com/watch?v=sdq_m2P0xVd w&t=289s; and Putting Principles into Practice: Mock Admissibility Hearing on Open Source Evidence – Part 2, The Judgment, 16 March 2021, available at: https://www.youtube.com/watch?v=-yVgbKTEMM& t=3s. GLAN has published a report setting out and analysing the findings of the exercise, see: Dearbhla Minogue and Síobhán Allen, Putting Principles Into Practice: Testing Open-Source Video as Evidence in the Criminal Courts of England and Wales, 2022, available on our website (the “Mock Hearing Write-Up” hereafter).
This report now presents the findings of the OSI & IHL Review for two main audiences – legal practitioners and investigators – as a further step toward increasing the usefulness of OOSI analyses for legal compliance and accountability. The report discusses how and to what extent OOSI can help in answering the questions posed when determining whether an attack has met the basic principles of IHL: the principles of distinction, proportionality, and the taking of all feasible precautions in attack. It is hoped that the analysis and discussion will prove useful both for domestic lawyers’ understanding of how OOSI can contribute to applied legal analysis and for investigators using OOSI to establish facts relevant to IHL compliance.
II. WHAT IS OOSI?

10. Journalism, intelligence, human rights and law enforcement investigations have undergone a sea change over the past two decades. Whereas investigators in each of these fields have long benefited from the internet, the unprecedented online proliferation of publicly available audio-visual information and other data since around 2005 has meant that a significant additional source of actionable information is now available. Hostilities taking place in every conflict from the Syrian civil war onwards have played out partly online, with witnesses often filming and publishing video recordings of aerial attacks and their aftermaths. Other data such as social media posts, flight and shipping data, weather logs, mapping services, satellite imagery, social media profiles, government databases and other public documents including state media articles and public records, are also now available to be aggregated and studied. This information can significantly build on what is otherwise known about an event, in particular where local and international investigators do not have timely access to the location in question. Crucially, this body of information is not only larger in quantity than pre-social media times but is also of a different character to traditional written reporting, being both granular and examinable in nature.

A. Terminology

11. A number of terms are employed to describe the online investigative work that locates, verifies and interprets this new generation of online content. Open source information (OSI) is a broad descriptor that encompasses publicly available information that any member of the public can observe, purchase or request without requiring special legal status or authorised access. OSI thus includes any public information, and the generality of the term can unhelpfully elide traditional materials such as NGO reports with substantive, examinable content which is the subject of open source investigations per se. A biased media article comprising a single paragraph, a propaganda video, a detailed public witness statement by a reputable NGO, and a meticulously filmed crime scene video posted on Twitter are all “open source”, but only some will be fit to...

16. This is the year in which Youtube and Facebook launched, with Twitter launching in 2006. It is also the year which the Rand Corporation suggests is used to demarcate so-called “first-generation” OSINT (which relied on traditional written materials) from “second generation” OSINT, which incorporates more granular data. See Heather J. Williams, Ilana Blum, Defining Second Generation Open Source Intelligence (OSINT) for the Defense Enterprise, Rand Corporation, 2018, available at: https://www.rand.org/content/dam/rand/pubs/research_reports/RR1900/RR1964/RAND_RR1964.pdf.

17. There are important imbalances influencing the kinds of content appearing online and ultimately represented in the OOSI findings. This can relate to geography (attacks in cities are more likely to be filmed and posted online than rural attacks, often due to differences in the availability of reliable internet and factors like population density and poverty); attack type (sexual violence in conflict, for example, is not filmed and posted online); even the language of posting and the use of local idiomatic language can mean that some results “rise to the top” of OOSI analysts’ search results more than others. Responsible international investigators will be aware of such biases and take measures to correct them where possible. For more, see: Yvonne McDermott, Alexa Koenig and Daragh Murray, Journal of International Criminal Justice, Open Source Information’s Blind Spot; Human and Machine Bias in International Criminal Investigations, 2021; See also Alexa Koenig and Ulle Egan, Power and Privilege: Investigating Sexual Violence with Digital Open Source Information, Volume 19, Issue 1, March 2021, Pages 55–84, available at: https://doi.org/10.1093/jicj/mqab014; The issue of bias was also addressed at the Mock Hearing (see paragraph 8 above).

be relied upon, in particular in a court of law. It is therefore beneficial to adopt terminology which properly describes the practice and subject-matter of open source investigation.  

12. Bellingcat adopts the term online open source investigation to describe its work, which is specialised and represents an entirely different exercise to the review and aggregation of traditional written material. It is useful to refer to a paper on the subject of open source intelligence (OSINT) by the Rand Corporation which gives expression to what online investigation actually is. Rand differentiates OSI (the catch-all category described above) from open source data, defining the latter, a subset of OSI, as: “material that would be of little individual value in isolation but is of intelligence value in compilation”. This definition recognises that OOSI involves the aggregation and cross-referencing of publicly available information to derive facts that are not established by the individual pieces of information themselves in isolation. It is the exhaustive collection and analysis of these resources, often in combination with each other, that differentiates OOSI from a simple review of written material.

13. To further the distinction of OOSI from traditional media review, we suggest loosely dividing open source material into descriptive content and examinable content, with the latter being the substantive material that, due to its granular and/or examinable nature, is capable of being analysed by investigators to draw new conclusions or cross-check existing ones. In other words, examinable content is material whose value is established by an analysis of the substantive content itself, which is to be contrasted with descriptive or “narrative” content, whose contribution is much more contingent on the trust placed in the author or organisation that published it. Descriptive content could range from a short news article to a lengthy NGO report containing witness interviews, while examinable content could be anything from a Tweet to an entry on Wikimapia or an aftermath video – there is no presumptive hierarchy between the two categories.

14. Furthermore, after the Mock Hearing exercise it became apparent that another term was necessary to describe a specific subset of core content – content which contains recordings of sound and/or photographic images (whether stills or video). We began to use the term online audio-visual content (OAVC) to describe such digital information. This definition is used to differentiate OAVC from other categories of information which would fall within the expanded category of examinable content but which does not contain audiovisual information – for example Wikimapia entries, text-only tweets or weather logs. Although the distinction was primarily due to the specific evidentiary characteristics of OAVC for the purposes of legal admissibility and weight, it is a helpful descriptor for the other contexts in which OSI is being

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19. For more on the introduction of OAVC as evidence, see the report published by GLAN on the Mock Hearing, referred to at footnote 19.
20. The expression OSINT is commonly used as a catch-all to refer to what is in reality OOSI, despite originally being coined to describe open source investigation by intelligence agencies. GLAN and Bellingcat avoid this term so as to detach our work from any association with intelligence agencies.
21. Rand uses the term OSIF to denote open source information.
22. See also Daragh Murray, Yvonne McDermott and Alexa Koenig, Journal of Human Rights Practice, Mapping the Use of Open Source Research in UN Human Rights Investigations, 2022, 1-28, in which types of OSI are distinguished based on two key variables: whether the item is a primary or secondary account, and whether the item is a unique piece of data or a report based on an aggregation of data.
23. According to the methodology, examinable content is: “Online audiovisual content (OAVC), including user generated content (UGC) and audiovisual content posted by organisations, such as NGOs or media outlets; Satellite imagery; Maritime trackers, aviation trackers, weather logs, and other forms of OSI tools and sources; Social media posts without audiovisual content which can be used to assist with OSI exercises such as chronolocation or initial geolocation enquiries, or those which can be analysed in bulk for text patterns; Sites which record user entries like Google Maps and Wikimapia.”
24. For more on OAVC as evidence, see GLAN’s Mock Hearing Write-Up.
described. User generated content (UGC) is a sub-set of OAVC that tends to refer to content generated or gathered by ordinary private individuals. In contrast, OAVC can include video released by the media (in particular local media) and NGOs.

B. Verification Techniques

15. It is important to acknowledge that in the current era of online misinformation and disinformation, much OSI has limited value until it has been verified by analysts. Indeed, it would be irresponsible of any journalist, investigator or lawyer to rely on an item of OSI unless it had been analysed and a proper assessment made of its authenticity. It is not the function of this report to exhaustively list verification processes or tools, however it is helpful to mention some main methods of verification used in the analysis of video content depicting airstrikes.

- **Geolocation**, in general terms, describes the process of identifying the geographical location of a person, object or event. It is achieved by comparing identifiable buildings or landscape features (mountains, roads) and other stationary objects (e.g. signposts, telephone poles, trees) seen in a video with either other videos of the same event or with satellite imagery. Any satellite image that is accessed through a provider of such imagery (such as Google Earth) is accompanied by its corresponding coordinates, allowing a precise location for that image to be ascertained. Therefore, where the contents of a satellite image match an event being depicted in OAVC it is possible to identify the location of the person, object or incident shown on the basis of geographic coordinates. Geolocation can verify that a piece of footage depicts what it claims to depict, by helping to eliminate the possibility that the footage has been staged elsewhere, has been repurposed from another event or has been digitally generated.

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25. A well-known example of the use of geolocation can be seen in the decision of the International Criminal Court in The Prosecutor v. Mahmoud Mustafa Busayf Al-Werfalli ICC-01/11-01/17 to issue an arrest warrant against a Libyan militia commander apparently on the basis of social media evidence. Al-Werfalli appeared in a video posted on Facebook on 23 July 2017 in which he gave the order for a number of prisoners to be executed. The location of the video was found by open source investigators who studied trees, tracks and walls in the videos until they found the location in Benghazi on satellite imagery. Once the location was identified, they were able to view what appeared to be blood patches which corresponded to the configuration of the prisoners as they were executed. The satellite imagery could thus corroborate what appeared to take place in the video. Whilst the videos themselves gave rise to the arrest warrant, the geolocation of the video using OOSI techniques greatly increased their reliability before the court.

26. For a thorough discussion of authentication through open source analysis, see GLAN’s Mock Hearing Write-Up.
Above: An example of geolocation, taken from Bellingcat’s investigation into the attack on the Office of the Presidency in Tahrir, Sana’a City. Note the comparison of identifying features between satellite imagery of the location and content captured in the aftermath of the attack.

- **Chronolocation** is the technique of identifying the exact or approximate date and/or time at which an incident occurred or at which a piece of audiovisual content was created. Satellite imagery can be used to narrow down dates of attacks using images of changing landmarks, and shadow analysis of OAVC can be used not only to identify
the time of day but also the time of year by reference to the path of the sun. As with geolocation, chronolocation helps to verify that video is authentic, matches other information concerning an incident and is internally consistent.

Left: An example of the steps involved in chronolocation, which includes measuring the proportionate length of the shadows cast by objects or people relative to their height. The proportionate length is then entered into a tool called Suncalc, which can give an approximate time of day.

• Other visual examination for internal and external consistency is a crucial part of the verification process. Analysts typically break a video into frames and methodically examine the content to check for inconsistencies and even so-called “artefacts of manipulation”, indicative of digitally-generated manipulation.

• Finally, source assessment can be a crucial component of authentication. The reliability of the online source of an item of OAVC can be relevant (though not necessarily determinative) to an assessment of whether the content is authentic.

16. Performing such verification on multiple items of OAVC allows them to corroborate and reinforce each other, forming what can be termed a “corroborative jigsaw”, with individual items of evidence serving to cross-authenticate each other.

27. See BBC Africa Eye OOSI investigation into the murders of a woman and her children in Cameroon, to which Bellingcat and Amnesty International contributed: https://www.bbc.co.uk/programmes/p0707w39.
C. Uses for OOSI

17. This report is intended to assist those engaged in the main disciplines for which OOSI as it pertains to IHL can be useful. They are:

- Investigative journalism;
- Assessments of aerial attacks (after-action strike analyses) by state agencies, including intelligence and military actors;
- Investigations by human rights organisations, both national (e.g. state-mandated human rights bodies) and international (e.g. United Nations bodies), and non-governmental; and
- Judicial and quasi-judicial proceedings such as administrative reviews of arms licensing decisions, criminal prosecutions and parliamentary reviews.

18. The treatment of OOSI as a source of facts will differ depending on the purpose of the investigation. Thresholds for introduction into judicial proceedings are far higher than, for example, the threshold at which information would be considered worthy of note to intelligence services or of foreign ministries conducting background research. For the latter two groups, the net can be cast wide, with flexibility as to what significance is drawn from what is shown in OOSI material. For example, as mentioned above, many States which supply arms to third countries are obliged to assess the risk that the recipient might use those weapons in violation of IHL. It is open to State agencies to use OOSI to investigate attacks carried out by the recipient State, and to compare the results of those investigations with any representations being made by the recipient State. Given that no judicial - or even quasi-judicial - determination is being made, but rather a risk assessment involving a much lower threshold, the investigators in this context can more freely review and draw conclusions from any OOSI content.

28. If online content is intended for judicial proceedings, a far-reaching set of considerations must be taken into account so that the evidence can withstand the rigorous testing imposed by a court setting. See, for example, the Mock Hearing, in addition to the Berkeley Protocol.
III. INTERNATIONAL HUMANITARIAN LAW

19. To fully appreciate the contribution that OOSI can make to legal analyses of aerial attacks, it is necessary to be aware of the relevant legal framework and its application in practice. This next section provides a foundation in the relevant principles of international humanitarian law (IHL).

A. Principles

20. International law arises from five sources as set out in the Statute of the International Court of Justice. The two salient sources for the purposes of this report are treaties between States and customary international law (CIL), which is derived from the practice of States. Legal obligations can be established by treaties which apply only to participating States, but they can also “crystallise” into CIL through widespread and consistent State practice, at which point they apply universally. According to an authoritative study by the International Committee for the Red Cross (ICRC), this has taken place for the main principles of IHL.

21. It is worth noting at the outset that IHL draws a distinction between international armed conflicts (IAC) and non-international armed conflicts (NIAC). The conflict in Yemen, being fought primarily between the internationally recognised government of Yemen and the Houthi armed group, is classified as a NIAC. The SELC and any other States have become involved at the invitation of the Yemeni government and thus, despite their defining role, their participation does not change the classification of the conflict as a NIAC.

22. Serious violations of IHL, when committed with intent, attract individual criminal liability as war crimes and are governed by international criminal law (ICL). The discussion in this report is concerned with the factual contributions OOSI can make to an understanding of IHL compliance, and does not extend to criminal infringements. While the same underlying facts would be relevant to both IHL and ICL analyses, there are important legal and evidentiary differences to consider, but those are beyond the scope of this report.

23. At the heart of IHL is the balance between military necessity and civilian protection. Decisions to launch attacks, and any assessment of them thereafter, must be guided by the following principles of IHL:

- Distinction: when identifying targets, parties to an armed conflict must distinguish between civilian and military objects.
- Proportionality: attacks which are expected to cause civilian harm that is excessive in relation to the anticipated military advantage are prohibited.

29. Statute of the International Court of Justice, Art. 38.
32. The most significant treaty is the Rome Statute of the International Criminal Court, which, in article 8, sets out the war crimes subject to the jurisdiction of the Court. The Geneva Conventions and API also create criminal offences of so-called “grave breaches” of certain of their provisions, as set out in summary here. War crimes also exist in CIL (see ICRC Study, Rule 156) and via national legislation in domestic jurisdictions.
• **Precautions:** parties must take all feasible precautions to protect from harm, and minimise harm to, civilians and civilian objects.

24. Legal principles of IHL regulate both IAC and NIAC, binding state armed forces and non-state armed groups; and prohibiting – absolutely – the direct targeting of civilians and civilian objects, failing to discriminate between civilians and members of the armed forces, and conducting attacks which cause disproportionate civilian harm. Yet, in many instances the discretion inherent in making targeting decisions and the unavailability of classified information can make it exceptionally difficult to identify with any precision when exactly the line has been crossed between lawful and unlawful targeting.

25. A major challenge for enforcement is the fact that any assessment of compliance with, or breach of, IHL is always highly context-dependent. For example, where an object has been targeted, an IHL assessor will need to consider the subjective understanding of the commander at the time of the decision to strike – as opposed to focusing solely on the consequences of an attack or the purely objective circumstances. A further significant roadblock is that this subjective information is, by default, classified – leaving external IHL assessors “in the dark” about key features of the decision-making process that led to attacks causing civilian harm. These complicating aspects of the rules and their application may be an obstacle in reaching legal conclusions, but an understanding of them can guide the course of online investigations towards information of inferential value in relation to IHL compliance.

26. This section first sets out what the relevant law provides for each of these principles. It then illustrates, through case study examples from the Yemen project, ways in which OOSI can be used to assist the legal analysis of compliance with these principles, in particular to overcome some of the challenges inherent to such analyses.

i. Distinction

27. The principle of distinction applies in both IAC and NIAC, as set out in the 1977 Additional Protocol I to the Geneva Conventions (AP I) relating to IAC and the 1977 Additional Protocol II to the Geneva Conventions (AP II) relating to NIAC. The principle is a norm of CIL and protects both civilian “objects” and civilian people.

28. Article 48 of AP I encapsulates the substance of the principle when it provides,

> “the Parties to the conflict shall at all times distinguish between the civilian population and combatants and between civilian objects and military objectives and accordingly shall direct their operations only against military objectives.”

29. Article 51(2) of AP I goes on to state that “[t]he civilian population as such, as well as individual civilians, shall not be the object of attack, [or the object of a]cts or threats of violence the primary purpose of which is to spread terror among the civilian population.”

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34. AP I, Art. 48.
35. AP I, Art. 51(2).
30. In respect of NIAC, Article 13(2) of AP II uses the same language as Article 51(2) of AP I, and specifically provides,

“[t]he civilian population as such, as well as individual citizens, shall not be the object of attack, [or the object of acts or threats of violence the primary purpose of which is to spread terror among the civilian population.” 36

Above: The street view of a market in Yemen

31. This absolute protection of civilians from attack in IAC and NIAC is established as a norm of CIL, applicable to all States. 37 Civilians are defined as persons who are not members of the armed forces, both under Additional Protocol I and in CIL applicable in IAC and NIAC. 38

Where there is any doubt as to whether a person is a civilian, that person will be considered a civilian 39 and where there are military personnel amongst a primarily civilian group “[t]he presence within the civilian population of individuals who do not come within the definition of civilians does not deprive the population of its civilian character.” 40

36. Id.
37. ICRC Study, Rule 1.
38. AP I, Art. 50. There is a certain noteworthy ambiguity in State practice as to the exact status of members of armed opposition groups, such as the Houthis. Article 43(2) of AP I provides that in international conflicts “[m]embers of the armed forces of a Party to a conflict (other than medical personnel and chaplains covered by Article 33 of the Third Convention) are combatants.” In non-international armed conflicts, members of the armed forces of a non-state armed group are targetable although the term “combatant” is not the legal term of art, because they cannot benefit from combatant status (indeed, it only exists in IAC). In both IAC and NIAC, civilians who are not formal members of the armed forces are targetable only “and for such time as they take a direct part in hostilities”. (See ICRC Study, Rule 6) This has been held to require a civilian directly to cause harm of a military nature, above a certain threshold, specifically designed to support a party to the conflict. The ambiguity arises when attempts are made to define members of armed opposition groups according to the combatant/civilian dichotomy, including in distinguishing military and civilian components of a non-state armed group. As noted by the ICRC Study at Rule 5, “practice is not clear as to whether members of armed opposition groups are civilians subject to Rule 6 on loss of protection from attack in case of direct participation or whether members of such groups are liable to attack as such, independent of the operation of Rule 6. Although the military manual of Colombia defines the term civilians as “those who do not participate directly in military hostilities (internal conflict, international conflict)”, most manuals define civilians negatively with respect to combatants and armed forces and are silent on the status of members of armed opposition groups”. What is clear is that persons who have no connection to the armed conflict are protected at all times in international and non-international armed conflict by the cardinal principle of distinction.
39. AP I, Art. 50(1).
40. AP I, Art. 50(3).
Objects

32. Article 52(2) of AP I applicable to IAC dictates that “[a]ttacks shall be limited strictly to military objectives.” While this rule is not explicit in AP II applicable to NIAC, later treaty law applicable in NIAC has included it, and it is a norm of CIL applicable in both IAC and NIAC.

33. International law provides a definition for the classification of objects as either civilian objects or military objectives. Civilian objects are defined as “all objects which are not military objectives.” In terms of determining whether an object is a military objective, Article 52 of AP I provides:

“In so far as objects are concerned, military objectives are limited to those objects which by their nature, location, purpose or use make an effective contribution to military action and whose total or partial destruction, capture or neutralization, in the circumstances ruling at the time, offers a definite military advantage.”

34. Whilst it may be relatively straightforward to identify objects which by their nature make an effective contribution to military action (for example: military aircraft), most often the application of the law is highly contextual. An assessment can be required of, for example, the military contribution that a bridge, a port or a stretch of road may offer an adversary or the extent to which an otherwise civilian factory’s production capacity is being used to the advantage of the opponent’s military forces. In NIAC, it is common for the non-state armed forces to establish command and control centres in civilian buildings such as schools, rendering them targetable under the above definition (subject to proportionality – see below).

35. Further, classification of an object as a military objective for the purposes of targeting requires establishing that attacking it would offer an advantage “in the circumstances ruling at the time”. An IHL analysis therefore also requires a temporal assessment in addition to assessing the substance of the object itself; for example, an otherwise strategically located and thus legitimately targetable bridge would no longer be a military object if at the time of the attack that location had in fact been abandoned by the relevant armed forces.

36. Finally, the test requires determination of the nature of the “definite military advantage” that would be gained by attacking the object, which needs to be specific and clear, rather than vague, psychological or aspirational.

41. AP I, Art. 52(2) (1977): “In so far as objects are concerned, military objectives are limited to those objects which by their nature, location, purpose or use make an effective contribution to military action and whose total or partial destruction, capture or neutralization, in the circumstances ruling at the time, offers a definite military advantage.”


43. AP I, Art. 52(1).

44. AP I, Art. 52.

45. AP I, Art.52(2).

37. International law affords specific protection to certain categories of civilian object by explicitly articulating that attacks on them are prohibited, for example undefended towns and villages, buildings dedicated to “religion, art, science, or charitable purposes, historic monuments, hospitals, and places where the sick and wounded are collected, provided they are not being used at the time for military purposes,” or “historic monuments, works of art or places of worship which constitute the cultural or spiritual heritage of peoples”, which has been interpreted to encompass educational buildings. Similarly prohibited are attacks on buildings, transport and personnel which use, in conformity with international law, the distinctive emblems of the Geneva Conventions.

38. In addition, the obligation to distinguish and protect civilians extends to a prohibition on attacks against a wider category of “objects indispensable to the survival of the civilian population”, such as foodstuffs, agricultural areas for the production of foodstuffs, crops, livestock, drinking water installations and supplies and irrigation works, for the specific purpose of denying them for their sustenance value to the civilian population or to the adverse Party, whatever the motive, whether in order to starve out civilians, to cause them to move away, or for any other motive.” The exception to this rule is when such objects serve “(a) as sustenance solely for the members of its armed forces; or (b) if not as sustenance, then in direct support of military action, provided, however, that in no event shall actions against these objects be taken which may be expected to leave the civilian population with such inadequate food or water as to cause its starvation or force its movement.”

Direct or Indiscriminate Attacks

39. The principle of distinction is violated if an attack is launched directly and exclusively on a civilian target. In addition, it is imperative to note that the principle is similarly violated if both military and civilian targets are attacked indiscriminately: “indiscriminate attacks” are prohibited pursuant to Article 51(4) of AP I and defined as

“(a) [attacks] which are not directed at a specific military objective; (b) those which employ a method or means of combat which cannot be directed at a specific military objective; or (c) those which employ a method or means of combat the effects of which cannot be limited as required by this Protocol.”

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47. AP I, Art. 59(1).
48. Hague Regulations Article 27. See also GC I 18: “Civilian hospitals organized to give care to the wounded and sick, the infirm and maternity cases, may in no circumstances be the object of attack but shall at all times be respected and protected by the Parties to the conflict.”
49. AP I, Art. 53.
51. ICC Statute 8(2)(b)(xvi) and (e)(ii).
53. AP I, Art. 54(3) in respect of IAC. For example, the UN Fact Finding Mission on the Gaza Conflict, commissioned by the UN Human Rights Council in April 2009, used satellite imagery analysis to document the destruction of industrial infrastructure, food production, water installations and sewage treatment plants. The Mission concluded that the destruction of greenhouse complexes “was not justified by any possible military objective.” Joshua Lyons, “Documenting Violations of International Humanitarian Law from Space” in International Review of the Red Cross (2012) 746.
54. AP I, Art. 51(4).
40. This rule is established as a norm of CIL applicable in both IAC and NIAC. Indiscriminate attacks are exemplified by the practice of “carpet bombing”, used in WWII.

41. Courts have suggested that the indiscriminate nature of an attack, in certain circumstances, including where the attacker’s awareness of “the presence of civilians in the relevant area” is evidenced, may constitute a direct attack against civilians or civilian objects. For example, “the use of weapons that have inherently indiscriminate effects in an area where civilians are present may constitute an attack directed at the civilian population or individual civilians.”

ii. Proportionality

42. The principle of proportionality prohibits attacks where the expected incidental damage to civilians or civilian objects is excessive in relation to the anticipated military advantage. The principle is codified insofar as it applies to IAC in Article 51(5)(b) of AP I as prohibiting “attack[s] which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated.”

43. Although the principle is not codified as applying to NIAC, the ICRC identifies it as being applicable in NIAC as a principle of CIL, on the basis of State practice and statements, the inclusion of the principle in military manuals, and other instruments applicable to NIAC. For example, Article 3(8)(c) of Amended Protocol II of the Convention on Certain Conventional Weapons (CCCW), which applies to both IAC and NIAC, prohibits the indiscriminate use of weapons covered by the treaty, including weapons “which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated.”

44. A proportionality calculation thus comprises three parts: a) the expected harm to civilians or civilian objects; b) the concrete and direct military advantage anticipated; and c) whether (a) is excessive in relation to (b). As with the principle of distinction, there are challenges in assessing compliance with the principle of proportionality from the outside, such as the clear difficulty in proving what the attacking party anticipated would be the effect of the attack in the absence of often confidential military information about the planning process. In addition, the determination of the military advantage to be achieved by the attack, its concreteness and directness, and its weighting against incidental civilian harm, are highly contextual. The assessment may depend on changing dynamics and military calculations and is incapable of relying on formalised values. It will be key to understand the knowledge that the decision-maker had before the attack, including their capacity and willingness to seek the relevant information in order to observe the principle and minimise civilian harm.

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55. ICRC Study, Rule 11.
56. See AP I, Art. 51(5)(a).
57. The Prosecutor v Bosco Ntaganda, Judgment, International Criminal Court, Trial Chamber VI, ICC-01/04-02/06, 8 July 2019, par. 921. See also The Prosecutor v Germain Katanga, Judgment Pursuant to Article 74 of the Statute, International Criminal Court, Trial Chamber II, ICC-01/04-01/07, 7 March 2014, par. 802.
58. AP I, Art. 51(5)(b).
59. ICRC Study, available at: https://ihl-databases.icrc.org/customary-ihl/eng/docs/v1_rul_rule14#refFn_A9C8FAD0_00018; See also Prosecutor v Hadžihasanović and Kubura, IT-01-47-T, Judgment, 15 March 2006, para 45.
60. Art. 3(8)(c), Amended Protocol II CCCW
iii. Precautions

45. The basic rule of distinction requires not only that combatants not try to kill or attack civilians, but also that they try not to attack civilians. The expression of this second component, which is just as critical as the rule against deliberate and indiscriminate attacks on civilians, is achieved through provisions concerning precautions in attack. IHL requires that parties to a conflict take all feasible precautions to verify that targets are military and to protect and minimise harm to civilians and civilian objects when directing attacks. The obligation to take all feasible precautions is a distinct obligation, although it is clearly linked to both the principle of distinction and the principle of proportionality. Both AP I and AP II articulate the principle of precautions as it pertains to IAC and NIAC respectively.

46. Article 57(1) of AP I provides for the principle of precaution in the conduct of attacks: “In the conduct of military operations, constant care shall be taken to spare the civilian population, civilians and civilian objects.”

47. The ICRC identifies the principle of precautions as constituting CIL applicable to both IAC and NIAC. Rule 15 of the ICRC’s CIL states:

“In the conduct of military operations, constant care must be taken to spare the civilian population, civilians and civilian objects. All feasible precautions must be taken to avoid, and in any event to minimize, incidental loss of civilian life, injury to civilians and damage to civilian objects.”

48. Rule 16 sets this obligation within the context of the obligation to respect the principle of distinction, providing that “[e]ach party to the conflict must do everything feasible to verify that targets are military objectives.”

49. The principle of precautions includes the following obligations, which are important to distinguish from one another:

- to “do everything feasible to verify that the objectives to be attacked are neither civilians nor civilian objects and are not subject to special protection”, e.g. cultural objects;
- to “take all feasible precautions in the choice of means and methods of attack” in order to avoid or minimise civilian harm;
- to refrain from deciding to launch any attack which may be expected to violate the principle of proportionality;
- to cancel or suspend an attack “if it becomes apparent that” the principles of distinction or proportionality may be violated;

62. AP I, Art. 57(1).
65. AP I, Art. 57(2)(a)(i).
66. AP I, Art. 57(2)(a)(ii). In addition, according to Art. 57(3), “[w]hen a choice is possible between several military objectives for obtaining a similar military advantage, the objective to be selected shall be that the attack on which may be expected to cause the least danger to civilian lives and to civilian objects.”
67. AP I, Art. 57(2)(a)(iii).
68. AP I, Art. 57(2)(b).
and to offer “effective advance warning...unless circumstances do not permit”.69

50. The law requires “all feasible precautions” to be taken. Feasibility in this context has been interpreted by many states to mean “that which is practicable or practically possible, taking into account all circumstances ruling at the time, including humanitarian and military considerations.” 70

51. Whilst the obligations set out above inherently contain margins of discretion in respect of the decisions to be made, the upshot is that military commanders have an obligation to do everything they can to acquire relevant knowledge and, based on that knowledge, avoid and minimise civilian harm. The obligation is therefore relevant in the context of, for example, intelligence gathering, weapon selection and choice of timing of an attack. In practice, this may translate to an obligation to consult available maps, lists and intelligence sources (to include classified sources such as aerial reconnaissance and human intelligence, in addition to open sources) to identify the existence of civilian objects, like a school or a hospital, in the vicinity of a military objective, and, if a military target is identified, to select a weapon and time of attack that would cause the least damage, for example outside school hours.

52. The only limitation to the obligation to take precautions is feasibility. As noted above, this has been interpreted to take into account military advantage considerations. The level of precautions necessary is more at issue when time-sensitive targets are involved, for example when a high value military leader is suspected to be present at an identified location. In that case, the commander must verify that the target is in fact present, conduct a civilian harm assessment, and, if the proportionality rule does not require that the attack be cancelled, take steps to minimise any expected civilian harm. The way the precautions obligation is discharged will also depend on the nature of the attack, with militaries making a common distinction between “deliberate” (or “pre-planned”) and “dynamic” strikes.71 A number of “sliding-scale” factors affect what is considered feasible, and are best understood via the “military advantage” variable. For example, if the target is suspected to be engaged in the preparation of an imminent attack or is even expected to flee, the military advantage in attacking without waiting increases, diminishing what precautions are feasible with respect to the fleeting nature of the target. Importantly, if there is doubt as to whether the target is in fact present, this diminishes the anticipated military advantage associated with the attack, rendering it less justifiable to proceed with the attack without taking precautions that minimise casualties (for example by waiting for a smaller weapon to be prepared or by waiting until civilians vacate the area).

69. AP I, Art. 57(2)(c).
See also Article 3(4) of Protocol II, annexed to the Convention on Certain Conventional Weapons.
71.  This is a distinction which is common to the procedures of NATO forces and has been adopted by the SELC. Deliberate, or “pre-planned” airstrikes are those for which there has been a full vetting process with the benefit of sufficient time to carry out an extensive verification process. “Dynamic” strikes are those undertaken under some time pressure due to the emergence of a target which is seen as a fleeting threat or opportunity, but which still have to go through certain pre-defined stages of verification and assessment. A third category, “combat engagement”, takes place when the immediacy of the engagement does not allow for either the deliberate or the dynamic process. See North Atlantic Treaty Organization, Allied Joint Doctrine for Joint Targeting, AJP-3.9 (n.p.: NATO Standardization Office, 2021), p. 26, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033306/AJP-3.9_EDB_V1_E.pdf.
53. Some states have gone so far as to argue that to the extent that an attack is not disproportionate as a matter of law, there is no standalone obligation to take extra precautions to minimise casualties. However, on a plain reading of the law, it is clear that the precautions obligation is designed to apply on a “constant” basis, and, taking into account the overall purpose of this body of law, any such purported limitation to the precautions obligation is not sustainable. If an attack would be proportionate but there are feasible steps that could be taken to minimise civilian harm, they must be taken.

54. An analysis without access to the full factual matrix surrounding an attack, and in particular the nuances of a feasibility assessment, thus clearly presents challenges. However, as set out in the case studies below, OOSI can help to mitigate some of these challenges.

B. The Use of OOSI Analysis in Assessing Compliance With These Principles

55. This section outlines how OOSI can advance the factual basis on which to assess whether an attack complied with the IHL principles introduced above. In practice, an attack which violates IHL will not usually infringe only one rule to the exclusion of others, because the rules are so interconnected. Indeed, the failure to take all feasible precautions may lead to, and reflect, the violation of the cardinal principle of distinction, or, alternatively, may be connected to causing excessive civilian harm and the violation of the principle of proportionality. Consequently, this section does not contain a separate analysis pertaining to each discrete obligation, but rather focuses on what OOSI can contribute to the factual questions which tend to be common to assessments of compliance with the principles as a whole; that is to say, the factual questions common to any comprehensive IHL targeting analysis.

56. The subjective and forward-looking nature of IHL obligations means that establishing the actual consequences of an attack – although absolutely crucial to document - only contributes part of the picture. The final analysis concerns what took place before the attack was launched, which requires evidence of what information the attacker had at their disposal, what efforts were made to obtain information, and the specific details of their calculations.

57. Taking this into account, it can be instructive to separate factual evidence into that which casts light on the attacker’s “subjective” decision-making and that which helps to establish the “objective” facts of the attack, including the consequences. The latter category is often available as the result of on-the-ground investigations into attacks, but the former category can rarely be accessed by those outside the military in question. OOSI can contribute to both categories, but its potential to assist with the “subjective” is one of its singular advantages. Importantly, OOSI’s contribution to both categories generally has the advantage of being immediate, or prompt – in contrast with on-the-ground investigations, which can take days, weeks or even years.

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72. AP I, Art. 57(2)(a)(iii) and (b).
73. This difficulty was highlighted by the Divisional Court of England and Wales in R (Campaign Against Arms Trade) v. Secretary of State for International Trade, [2017] EWHC 1726 (QB). The Claimants relied on a range of traditional NGO reporting which could only demonstrate civilian harm without evidence of the decision-making process. The U.K. government successfully argued that their access to classified information gave them a better understanding of whether the attacks may have violated IHL. Although this judgment was overturned on appeal, the comments concerning the importance of the remainder of the “picture” would persist in any future challenges of this nature.
i. Objective facts – who and/or what, if anything, was struck, where and when did it happen, and who was responsible?

58. At its crudest, OOSI can help an investigator to establish whether any attack or explosion happened at all, in addition to its exact location expressed in terms of latitude and longitude. Where the purpose of the information gathering is high-level monitoring (such as for a government risk assessment, civil society data collection or an intelligence service), this can provide crucial, real-time information about the events unfolding in a given conflict. Even if the OOSI can provide no more information than this, this is still useful. [HOD10007; SAA10012; SAA10010H]

![Image: Above: It was possible to identify the location of an airstrike on the village of al-'Eram using open source photographs and satellite imagery.]

59. For a variety of reasons, the exact location of an attack is a crucial fact in any IHL assessment. Knowing the exact location can assist an assessment of whether the location is in a civilian area and/or how it relates to the location of other known military objects or sites of significant hostilities. In the Yemen Project, the use of geolocation in OOSI investigations often placed airstrikes in areas which, through analysis using platforms such as Google Maps, could be demonstrated to contain densely spaced civilian homes and businesses such as restaurants and shops. [SAN10017] The assessment of OAVC often identified individual businesses and items that appeared civilian in nature, such as restaurants, which could often be connected to a tag on mapping services. [HAJ10003]

60. OOSI can provide real evidence of what structure, objects and people were struck or harmed by an attack. As such, it can assist in the characterisation of the civilian or military nature of such objects or persons. Many Yemen Project investigations focused on attacks which NGOs or journalists found had targeted objects or locations that were not military objectives. Despite the unimpeachable reliability of many NGO and media reports, such written evidence is

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74. Since geolocation is a key part of the verification process, it is unlikely that an OOSI investigation would confirm that a specific attack took place without knowing exactly where it took place.
75. See, for example, the work of the Yemen Data Project and Airwars.
often dismissed or deprecated by governments (not to mention courts)\(^c\) as insufficient to establish the civilian or military nature of a target. This is due to a combination of factors, notably, in the context of judicial assessment, the hearsay nature of such written material, along with allegations that the whole picture may not have been obtained by the NGO (for example where the military target could have vacated the location prior to their arrival). OAVC, which is more immediate, can thus be useful to demonstrate what can be observed at the location as an aid to assessing whether the location was civilian generally, in addition to assessing whether any military presence or objects can be observed at the location. OAVC often shows precisely what was present at the scene in the immediate aftermath – examples in the Yemen Project include market stalls [HOD10006], market produce [HAJ10006], livestock [LAH10001], restaurant signs [HAJ10003] and other civilian items. The importance of this cannot be overstated, in particular where the SELC denies that the targeted location was civilian.

61. OOSI can also assist in the assessment of the scale, type and extent of the damage caused by the attack. This can be particularly relevant to the linking of an attack to a particular party depending on what military capability each party to the conflict has and what weapons they have access to – a crucial component of an investigation where attacks are denied by the party suspected of carrying them out. For example, specific types of structural damage to buildings (such as entry holes in the ceiling or so-called “pancaking”) smoke columns and craters of a certain size can indicate that the weapon used was a large air-delivered munition; in the case of Yemen, only the SELC has the capacity to deliver such munitions [HOD10006]. This has proved to be a very important use of OOSI in the Yemen context, given the number of instances in which the SELC’s denials have been called into question by the Yemen Project findings.

62. OOSI can also be helpful in determining levels of civilian harm, one of the crucial elements of the proportionality calculation, as well as contribute to inferring the commander’s reasonable anticipation of such harm. Assessing the extent of the damage by locating the outermost points of property damage from the impact point (by measuring how far damage can be observed in OAVC and satellite imagery) can allow a blast area to be mapped. The use of munitions with a very large blast area in a clearly and predominantly civilian area may allow a reasonable inference as to what civilian harm the commander anticipated. In addition to being an important facet of the consequences of the attack generally, this can assist with the estimation of the size of the weapon used which can also provide insight as to the party responsible, as per the discussion above.

63. For a variety of reasons, OOSI is not suited to conclusively identifying, verifying and counting civilian casualties. This is a process which must be undertaken by trained investigators with replicable methods for conducting interviews with relatives, medical professionals and consulting official documents such as death certificates. In practice, only some (if any) of the attack’s victims will be captured on OAVC, and in many cases – for example if they are men, who usually comprise the majority of the military forces – it can be especially difficult to ascertain their status as civilian or military. However, OAVC also can nevertheless allow visual examinations of physical characteristics of some of the victims of the attack, including their size and clothing, which can be used to draw inferences as to their civilian or military character.

76. See the judgment of the Divisional Court in \(R\) (Campaign Against the Arms Trade) \(v\). Secretary of State for International Trade, \(supra\) note 11.
Open source investigators often encounter, and verify, footage showing deceased or injured women and children, presumed to not be involved in military activity. They can also uncover imagery of male casualties dressed in civilian clothing, which is at the very least relevant, in particular where the opposing forces are known to usually wear uniform. Descriptions of the casualties is a common feature of OOSI findings [TAI10006, SAA10012]. The reports sometimes note the presence of military personnel in aftermath footage, while noting that they may have attended the scene in response to the attack. Finally, an important point arises in this regard as to the relevant cultural context of any conflict being investigated: in the case of Yemen, it is important for OOSI analysts and IHL assessors to recall that Yemeni men routinely carry weapons as a social custom, which does not in any way indicate their affiliation with an armed group. In the Yemen Project, this is noted each time a man carrying a rifle is observed in the aftermath footage (unless he is wearing military uniform). For completeness, the Yemen Project includes an aggregated range of possible civilian casualties, taken from a range of media and NGO reports. This is not strictly OOSI analysis, being an aggregation of traditional media without any examinable content, however it is an exercise that would be useful for some purposes. Overall, therefore, in ascertaining the civilian or otherwise nature of human casualties, OOSI needs to work with and complement, other evidentiary sources, as well as a contextual understanding of the (cultural) conditions of the conflict.

64. In some cases, OOSI can play a role in confirming or contradicting official statements by a party to a conflict concerning a) the occurrence of attacks and b) facts concerning admitted attacks. Often, in response to demonstrable civilian harm – suggestive of a violation of the principle of distinction – the attacker may counter-argue that civilians were not attacked directly or indiscriminately, but that the primary target of the attack was of a military nature. This, for example, can be a fighter occupying a civilian building or being present in an otherwise civilian location, like a market. Whether a military target was or was not present at the site of an attack can be difficult to establish with absolute certainty, even by on-the-ground investigators. It can be relatively straightforward to answer this question where, for example, a civilian’s house is bombed or where a school is targeted; in these cases, such presence and use could be confirmed through interviews with owners, residents and other individuals. However, the question is more difficult to answer where an attack takes place in a commercial area open to the public, including to military personnel. Such personnel and vehicles can, furthermore, flee before or after the attack, weapons can be moved or can be destroyed in the attack, and other military activities, such as command and control, may only be evidenced by equipment that does not appear obviously military (such as computers). In addition, the attacker can often allege that witnesses either did not know about, or may be withholding knowledge of, military activity at the attacked location (potentially out of fear of the military in control). Given these difficulties even under “ideal” investigatory conditions, this is almost never an area in which OOSI can be determinative. However, it can certainly contribute to corroborating (or contradicting, as the case may be) NGO and media findings about the nature of a particular target. For example, it could simply verify that a location had no immediately apparent military objects in the direct aftermath of an attack. [SAN10017] Although this cannot ‘prove a negative’, it can be relevant, in particular in cases where the SELC has alleged that a particular type of military objective, such as a military vehicle or hangar, was present and is patently not seen in the OAVC. [DHA10002, HAJ10003, SAN10004]
65. OAVC can often depict weapons remnants, and although such moveable objects must be treated with extreme caution by any OOSI analyst, they are usually noted for completeness. Again, depending on the purpose of an investigation, features of OOSI such as this can still be taken into account, albeit with circumspection.

66. In respect of the Yemen conflict, official statements about incidents are often released by both the SELC itself and also the Joint Incident Assessment Team (“JIAT”) — an investigative body launched by the SELC in defence of allegations of breaches of IHL and war crimes in the conduct of aerial bombardment. Significant concerns have been raised in respect of the credibility of JIAT by organisations like Mwatana for Human Rights, Human Rights Watch and United Nations investigatory bodies. The SELC and/or JIAT frequently outright deny that the SELC was responsible for any attack at the location where an incident has occurred. Three recurring themes among JIAT’s published reports are conclusions that a) the SELC was not responsible for the attack; b) the attack was justified; or c) the bomb went off-course. This is an area in which OOSI can make a rich factual contribution, because OAVC repeatedly provides compelling evidence that such statements by JIAT are untrue. These contradictions are extremely important as a reflection of the overall credibility of the SELC, but they also carry further indications about IHL compliance. For example, if an airstrike is not even recorded in the SELC’s logs, this is at the very least a strong indication that it was carried out on a spontaneous basis, without proper civilian harm projections, verification procedures and adequate procedural propriety. Of course, another explanation for such persistent denials of attacks on civilians is that the SELC has carried out intentional attacks on civilians, and is attempting to cover this up.

ii. Subjective facts — what information was, or could feasibly have been, available to the attacker?

67. Although, as noted already, the subjective elements of an IHL assessment are more difficult to evidence, OOSI can also contribute to determining the attacking party’s understanding of the nature of a target in advance of an attack in addition to enabling inferences to be made in respect of the foreseeability of the consequences of the attack. For example, this may centre on the visibility that the attacker would or could have had of the target and, therefore, of the target’s relevant civilian or military characteristics.

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68. This question can be illustrated in relation to the military capacities of the parties involved in aerial bombardment in Yemen. It is a matter of public record that the SELC has access to very high-resolution reconnaissance imagery which is capable of distinguishing adult men from women and children, in addition to identifying weapons and observing behaviour. For example, a leaked US report obtained by The Intercept describes a drone feed depicting the aftermath of a SELC bomb on a tent in which “multiple personnel, to include at least 1 female and 4 children, exited the tent and fled towards a road”. Further, the SELC released, and then apparently deleted, sample reconnaissance footage showing men that it claimed were fighters in very clear detail before being targeted with SELC bombs. In some of the videos, the gender and size of the people in the sample videos was very clear, suggesting that in cases where women and children are present, they would be visible to such reconnaissance sensors. Open source information exists in respect of specific weapons purchases the SELC’s member states have made, and thus there can be inferences made about the specifications of the reconnaissance pods in use by the SELC. Further, where the assessment is being conducted by state parties externally involved in the conflict, the foreign ministries and intelligence services of arms-supplying states would likely have knowledge of the reconnaissance capabilities of the recipient state.

69. This information can be coupled with further information gleaned from OOSI about any physical characteristics of the people or location which would be visible from the air. This includes, where the attack happened wholly or partially outdoors:

• the physical appearance of the people harmed, including their clothing, age and gender and whether they were carrying weapons;
• what the people were doing, for example, moving between market stalls;
• what other objects were present, for example market stalls, civilian cars, livestock;
• what clear markings of protected status were present, for example red crescents and how close they were to the point of impact; and/or
• what the general area looked like from above, for example whether it was clustered with houses, shops or other civilian or military structures.

70. A particularly stark example of this is seen in incident SAN10017, in which an item of OA VC actually captures a second-wave attack while civilians are attempting to rescue a young casualty, who may be a child. This video was the subject of the Mock Hearing, referenced above. In the video, the people appear clearly to be civilians (a woman in a full-length black abaya and a man in a blue office suit), and the skies are clear, allowing for an inference that the attacker was able to obtain a clear picture of the scene before launching the second airstrike.

71. Another feature of OOSI which is relevant to subjective questions of knowledge is the location of the impact, usually denoted by a crater. In many of the cases examined in the Yemen Project, the craters are located in open-air spaces where civilians were circulating. This, when coupled with a presumption that high resolution reconnaissance was available, allows for inferences that the people were visible and that the attacker knew they were launching a munition at a group of civilians.

72. Furthermore, OOSI that shows the exact location of the crater or impact point can allow for an estimation of what was the expected blast area prior to the attack based on the known blast radius of the types of munition that are known to be in the arsenal and use of the party, as in the case of the SELC. For example, in relation to the Mk 82 aircraft bomb (the smallest munition known to be in common usage by the SELC), “[t]he peak overpressure reduces to 34 kPa at a distance of 31. Assuming that the point of detonation is the centre of a circle, a radius of 31 m produces a circle with an area of 3019 m². Within this area, a Mk 82 aircraft bomb will cause the collapse of most buildings, severely damage heavily built concrete structures and produce injuries to all persons present, killing the majority of them.” Note also that this only refers to the radius within which the peak overpressure remains at the level at which “injuries are universal [and] fatalities are widespread.” Within a wider radius as the overpressure reduces, “serious injuries are common and fatalities may occur [and] residential structures collapse.” This assessment therefore goes to the question of the foreseeability of the extent of the damage caused by an attack, which is a key feature of an analysis of what civilian harm was expected by the attacker. In the cases of incidents where the impact location is in the centre of a bustling civilian area, it is only logical that the attacker would have known that all of the people within the lethal blast area would be killed, and that people and property within a much wider, non-lethal blast area would be harmed. Such a scenario may allow an inference of a complete absence of an effort to distinguish between civilian and military targets, rendering the attack indiscriminate. Even if the argument can be made that the primary target was of a military nature, such analysis would allow inferences in respect of proportionality. While the OOSI analyst, as discussed, will not know the value of the “counterweight” – being the concrete and direct military advantage anticipated by the targeting of a military object that has been claimed to be present – the analysis will provide an IHL assessor with a significant degree of knowledge on the civilian harm anticipated.

73. Information about the weapons available to the SELC may contribute further information for IHL purposes. For example, it is known that the SELC uses 500 lb, 1,000 lb and 2,000 lb bombs. In the case of the Mastaba bombing, [HAJ10006] the SELC used two 2,000 lb bombs, whose blast area is extremely large. Even if the SELC was correct in its assertion that there was a gathering of Houthi recruits at the location, at whom the attack was targeted, it was not necessary to eliminate them using such large munitions where the already very wide blast area of the 500lb bomb would have sufficed. This raises an important aspect of the relationship between the concurrent obligations included in the principle of precautions to take those precautions necessary to minimise civilian harm and to cancel all disproportionate attacks. Even if the use of a 2,000 lb bomb to kill the recruits was proportionate, but a 500lb bomb would have

80. Each munition in use by the SELC (ranging from 500lb to 2,000 lb laser guided munitions) has a known lethal and non-lethal blast area. This can be coupled with the presumption that the attacked location is the intended object of the attack, given the extremely effective satellite and laser guidance systems employed by the SELC.


82. Id, at page 47.
effectively achieved the same result, the SELC has failed in its obligation to do everything feasible to minimise civilian harm by unnecessarily selecting the larger bomb. Although they will not have breached the proportionality rule, they will have breached the rule obliging them to reduce civilian harm where possible. On the other hand, if either the 500lb or the 2,000 lb bomb was expected to cause disproportionate civilian harm and no smaller munition is available, in order to comply with their IHL obligations the SELC would have to cancel the attack entirely, because the unavailability of the correct weapon cannot absolve the attacker of their proportionality obligations. It does not matter that this would allow the military target, the Houthi recruits, to escape.

74. To the extent that an OOSI analysis can identify the weapon used, it can also use the known margin of error of that weapon to help determine the likelihood that a civilian target was struck due to a technical error. The SELC’s accountability mechanism, JIAT, very often concludes that attacks that caused grave civilian harm were the result of bombs malfunctioning and missing their intended target, despite the fact that the SELC uses precision-guided munitions with a very small circular error probable (CEP), which invites a presumption that they hit their intended targets. OOSI can provide helpful insights into how plausible it is that an attack was the result of a technical error, given how often it is alleged to have occurred in respect of airstrikes in Yemen.83

75. The party launching the attack often claims, in the alternative, that an attack was mistakenly launched on the basis of faulty intelligence. This has, indeed, been the practice of the SELC through the JIAT in the case of Yemen. While OOSI, by definition, would never be able to uncover what classified intelligence led to the decision to strike, it can provide information about how the attacker could have spotted that the intelligence was incomplete or, alternatively, evidence that the attacker did not take the precautions that would have led them to notice civilian presence in the area [SAN10005].84 In this regard, OOSI can uncover satellite imagery demonstrating that the targeted location was clearly a civilian location at the time of or shortly before the attack. It is sometimes clear even on relatively low-resolution commercial imagery that given locations appear civilian in character, for example through the presence of market stalls, civilian cars, market coverings or even densely packed residential houses.

76. Further, OOSI can provide key information about the timing of the attack, which in addition to contributing to other key findings, can also be indicative of the attacker’s efforts to reduce civilian harm. For example, where the SELC targets a bridge during the day on the basis that it is allegedly being used by Houthi vehicles, killing civilians who are crossing the bridge, it might be a clear indication that they did not take the available precaution of waiting until the bridge was less busy to strike, for example during the night.

83. For example, the airstrike in al Raqas, Sana’a, was said to be the result of a technical malfunction (see https://yemen.bellingcat.com/investigations/san2005-sanaa-residential-house-strike). The JIAT report was published after the Bellingcat report was published, and can be found at: https://www.spa.gov.sa/viewstory.php?lang=en&newsid=1992023. For another example, see the airstrike on 12 July 2020 covered by Sky News which killed three women and six children, available at: https://news.sky.com/story/yemen-evidence-of-potential-war-crime-by-saudi-coalition-12083413. JIAT found that the bomb had veered off course by some 780 metres (see https://www.spa.gov.sa/2161522).

84. See https://yemen.bellingcat.com/investigations/san10005-the-al-kubra-funeral-hall-strike in which a funeral was struck despite containing hundreds of civilians. The funeral was advertised on Facebook and it was to be expected that many civilian men and boys would be in attendance.
77. Relevant to IHL analysis are so-called “second wave” attacks – striking a target two or more times within a short period, often killing and injuring individuals whose attendance at the scene was the result of the first strike, such as first responders.85 OOSI can help to identify these cases given that it can confirm both the existence of more than one crater and/or the temporal proximity of two or more airstrikes through other means. Indeed, such second wave attacks can be captured on camera by passers-by who begin to film the aftermath of the first strike, as took place in two of the case studies addressed below. The proportionality calculus must be undertaken for each airstrike in the series, which must take into account the increased civilian presence in addition to the potentially diminished military advantage in striking the same target again. Evidence of second wave attacks can therefore indicate that the attacker either willfully or indiscriminately attacked civilians, including first responders. At the very least, it can suggest that the attacking party failed in their ongoing obligations to take precautions to determine the (changing) nature of the target and to minimise civilian harm and to cancel indiscriminate and disproportionate attacks once the expected civilian harm had necessarily increased.

C. Temporal Advantages

78. Investigations by on-the-ground teams often take place days, months and even years after an incident. To the contrary, items of OAVC can often be captured contemporaneously with the event, or very shortly afterwards. This can be significant, for example, when OAVC captures victims of the attack who are then buried the same day. OAVC can also capture items that are quickly moved but which assist in the analysis of key questions, for example market produce, fabric or plastic scraps from markets stalls, livestock, weapons and vehicles. It can also help to corroborate or contradict the recollections of witnesses as regards the time, location or other details of the attack. Thus, even where an item of OAVC might not be robust enough to stand on its own, it can corroborate other reliable evidence of certain facts such as the occurrence, time or consequence of an attack.

85. Also known by the informal term “double-tap”, this refers to an attack in which two munitions hit the same area in succession, generally with a few minutes between each strike. See for example Ben Norton, Salon, Don’t Shoot the Rescuer: U.S.-Backed Saudi Coalition Likely Targeting Medical Workers with ‘Triple Tap’ Strikes in Yemen, January 23, 2016, available at: https://www.salon.com/2016/01/22/dont_shoot_the_rescuer_u_s_backed_saudi_led_coalition_likely_targeting_medical_workers_with_triple_tap_strikes_in_yemen/.
IV. CASE STUDIES

79. In this section, we provide case study examples to illustrate ways in which OOSI has been used in the Yemen context to assist IHL analysis and draw attention to the areas where it has faced challenges. The investigations cited in this section are the Yemen Project investigations referenced above, conducted by Bellingcat using the process developed pursuant to GLAN’s legal recommendations. For each case, an overview is given of what was reported in the descriptive content, followed by comments on what information of relevance to IHL assessment OOSI could contribute.

CASE STUDY 1
Location: Zabid Market86 [HOD10006]
Date: 12 May 2015

At about 4pm on May 12, 2015, the SELC launched an aerial attack on a crowded market in the Zabid district of Hodeidah.

The NGO reporting on this airstrike established that three munitions had struck the market, with the first two detonating and the third failing to explode. On-the-ground investigations by Human Rights Watch and Mwatana documented dozens of civilian casualties. Human Rights Watch published one photograph of the location, taken on 26 July 2015.

JIAT investigated and concluded that no SELC airstrike took place at this location on this date and therefore the SELC was not responsible for any alleged strike on Zabid market.

Above: An example of the identification of satellite imagery depicting market stalls taken two months before an airstrike on a market in Zabid, Hodeidah, compared with OAVC showing the market stalls shortly after the attack. This can enable analysis of whether the attacker knew or could have known that the object of the attack was civilian.

86. https://yemen.bellingcat.com/investigations/hod10006-the-zabid-market-strike
**OOSI’s contribution to factual basis for IHL assessment**

This case study demonstrates the capacity of OOSI to counter an overall denial by the SELC that it conducted the attack. Although reliable NGO reporting found that the attacks were carried out by the SELC, no weapons remnants nor craters were discovered, allowing for the theoretical possibility that the explosions were not the responsibility of the SELC.

Bellingcat located one video, filmed from approximately 500m south of the attack site, which showed two large, discrete smoke columns appearing to originate from the direction of the destroyed building. Another video showed the destruction to the market building, which displayed specifically the phenomenon known as “pancaking”, in which the floors of a building collapse on top of each other after the building’s walls and support structures are blown from the inside out. A weapons expert instructed by GLAN concluded that the combination of the size and shape of the smoke columns and the ‘pancaking’ meant that the cause of the damage was more likely to be air-delivered 500-lb (or larger) bombs than any other possible cause, such as shelling or the explosions of a weapons cache, thus linking the attack to the SELC.

*Above: An example of smoke plumes being visible in OAVC, which could be analysed by a weapons expert to assist in identifying the munition. Taken from the investigation into the attack on the market in Zabid, Hodeidah.*
OOSI analysis also supported NGO evidence that the object of the attack was a civilian market. For example, a video posted online a month after the attack showed the remains of many small stalls, and other details from inside the remains of the building were suggestive of a restaurant. The Bellingcat report notes that there were references in the NGO evidence to the presence of Houthi fighters who had purchased some market produce and left prior to the attack. The report then analyses the OAVC, stating:

“None of the videos or photos of the aftermath depict anyone with a weapon or any obvious military personnel. Dozens of casualties are depicted in open sources, including both wounded and clear fatalities, many of whom have clearly suffered extreme physical trauma. These casualties appear to be almost entirely male, ranging from boys to old men.”

As noted above, the absence of evidence is not necessarily evidence of absence, but the OOSI nonetheless contributes further pieces of information to the overall picture when assessing the incident and IHL compliance.

OOSI also made an important contribution to the subjective question of what the attacker knew about the target. Geolocation allowed for the discovery of satellite imagery of the market, which – even at resolutions far lower than that which is known to be available to the militaries in question – showed clusters of market stalls. The most recent satellite image was taken in March 2015, however the aftermath video verified by Bellingcat showed that these small stalls were indeed present at the time of the attack. This allows for a clear inference that the attacker, were they to have reviewed the physical appearance of the location from above, would or should have known it was a market. Indeed, noting that these market stalls are in the open air, it is highly likely that the civilians moving between the stalls would have been visible on a high-resolution drone feed. This suggests that the attacker either a) knew of the overall civilian nature of the location, and the presence of civilians, and launched an attack either directed at civilians or failing to discriminate between civilians and fighters or that was clearly disproportionate; or b) failed to take relevant, feasible and easily available precautions to that effect.

Finally, the geolocation of the market and the identification of the weapon can allow for the lethal and non-lethal blast areas of the bomb to be mapped onto the overall area of the market. This allows inferences to be drawn about the level of civilian harm that would be expected by a commander making the decision to launch such a bomb at a busy market of this size.
On 6 July 2015, two SELC bombs landed on a busy livestock market in Lahj governorate, killing at least 50 civilians. NGO and media reporting reliably established that two large explosions took place at the market, leaving 1-2 large craters. The witnesses cited by the NGO reports described planes overhead.

JIAT investigated the incident and found that the nearest SELC airstrikes on the date in question were 7 and 10 kilometres away respectively. JIAT therefore found that the livestock market was not bombed.

**OOSI’s contribution to factual basis for IHL assessment**

OAVC showed scores of dead goats, reinforcing reports that this was a livestock market. Other content in the OAVC, such as market stalls and restaurant signs, also supported claims that the location was a civilian commercial one. A Google Maps image showing services tagged at the location (accessed on 21 Feb 2019) showed a large number of restaurants and other commercial activities. The sizes of the craters seen in the OAVC were consistent with large (500lb-1000lb) air-delivered bombs, linking the attack to the SELC.

Bellingcat noted that there were unconfirmed reports in the descriptive content of Houthi presence near or in the market. OAVC showed many casualties, none of whom Bellingcat identified as having the appearance of being military. Numerous vehicles were depicted in the OAVC, including trucks and SUVs.

Chronolocation appeared to support the claim that the attack happened in the early morning, when the market was being set up. Geolocation of OAVC led to the discovery of satellite imagery clearly showing small stalls. The stalls, in particular those in the middle of the road, can be seen in the aftermath OAVC. Further, the craters were geolocated to two open-air parts of the market, suggesting that the attacker – if they were using high-resolution reconnaissance technology – would have known they were attacking a crowded market.

Inferences can thus be drawn from this information which are relevant to the subjective questions involved in IHL compliance: the contemporaneous presence (and therefore inferred visibility) of market stalls at the time of the attack, the visibility of the market’s customers in the open area that was struck. Further, SELC’s failure to admit responsibility for this attack raises a range of significant concerns.

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On 15 March 2016, two munitions exploded in a busy market at Mastaba, Hajjah governorate, killing around 100 civilians.

NGOs reported that scores of civilians were killed in two airstrikes. Human Rights Watch found remnants of a GBU-31 satellite guided bomb, which consist of a MK-84, 2,000-lb bomb paired with a JDAM satellite guidance kit. Human Rights Watch reported that a team of ITV journalists found remnants of another 2,000 lb bomb, this one paired with a Paveway laser guidance kit.

JIAT claimed that the airstrike targeted a large gathering of Houthi armed recruits. They claimed that the market was only operational on Thursdays, whereas this attack took place on a Tuesday. They also appeared to reject allegations that civilians had been harmed, in addition to releasing a video claiming, using visual aids, that the market was not affected by the bombing.

**OOSI’s contribution to factual basis for IHL assessment**

In this case, the OOSI did not introduce new findings, but played an important role in corroborating NGO reporting.

The OOSI investigation disproved the claims made by JIAT that the market was unaffected by the bombing by comparing the image released by JIAT with the indisputable damage seen in the OAVC. OAVC also showed evidence of fruit on a partially collapsed market stall. Bellingcat’s analysis of the immediate aftermath footage showed large numbers of dismembered bodies, some of whom were clearly children.

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88. [https://yemen.bellingcat.com/investigations/haj10006-the-al-khamis-market-strike](https://yemen.bellingcat.com/investigations/haj10006-the-al-khamis-market-strike)
Geolocation analysis was successfully conducted on the first impact location, which was directly in the centre of the market complex. There was no crater visible in the OAVC to correspond with the second airstrike, although Bellingcat noted that it may have been covered up with earth-moving equipment. From the location of the first crater, however, OOSI could enable inferences to be made about the expected civilian harm, considering the extremely large blast radius of a 2,000 lb bomb. JIAT did not clarify how many Houthi recruits they considered to be present, but in assessing whether there was a military objective, the clearly inevitable extensive civilian harm involved in directing two 2,000 lb munitions at a busy market building could enable an IHL assessor to take a view on the legality of this incident.

Bellingcat noted that the descriptive content contained a range of allegations of Houthi presence, but that OOSI was unable to identify any signs of military presence in the market itself. Bellingcat identified two suspected checkpoints on the road around 450 metres away from the market on either side.
CASE STUDY 4
Location: Mawiyah Fuel Station89 [TAI20001]
Date: 24 May 2019

On 24 May 2019, a large explosion occurred at a fuel station in Mawiyah, Taiz.

There was no detailed international or national NGO report on this incident, although the United Nations Office of the Resident Coordinator and Humanitarian Coordinator for Yemen released a statement which said that “at least a dozen civilians, including seven children, were reported killed ... when a strike hit a fuel station in a district east of Taiz city in Yemen.” The attack was also reported in brief by UNICEF, UNHCR and in more detail by a number of media outlets (see Bellingcat’s list of media sources).

OOSI’s contribution to factual basis for IHL assessment

OOSI contributed significantly to the concrete knowledge base concerning this incident. First, given that all reports of this attack are second-hand (to be contrasted with NGO reports that explicitly state that they conducted on-the-ground investigations), OOSI was actually able to evidence the fundamental fact of the occurrence of a large explosion. The Bellingcat investigation geolocated OAVC to find the now-destroyed fuel station on satellite imagery, which showed its presence on 24 May and its absence on 25 May. Multiple items of OAVC showed that the station itself had been completely destroyed, save for the metal frame which supported the awning.

The OAVC verified by Bellingcat confirmed that there were casualties. As to whether those casualties were civilian, Bellingcat identified imagery of charred corpses whose “size and appearance” indicated that they were children. This is consistent with reporting on the issue of child casualties.

The Bellingcat investigation also revealed what appeared to be a nearby Houthi checkpoint, which was undamaged by the strike. Investigators combined images taken from aftermath video with an analysis of satellite imagery to show that the apparent checkpoint was 25 metres from the fuel station and that there were possible speed-bumps on either side. In addition, the aftermath footage showed several armed men, some of whom were dressed in “military fatigues and [were] wearing military webbing.” However, as noted above specifically in relation to the carrying of weapons in Yemen, an understanding of the relevant culture and context is crucial in assessing what OOSI can tell about an incident. In the context of the Yemeni conflict, it is not unusual for Houthi military personnel to come and inspect the site of an attack, therefore their presence afterwards as depicted in the OAVC is not at all determinative of their presence prior to the attack.

89. https://yemen.bellingcat.com/investigations/ta20001-fuel-station-strike
In this case, it was not possible to ascertain the exact or approximate time of the strike through shadow analysis, although Bellingcat could confirm the date through the comparison of satellite imagery on the morning of the 24th (when it is present) and on the 25th, (when it has disappeared). They also noted that the satellite image from the 24th was captured at 0911 AST, showing that the structure was intact at that time, and the earliest tweet they found depicting an image of the attack was posted at 1402 AST, leaving a time range within which the attack took place that matched the media reports.

This is also an example of successful verification where the main items of OAVC were posted by Houthi sources. As noted in our report in respect of the Mock Hearing referenced above, OAVC from biased and/or unreliable sources can still be reliable evidence; in this case in particular as to the presence of immovable objects such as the destroyed fuel station and the checkpoint.

**Above:** The remains of the fuel station can be seen in the back left, while in the foreground a road, improvised speed-bump and small structure can be seen. Bellingcat confirmed using the TerraServer preview tool that this small structure was present in the most recent satellite imagery, taken on 2018/09/14.
On 4 July 2015, an explosion occurred near a restaurant in Muthalith Ahim injuring and killing at least 65 civilians.

Witnesses told Human Rights Watch that there was a Houthi checkpoint around 50 metres from the location of the market, which was not damaged in the strike.

JIAT investigated and concluded that the location was at the time under the control of the Houthi armed militia and in active use by them as a centre for reinforcement of forces, and thus that the attacked location was a legitimate military target. JIAT further added that there had been a ballistic missile in a hangar and gathering of Houthi forces at the site.

**OOSI’s contribution to factual basis for IHL assessment**

Bellingcat found OAVC corroborating NGO reports that an explosion took place, killing a large number of people who did not appear to be military personnel. OOSI also enabled the geolocation of the crater, which is located on a fork in a road. The intersection contains a number of restaurants, a hospital and a mosque. Specifically, the impact location is equidistant between two restaurants and, in one of the photographs, there can be seen market stalls or benches. This corroborates the Human Rights Watch reporting that the area outside one of the restaurants was being used by traders selling fish, vegetables, call phones, qat and other items.

With the exception of one person filmed in the aftermath who may have been carrying a weapon, all of the other people captured in OAVC were dressed in civilian clothes. Photos taken after the attack revealed a damaged water truck.

All these indications of a heavy civilian presence weigh against the SELC’s claim to have targeted a military objective. Noting the open-air location of the crater and the remains of the market stalls, any analysis of legality would need to consider the visibility of such vast numbers of civilians on a high resolution drone feed. Additionally, the restaurants were tagged in Google Maps, which would have been available to the SELC’s commanding officers.

On 7 May 2018, two munitions successively struck the Office of the Presidency, a government building in a heavily populated central district of Sana’a. The Office of the Presidency and other surrounding buildings were damaged, with reports indicating that up to 6 people were killed, and up to 60 people were wounded. There were no detailed NGO reports into this incident, although the International Committee of the Red Cross and Medicins Sans Frontieres both published statements reporting civilian deaths.

The SELC admitted the attack: JIAT stated that the airstrike targeted high level Houthi military leaders and not civilians. The JIAT report did not acknowledge any civilian harm.

OOSI’s contribution to factual basis for IHL assessment

OOSI was helpful in this case in determining a number of facts relevant to an IHL analysis. First, in respect of the location/object that was attacked. Through geolocation, OOSI was able to confirm that the location targeted was the Office of the Presidency despite the fact that the SELC stated that they had targeted the “Presidential Palace” rather than the “Office of the Presidency”. Whilst it may simply have been an error in the JIAT report, it raised the possibility that the SELC may have confused the two similarly named buildings prior to the attack and thus targeted the wrong location.

Above: A comparison of buildings and structural damage seen in online videos with satellite imagery taken before and after the attack.

OOSI analysis of two archive sources, Wikimapia and Open Street Map, suggested that the Office of the Presidency serves as a civilian government employee facility and does not seem to have a military function. It is also clearly in the commercial centre of Sana’a.

OOSI analysis demonstrated that this attack seemed to have involved a “second wave” strike. Two videos, posted on Twitter and YouTube respectively, showed a second blast occurring in the aftermath of an initial explosion. The Twitter video depicted the second airstrike detonating while civilians attempted to rescue a young casualty. In the video, the skies are clear and the people are dressed in distinctively civilian clothing – the woman in a full-length black abaya and the man in a blue office suit. OOSI analysis thus provided a basis for inferring that the civilians would have been visible to a high resolution drone sensor, if one was being used.

The Bellingcat analysts noted that a UAE-based publication had stated that the attacks targeted Mahdi al-Meshat and Mohammed Ali al-Houthi. Both have made public appearances following the airstrike, suggesting that they may not have been present when the airstrikes took place, given the probability that they would have been killed if they were. Findings such as these highlight that the attacker’s proportionality calculus must not only factor in the isolated military value of the elimination of the target in question, but must also factor in the actual likelihood that the elimination will be successful. If the SELC only suspected, rather than knew for sure, that these two high-value targets were present, the corresponding level of lawfully acceptable incidental civilian harm would be lower.

No military vehicles or equipment are seen in the OAVC, though it is acknowledged that one of the videos in question was published by al-Masirah, the Houthi television channel, who may edit certain features out of propaganda videos. Uniformed personnel appear in OAVC taken after the airstrike – no information is available about whether they attended the scene after the bombings or were there beforehand.

This incident is an important example of OOSI contributing to determining what is known about an airstrike, both in terms of objective facts on-the-ground (the occurrence of the attack; the relevant characteristics of the neighbourhood) and in terms of facts with inferential value for the subjective state of the decision-maker (the presence of visible rescuers in clearly civilian clothing when the second airstrike landed).
CASE STUDY 7
Location: Al Khokha Market [HOD10003]
Date: 10 March 2017

On Friday 10 March 2017 at around 5:30 pm, the SELC launched an airstrike on a qat market in al-Khokha roundabout in Hodeida governorate. Mwatana found that the airstrike resulted in the deaths of 21 civilians including 3 children and injured 7 others. A nearby military camp (about 200 meters away) was targeted with two bombs before the third fell on the market, where people had reportedly fled following the attacks on the checkpoint.

This incident is another example of a case where the SELC denied all responsibility for the attack. JIAT investigated and concluded that the market was not bombed, stating “... on 10th March 2017, the coalition forces bombed a number of legitimate military targets. The closest target was 10 km from Al Khokha city in Hodeida, and the market was not bombed by the Coalition forces.”

OOSI’s contribution to factual basis for IHL assessment

The Bellingcat investigation corroborated reports that a market was attacked, locating and verifying aftermath footage which showed what appeared to be the remains of market stalls and market goods. Geolocation of the footage, including a review of the area on satellite imagery revealed that the location of the strike was a roundabout in al-Khokha which contains, according to Google Maps, a number of civilian businesses such as a restaurant and a hotel. The streets converging on the roundabout contain food markets, mosques and a bakery. Accordingly, the OOSI both corroborated facts established by reliable on-the-ground reporting and, through geolocation, further established a clearer picture of the nature of the target and its potential legal classification.

92. https://yemen.bellingcat.com/investigations/hod10003-al-khokha-market-strike
On 7 October 2015 at around 9.30pm, around 40 civilians were killed when an SELC bomb struck a wedding party in a house in Sanaban village, Dhamar. Residents told NGOs that there were no military targets in the vicinity, and that a fighter jet was circling as the bridal convoy was approaching the village. The attack site was visited by Human Rights Watch and Mwatana, both of whom found that a wedding party was underway when a munition detonated.

JIAT investigated the claim, finding that on 7 October 2015, a group of armed vehicles were targeted on an adjacent road and that no civilians were targeted.

**OOSI’s contribution to factual basis for IHL assessment**

Bellingcat discovered and geolocated footage of the aftermath of the attack which corroborated the NGO reports that most of the victims of the attack were women and children. Further, Bellingcat mapped six cars which were present at the scene, noting that this was consistent with narrative reports that the bridal convoy had just arrived at the house when the bomb struck. Bellingcat analysed the geocoordinates provided by JIAT, noting that they were around 162 metres away from the actual location of the attack.

The OOSI therefore contributed the exact location of the attack (a remote civilian village), in addition to contradicting the SELC’s claim that the convoy was targeted on a nearby road, rather than where it stopped outside the wedding party.

Above: Composite image of the cars at the scene from the aftermath video

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On 8 October 2016, the SELC directed two munitions at a building where as many as 1,500 men and boys were in attendance at a funeral. The attack was investigated in detail by many on-the-ground organisations, whose reports agreed that at least 100 people were killed and hundreds injured. Reports, including by Mwatana, confirm that Houthi commanders and military personnel were in attendance at the funeral, which was for a high profile Houthi figure. The event had been advertised on Facebook. Reports also state that it is culturally expected all men and boys to attend such a funeral (whether they are military personnel or not).

JIAT investigated the incident and found that the SELC had attacked the venue on the basis of faulty intelligence.

**OOSI’s contribution to factual basis for IHL assessment**

This was an airstrike in which significant witness testimony and some audio-visual content was available from NGO sources. That information, as already noted, established the extremely high civilian casualty toll in addition to the fact that the SELC was responsible (which is in any event admitted).

OISI was able to corroborate this information by locating footage of the burning building, of the dead and the survivors, and more. One important corroboration that was found in OAVC was the occurrence of the second attack not long after the first: the second-wave attack was captured on camera from a distance by a member of the public who began to film the aftermath of the first strike. OSI was also able to geolocate the strike and identify a satellite image showing two entry holes in the remains of the destroyed hall.

This is an example of a case in which the SELC’s claim of faulty intelligence can also be interrogated as it pertains to the obligation to take all feasible precautions. JIAT claimed that “a party affiliated to the Yemeni Presidency of the General Chief of Staff wrongly passed information that there was a gathering of armed Houthi leaders in a known location in Sana’a, and insisted that the location be targeted immediately as a legitimate military target. The Air Operations Center in Yemen directed a close air support mission to target the location without obtaining approval from the Coalition command ... and without following the Coalition command’s precautionary measures to ensure that the location is not a civilian one that may not be targeted.” It is apparent from this statement that no precautions were taken to assess the location or what was taking place at the location. For example, if the simplest of precautions had been taken, the commander could have discovered via social media that a funeral was taking place, or if the location had been surveilled for longer or at all, civilians would have been seen entering and leaving the building.

On 24 October 2018, a vegetable washing facility near Bayt al Faqih was attacked with an explosive munition. JIAT investigated this incident and found that the SELC had not targeted the vegetable ‘market’ and that satellite imagery post-dating the allegation revealed no traces of aerial bombardment.

There were no detailed NGO reports of this incident, only media articles and high-level statements.

**OOSI’s contribution to factual basis for IHL assessment**

OOSI determined the location of the attack, in addition to verifying OAVC that depicted casualties in and around piles of vegetables and two large stone troughs of water containing vegetables. Earlier footage of the site in use for the washing of okra was also located. Analysts identified a crater in two independent items of OAVC.

The Bellingcat investigation also located a structure which may be a checkpoint near the road which runs through the location – it is approximately 215 metres from the location of the crater.

The OOSI therefore contributed significantly to the knowledge base concerning this incident. It determined that an explosion had taken place at a vegetable washing facility. Additionally, the presence of a crater supports other reporting suggesting that this was an SELC airstrike.

96. [https://yemen.bellingcat.com/investigations/hod10007-the-vegetable-washing-strike](https://yemen.bellingcat.com/investigations/hod10007-the-vegetable-washing-strike)
CASE STUDY 11
Location: Detention facility, Sana’a97 [SAN10004]
Date: 12 or 13 December 2017

On 12 or 13 December 2017, a series of airstrikes targeted a compound being used by the Houthis to house detainees. This attack was evidenced by media reports, but there were no detailed NGO investigations.

**OOSI’s contribution to factual basis for IHL assessment**

This is an important example of a case where OOSI contributed a great detail to the specifics of what was targeted, and where. Large quantities of OAVC were discovered and geolocated, with Bellingcat breaking down the individual points of impact and damage at the facility, including the specific geolocation of craters. The analysis also clarified that some reports had confused this location with the Presidential Palace, misattributing video of the Presidential Palace attack to the attack on the detention facility.

**Above:** Two satellite images showing the building before (2017/11/18) and after (2018/01/01) the 2017/12/07 airstrike. **Bottom:** Damage to the T-faced building as shown in the Anadolu Agency video.

On 12 May 2015, two buildings in Abs were destroyed, and other buildings damaged, in an SELC airstrike. Many of those detained at Abs prison, which was used to house petty criminals, were killed and injured. JIAT investigated the incident, finding that two weapons depots, 900 and 1,300 metres away from the prison respectively, were targeted, and that the prison at Abs was not affected.

**OOSI’s contribution to factual basis for IHL assessment**

OOSI contributed significant additions to the knowledge base concerning this incident. It geolocated the prison and found aftermath footage, in addition to locating footage from before the incident, confirming its use as a prison as of March 2014. It also located a structure which, according to Bellingcat’s analysis, the SELC may have mistaken for Abs prison. Importantly, it contradicts JIAT’s finding that the prison was not affected.

*Above: Satellite imagery taken on 2017/12/01*

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98. [https://yemen.bellingcat.com/investigations/haj-10005-the-abs-prison-strike](https://yemen.bellingcat.com/investigations/haj-10005-the-abs-prison-strike)
INTERNATIONAL HUMANITARIAN LAW & THE AERIAL BOMBARDMENT OF YEMEN
A study of the contribution of online open source investigations

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