Geospatial dataset and analysis of usability for emergency communications of the official maps of Gaza "Humanitarian Area" and evacuation blocks

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Summary

This repository describes and provides downloadable vector files for three different maps produced by Israeli government institutions indicating the location and extent of the "Humanitarian Area" (HA) in Gaza that forms the centerpiece of Israel's program for citizen protection and humanitarian aid in recent months. These official maps used to guide the Gazans from the areas the IDF calls to evacuate and toward the Humanitarian Area it declares to be their safe destination are inadequate emergency communication measures, ill suited to use of the intended audience, especially in a chaotic low-resource context.

The **first** map, in use since May 6, 2024 in various social media released by the Coordinator of Government Activities in the Territories (COGAT), is a low resolution static image showing the HA superimposed on a basemap showing only targeting/evacuation "blocks" from which civilians were instructed to flee to the HA. The **second** is a contemporaneously released online web map on an Israel Defense Forces (IDF) website pointed to via a QR code sometimes embedded in this static map. The web interface allows panning and some degree of zooming of a map showing the HA and the targeting zone polygons superimposed on a standard OSM vector basemap. The **third** is a sketch appearing as an appendix in the State's response to the Israeli High Court of Justice's June 6, 2024 *order nisi* requiring that it submit a range of further information necessary for the court to establish the full evidentiary basis for its deliberations after three rounds of hearings on a March 18, 2024 petition against COGAT and the government of Israel by a coalition of six Israeli NGOs.[1] This petition demands that the state improve its humanitarian aid and citizen protection practices in the Gaza Strip in accordance with its obligations under international law, both as a party to the hostilities and as an occupying power.

[1] https://gisha.org/en/israels-high-court-issues-order-nisi-in-gaza-aid-access-petition-filed-by-human-rights-organizations/

The sketched map in the State response is not really usable as a map, so the analysis offered here is primarily of the usability of the static and interactive maps within the larger context of the targeting and evacuation procedures in use since December 1, 2023. The extent of the HA differs somewhat between these maps, and the format of each has different uses and limits. The static map can easily be saved for offline use and indicates roughly which block numbers are in and outside of the HA and evacuation areas. However, while convenient for army purposes of aggregate characterization of local populations, these blocks are cadastral units with which Gazans are not familiar, while the low resolution and the rotated orientation make the map almost useless for navigation purposes. The interactive web map has the HA precisely defined against a street with the block polygons precisely denoted superimposed on a standard street maps showing main roads and orienting features. However this requires an active internet connection, the HA polygon is not downloadable, and does not allow sufficient zoom levels and standard satellite or other basemap that would allow real navigation, especially in emergency situations. **Thus, the official maps used over the last half year to guide the Gazan population from the areas the IDF calls to evacuate are inadequate for emergency communication, as are the newer maps showing the humanitarian area designated as their destination**

The use and especially the persistence of these inadequate maps is at odds with their declared intention of facilitating civilian protection. Despite their important role, the IDF has not evolved better versions of and platforms for these. It is unclear whether this is due to a lack of resources, foresight, or relevant expertise, or to a lack of commitment to this purpose. Hopefully the materials and comments here might prompt improvements in the spatial communication offered by official parties or, at least, support efforts by individuals and humanitarian organization to supplement these as needed.

Background and objectives of the maps described and offered in digital form

This document describes and offers downloadable vector files of three versions of official Israeli Defense Forces (IDF) maps of the Gaza "Humanitarian Area" (HA) that serve as the basis for Israel's humanitarian aid plans for Gazan citizen, and of the instructions Gazans are given for emergency evacuation. This follows a similar effort half a year ago (December 4, 2023): "Geospatial dataset of Gaza targeting polygons publicized by the IDF on December 1, 2023", https://doi.org/10.7910/DVN/0HUXOJ). That described and released in downloadable geospatial format the "Block" system polygons that were the

basis for Israel's targeting of areas in Gaza and the emergency calls for evacuation from December 2023 onwards.

This earlier effort was done rapidly, and released on the Harvard Dataverse repository, in order to describe this official spatial information (initially of the targeting polygons and now of the HA) and make the key data polygons available for download in a standard geospatial format that can be used to render and analyze them, or create additional use options.

This first intervention was not intended to engage with the motivations for or efficacy of the block targeting system and notification efforts made by the IDF during this war, nor, indeed, the highly contested contexts of or justifications for the current round of violence. Similarly, this current repository does not enter into the question of the role of the HA, the feasibility of access to it, or the degree of safety or livability it offers. It is intended to describe the status and limitations of existing official HA maps as a form of emergency communication and provide a downloadable version of the IDF HA polygon so that individuals and organizations as well as the producers of the maps can create maps better suited to their declared purpose of civilian protection.

A prior version (1.0) of the current Humanitarian Area document in this repository was done rapidly on the basis of two static image versions of the HAP maps: (1) the ("**response map**") contained in the State's June 28, 2024 response to critiques of its provision of aid and safety to civilians during the current round of Gaza hostilities and conduct of the war (see Fig. 4); and (2) the map used ongoingly on social media by the IDF/ Coordinator of Government Activities in the Territories,) ("**COGAT map**") from May 6, 2024 to the present (see Fig. 1 and 2). This current repository version is updated to reflect an additional version of the map ("**IDF interactive**") embedded in the IDF's interactive "Swords of Iron" Arabic language web site.[2] That web site was launched on December 1, 2023, with the targeting polygons added a few days later. The HA polygon was added to it on May 6, 2024, when an expanded HA was declared (Figure 1).

Methodology

[2] https://www.idf.il/ar/%d8%ac%d9%8a%d8%b4-%d8%a7%d9%84%d8%af%d9%81%d8%a7%d8%b9-%d8%a7%d9%84%d8%a5%d8%b3%d8%b1%d8%a7%d8%a6%d9%8a%d9%84%d9%8a/%d8%ac%d9%8a%d8%b4-%d8%a7%d9%84%d8%af%d9%81%d8%a7%d8%b9-%d8%a7%d9%84%d8%a5%d8%b3%d8%b1%d8%a7%d8%a6%d9%8a%d9%84%d9%8a/swordsofiron-011223-150/

The versions of the images available to the public were obtained through:

- direct download of the Twitter/X image for the COGAT map used in a recent (July 1, 2024) evacuation call[3];
- capture of the embedded image in the State response PDF; and
- extraction of the polygon point pairs of the vertices comprising the GeoJSON polygon feature used to render the IDF interactive web site, which was then saved to the more usable formats in this repository.

The two static maps were georeferenced using the built in engine of QGIS (3.32.1-Lima) (see Fig. 3). Sufficient control points were selected across the map extents. In the case of the COGAT map the vector layer was used as this offers unambiguous block polygon interstices. Georeferencing of the State response map was more difficult, as almost no orienting information is given other than the extent of the Gaza strip and one or two major roads, whose inflexions were used for control points. In both cases, residuals of the transformation were less than one pixel for all points. (Georeferencing control points and transformation parameters available upon request).

Digitization of the static maps was manually performed on these georeferenced images to create a vector polygon of the HA extent. This was difficult given the considerable width of both lines, especially the State response map (where the boundary was given as a color ramp of around 1.5 km). In both cases, an attempt was made to reflect the outer edge of this wide demarcation boundary. Area and distance measurements used in this text were done using the standard feature identification and measurement tools of QGIS.

Shaping usable disaster and emergency communication

The topics of emergency communications and public responses to warnings emerged as a field of study from the mid 1950s onwards, during the Cold War period, with increasing multi-disciplinary inputs. Milestones in this area are the standardized practices of the Federal Emergency Management Agency (FEMA), the 1986 Chernobyl disaster that highlighted the need for communication across borders, the 9/11 attacks that prompted advances, and the Indian Ocean Tsunami (2004) and Hurricane Katrina (2005).

[3] The image versions of the IDF web site are at a somewhat higher resolutions than those posted on Whatsapp or social media, which would allow a somewhat improved georeferencing/digitization. The polygon traced here is of the one more commonly used and available.

The increasing dominance of the internet and social media in the last decade or so revolutionized the field. There are books specifically on this; an annual conference on Information Technology in Disaster Risk Reduction; and the top journals in disasters, emergency and crisis management, and risk analysis often feature relevant analyses and case studies. Use of the internet and social media for communicating risk--including for spatial orientation-- is also a key component in the university programs devoted to disaster and hazards research and the guidelines and training materials put out by international organizations such as the UN Office for Disaster Risk Reduction (UNDRR), or the International Federation of Red Cross and Red Crescent Societies (IFRC).

The military use of this vast amount of accumulated experience on best practices in emergency communications is more limited, especially when it comes to warning civilian populations on the enemy side; but examples exist**.** And, **once an army has declared its interest in protecting civilian lives from the hazards it creates, it behooves them to draw on this wealth of knowledge to do so**. Some of the key components in every disaster and risk communication program might be blocked, such as pre-disaster planning and testing, or prior building of community disaster resilience. But the key design considerations remain, as do the toolkit of best practices, and, even, the ability to pretest proposed communication releases, or iterate improvements after initial operation through analyzing use and obtaining feedback.

What are some key guidelines for emergency communications, including of spatial information?

Importantly, **these must take into account the knowledge, contexts, and needs of the target population**. By definition, in an emergency people will be panicked and often on the move, and will frequently lack internet access and even electricity necessary for use of digital platforms. They are likely to be moving through an altered landscape with non-functional road infrastructure.

To overcome these challenges, spatial information (risk areas, safe areas, evacuation routes, resources, etc.) should be presented in maps that are clear, and high contrast, with bold iconography of relevant features, and using orienting information that is familiar to the audience and relevant for understanding the extent of areas of risk and safety, and how to move from one to another. Communication should combine multiple platforms and devices, including those not exclusively dependent on electronic devices.

Thus, maps should be in static form and interactive format. The spatial information of the **interactive portal** should allow panning and zooming to the necessary levels of detail, and use basemaps that allow determination of

boundaries and locations. Because mobile device GPS does not depend on internet access, emergency-related features as well as the basemaps can be downloaded or cached by many mobile geospatial apps, such as Google Maps. Thus, emergency maps should allow their offerings to be downloadable in a way that can saved on devices for offline use, and be accompanied by simple instructions for doing so. Providing emergency data in downloadable standard formats will also allow other agencies to immediately incorporate them in additional locally adapted forms and other apps. Such data can also be directly deposited on established humanitarian data exchange sites, such as the United Nations Office for the Coordination of Humanitarian Affairs' (OCHA) Humanitarian Data Exchange.[4]

The **static formats** can also utilize cartographic techniques that overcome some of these limitations: for example, the use of a main map with the entire area at smaller scale and inset maps of key areas that are then shown at larger scales, or else a multi-page image set. While the initial map should load quickly and fit on the device screen, it can be a downloadable file at higher resolution that users can scale and pan while offline to get precise information on any area of interest. Maps should be clearly dated, to avoid confusion if they are superseded as situations evolve.

Comparison of the three official "Humanitarian Area" maps

As the **IDF interactive map** has precise polygon coordinates embedded in a GeoJSON object used by the Javacript code that renders the IDF web site, this could be seen as some form of reference for the others. The **COGAT map** appears to be derived from this IDF interactive layer, but this is difficult to assess as COGAT social media communications use a low resolution static image, with no map projection or scale given, no orienting landmarks, and a rotation substantially different from the standard north-south cartographic convention, and a line width of 140 meters. This static image needed to be georeferenced (see Fig. 3) and manually digitized before it could be compared with landmarks or spatial features.

The purpose of this "reverse engineering" of the static maps is not so much to create a new layer, but to demonstrate the extent of ambiguity (and, thus, discrepancies) that can arise when the static maps are of low quality. That is, it underscores the limits of spatial guidance that can be wrung out of these maps

[4] https://data.humdata.org/

even through the best efforts of an experienced geospatial practitioner using good desktop hardware and software.

While the COGAT static map and the IDF interactive map are essentially the same, there are **some differences between that may go beyond these potential artifacts** of the process of reverse-engineering the former crude rotated low resolution map. Thus, these maps may have had two similar but different sources digital sources. For example, the IDF map of the Humanitarian Area using precise polygon coordinates diverges from the targeting block boundaries to the west, thus entering as far as 150 meters into the sea, whereas the static map adheres to the block boundaries (see Figure 7). This is unlikely to be a concession to Gazan bathers, and more probably the person defining the web-based polygon wanting to save effort by rendering the entire coastal side of Gaza with a single straight edge, rather than following the multiple vertices of the blocks, which adhere closely to the coastline.

Both the IDF interactive and COGAT static map adhere closely, but not entirely, to the targeting block boundaries, but on the east side of the HA they diverge from these to favour a main roads, thus bisecting several blocks. This would result in ambiguity if these block numbers are announced as targets at risk requiring for evacuation, as was the case in the massive July 1, 2024 evacuation warning of the entire south-east of the Gaza strip (Figure 7). In that announcement residents were directed from listed block numbers to the HA, including many of those lying partially in the "Humanitarian Area" and partly outside of it. **They were thus defined as residing in an area both risky and safe**. Those with internet access to the IDF interactive map might have ventured a guess that the road bisecting the evacuation block demarcated the two, and on this basis make the stressful risky decision of whether to remain in their homes.

The State's response map of the HA (Figure 4) is even more crude than the COGAT maps continually used as emergency communications. It lacks even the orienting features of the targeting blocks, and the polygon boundary is not a sharpish line of around 140 meters in width but a color gradient of 1500 meters. Here, too, there are differences that seem to extend beyond the distortions of reverse engineering and low resolution. Most substantially, compared to the IDF interactive map, the HA is truncated by 2.5 km^2 to the south, and extended by 3 km^2 to the north (Figure 5). Overall, the area of the State's response map is 7 km^2 greater than the 60 km^2 of the IDF interactive one. But this difference must be taken with caution as the response map is so crudely delineated, and this area would include much area in the sea. Overall, the map does not appear to be designed to show the extent of the HA, but rather to schematically indicate its

approximate relation with respect to the entry points into Gaza of water supply lines and the Gaza crossings.

The following are some comments on the functioning and usability of the IDF interactive and COGAT social media maps in the contexts for which they were intended.

The emergence of cadastral blocks as a key spatial communication means

Both maps discussed here utilize a **block numbers scheme** to subdivide the Gaza strip area into over 600 smaller subareas. These are the main orienting feature of both maps and also listed by number in texts announcing which blocks must be evacuated in advance of military action (initially this was by aerial bombardment, and then after Israel's ground invasion began, by land forces as well). Since block numbers can be communicated non-graphically, for example in the IDF's radio announcements, automated calls or SMS, or word of mouth, they served as a key spatial orientation.

When the army commenced its system of rolling targeting and calls for evacuation of different parts of Gaza, beginning in early December 2023, it required some system of subdividing Gaza into much smaller areas. They chose the cadastral block system, which partitions Gaza into just over 620 smaller units. This offered several advantages to the army, but was less useful for emergency communication of critical spatial information.

The blocks used in the IDF targeting and evacuation practices are based on the Blocks and Parcels cadastral system that evolved with land reforms in the Ottoman period (1517-1917), in particular the Land Code of 1858. This was the basis for land ownership registration and taxation purposes of plots within these, and its layout drew on prior boundaries such as the village boundaries in traditional usage and local knowledge, agricultural plots, and roads and natural features. The British Mandate (1920-1948) inherited this system, which it developed with more accurate surveying and mapping techniques, and standardization. This was largely retained by the State of Israel after its establishment in 1948, and was modernized and digitalized it over time. As the Ottoman and Mandate block systems were historically continuous into the Gaza Strip, these polygons and their numbering system were available to the IDF as the basis for subdividing Gaza in targeting announcements and maps. As the basis for land ownership and taxation and urban planning, these block allowed aggregation of information on the number and social backgrounds of inhabitants

in 620 distinct areas, which might have served the IDF's choice of the areas to attack and evacuate.[5]

However, these block divisions, which reflect a spatial logic inherited from century-old cadastral systems, are only partly related to contemporary spatial features, and their locations and extents are unknown to most of the Gaza inhabitants who were suddenly required to use them to adhere to COGAT's instructions on avoiding danger. Most people in Israel and Palestine are not familiar with the system, encountering it only glancingly, perhaps, as land-owners obtaining planning permission for construction or modifications of land use. They would be unlikely to know the extent of their own block, much less the number and location of the hundreds of others across the Gaza strip. Sometimes the blocks are aligned with contemporary roads, especially in the older central areas, other times diverging from or having no relationship to them.

In order to adhere to the block system announcements, both in deciding where to evacuate and the extent of the designated HA destination, Gazans would need to match block numbers to their experienced geography. This was not easy. When the IDF announced this block announcement and evacuation system on Dec. 1, 2023, it posted a static map of this system with a rough outline of about 20 neighborhoods overlaid onto these with a labeled legend. This allowed some rough orientation in terms familiar to the target(ed) audience. These were overlaid onto an aerial image, but with transparency settings and a density of vector and other overlays that made the satellite raster illegible except in the larger blocks containing agricultural land. A few days later, however, the neighborhood overlay map was replaced by static maps and an interactive web map that contained only the blocks, not the neighborhoods. Thus, the blocks became the primary geographic orientation, and these were mostly unlinked to recognizable geographic features, at least for static maps that were being released. This motivated my rapid release of the precise block polygons in vector format shortly thereafter.

The usability of the official HA maps for emergency communication

The static COGAT map of the HA used on the web site, social media, and leaflets dropped from the air, indicates the block numbers from which

[5] Possible evidence of such advantages and uses of cadastral block data by the IDF appears in the data fields of an operational layer included, probably unintentionally, in a web version of the block polygons. Further information available upon request from the author upon legal advisement.

evacuation was urged and those lying within the HA, and their approximate spatial configuration. Asides from these and the outline of the Gaza strip itself, there is little orienting information. These were available in only a low resolution (680 by 382 pixel, 96 dpi, 92 k) file, making zooming of little value, and, in any case, they contained little orienting information. In fact, they were misoriented, so that an arrow denoting the suggested flight to the northeast (Figure 2) under cartographic convention, is, in fact calling for evacuation to the north west (see Figure 3). While the topology and rough location of the blocks is conveyed, the user cannot understand their location nor extent in usable terms, and some block numbers are obscured by labels or are too small to be read. The HA boundary is also unclear. In the north and south it mostly aligns with the edges of blocks, so that there is only one boundary needing geographic determination. But in some areas, especially to the west of the HA, some blocks lie both inside the ostensibly safe HA and outside it, in the area to be evacuated, so that there are two unknowns: the location of the HA boundary and where it bisects these block.

The IDF interactive map has precise vector spatial delineation of these boundaries, and some orientation of these with respect to familiar features on a standard OSM (Open Street Map) web map—see upper right of Fig 8. However, it requires an active internet connection and, even then, the base map and zoom levels do not allow adequate orientation with respect to smaller streets or unmapped features, as would be possible, for example, with a standard satellite imagery basemap.

The need for alternatives to the standard OSM basemap is even more important in the Gaza area, where only the names of larger roads are available, so that people trying to navigate on the majority of unlabeled streets would need to count the number of streets between the larger labeled ones to do this. The IDF site does not have a choice of basemaps or saving of the map for offline use as some map applications such as Google maps do. Nor does it enable downloading (caching) of the basemap within the application for offline use, as can be done, for example, with Google Maps, nor of the vector layer, so that it can be used in such applications. The downloadable KML file of the HA included in this repository allows these obstacles to be overcome. For example, the bottom part of Figure 8 show the far greater resolution and offline use possible on a phone using this downloadable HA file in apps like Google Earth.

These shortcomings in the interactive map are not inevitable: rather trivial changes to the existing IDF web would overcome these limitations. A day of work by a programmer and a few thousand dollars a month for an API for serving standardly available high resolution satellite web basemaps would overcome

most of the limits described here. An example of two pages of Javascript code for accomplishing this within the current IDF site is available upon request.[6]

To summarise. **The official maps used over the last half year to guide the Gazan population from the areas the IDF calls to evacuate are inadequate for emergency communication, as are the newer maps showing the humanitarian area designated as their destination.** The static maps are insufficient for spatial orientation by the public, except at a very crude level, while the interactive map provides precise location upon a street basemap, but is not downloadable for off-line use, and does not include a satellite basemap. The materials posted in this current repository allow individuals and organizations to overcome these barriers.

The use and especially the extended persistence of these inadequate maps is at odds with their declared intention of facilitating civilian protection. Despite their important role, the IDF has not evolved better versions of and platforms for these. It is unclear whether this is due to a lack of resources, foresight, or relevant expertise, or to a lack of commitment to this purpose. Hopefully the materials and comments here might prompt improvements in the spatial communication offered by official parties or, at least, support efforts by others to supplement those.

[6] Currently, the site renders the HA polygon superimposed upon the standard OSM tile layer with Arabic language preference, and allows zoom levels from 12 (most zoomed out) to 17 (a relatively detailed view). Two pages of Javascript (available upon request) inserted into the current IDF site or similar that would improve things substantially. The first (50 lines, including comments) adds a button to the map that triggers the conversion of the GEOJSON polygon into a downloadable KML file. The second (66 lines) broadens the users choice of basemaps beyond the standard OSM. The options include the Humanitarian styled OSM, Google Maps (either roadmap, satellite, terrain, and hybrid), Bing maps aerial, the ESRI World Imagery layer, and Mapbox, all with zoom levels allowing users to carefully locate themselves and other features on these. Bing, Google, and Mapbox all offer high resolution aerial maps of Gaza. They require an API key costing about $100-$500/month for up to 100,000 uses, and $1000-$5000/month for a million users a month. Discounts are available for humanitarian and nonprofit use.

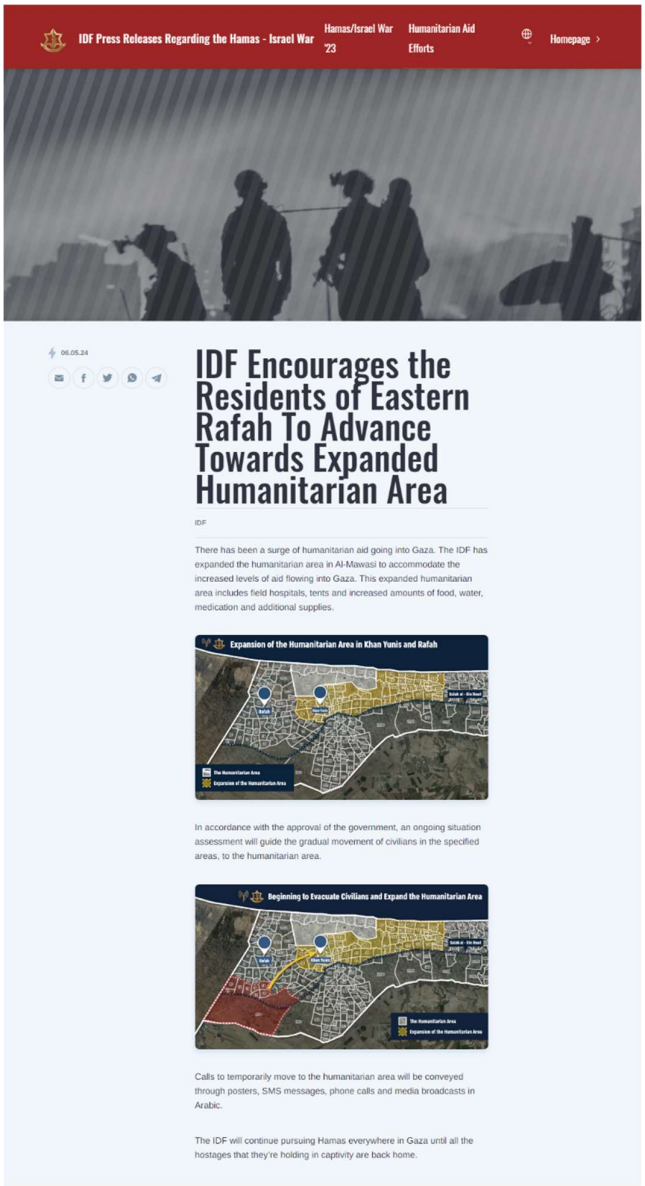
Fig. 1. Initial (May 6, 2024) announcement of an expanded Humanitarian Area and call to evacuate western Rafah neighborhoods to this.[7]

Notice text: "There has been a surge of humanitarian aid going into Gaza. The IDF has expanded the humanitarian area in Al-Mawasi to accommodate the increased levels of aid flowing into Gaza. This expanded humanitarian area includes field hospitals, tents and increased amounts of food, water, medication and additional supplies.

In accordance with the approval of the government, an ongoing situation assessment will guide the gradual movement of civilians in the specified areas, to the humanitarian area.

Calls to temporarily move to the humanitarian area will be conveyed through posters, SMS messages, phone calls and media broadcasts in Arabic.

The IDF will continue pursuing Hamas everywhere in Gaza until all the hostages that they're holding in captivity are back home."



[7] https://www.idf.il/en/mini-sites/idf-press-releases-regarding-the-hamas-israel-war/may-24-pr/idf-encourages-the-residents-of-eastern-rafah-to-advance-towards-expanded-humanitarian-area/#:~:text=The%20IDF%20has%20expanded%20the,water%2C%20medication%20and%20additional%20supplies. [Downloaded 20240713]

Fig. 2. ***Israeli army spokesman - COGAT (twitter/X) announcement of July 1, 2023***

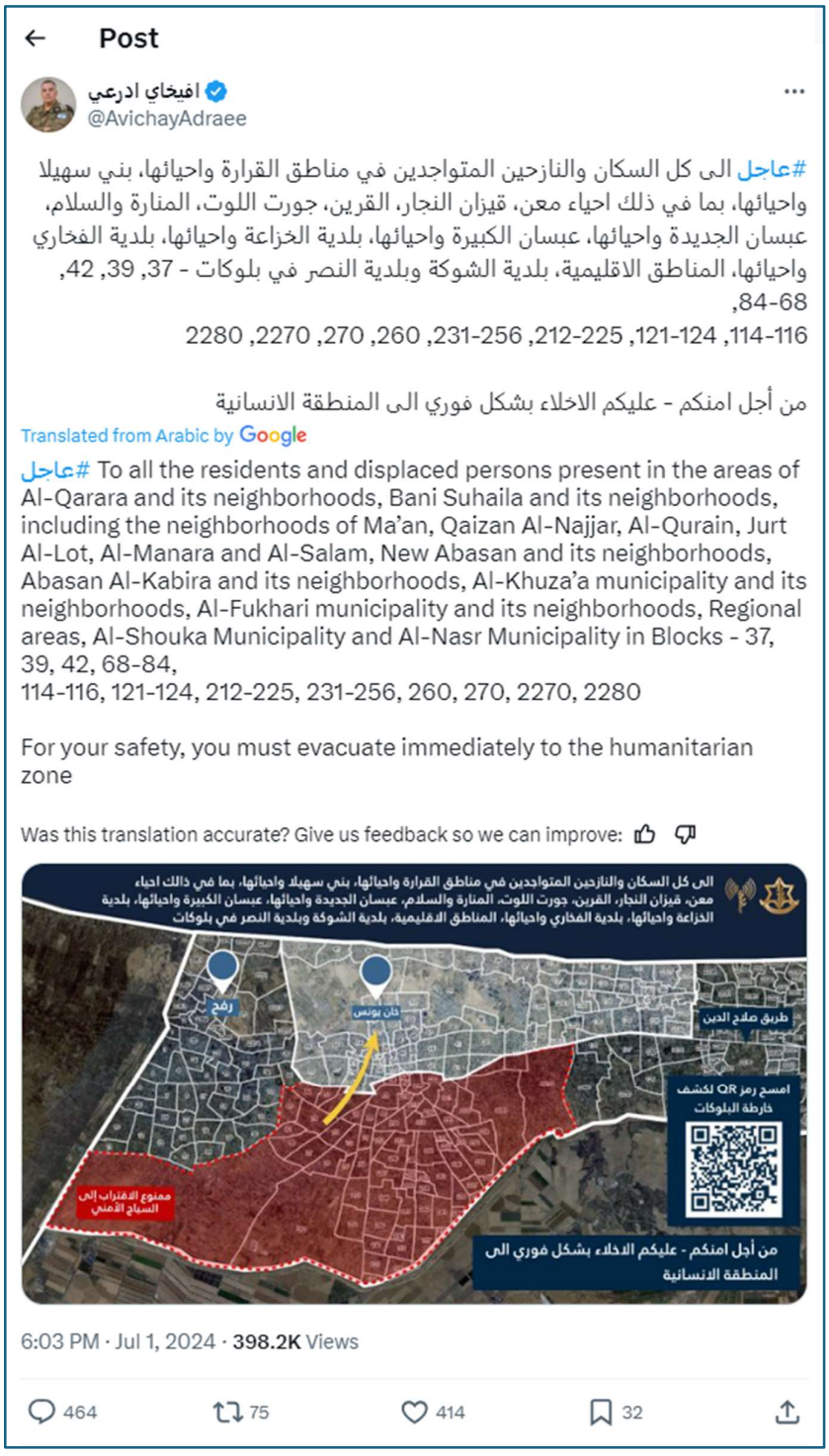


Fig. 3. Transformation of rotated COGAT map to standard cartographic rendition through georeferencing with sufficient number of best available control points to minimize error

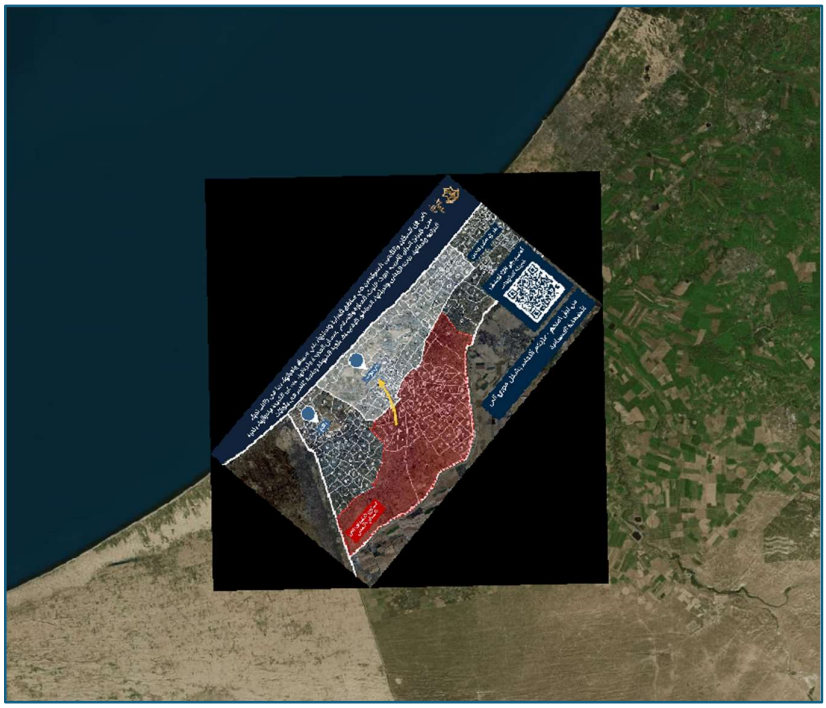
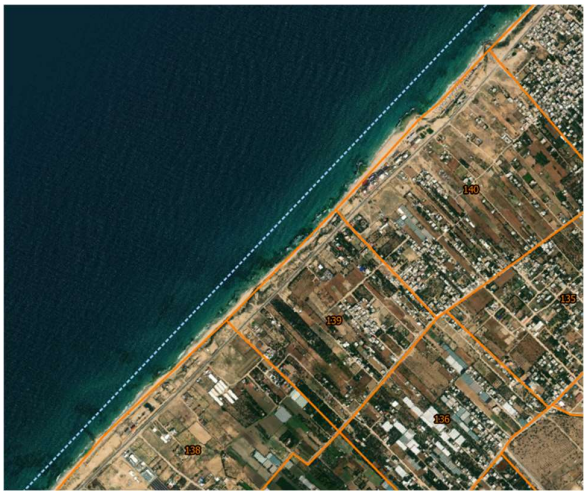


Fig. 4. June 28, 2024 State Response to Israel High Court of Justice regarding Humanitarian Assistance to Gaza

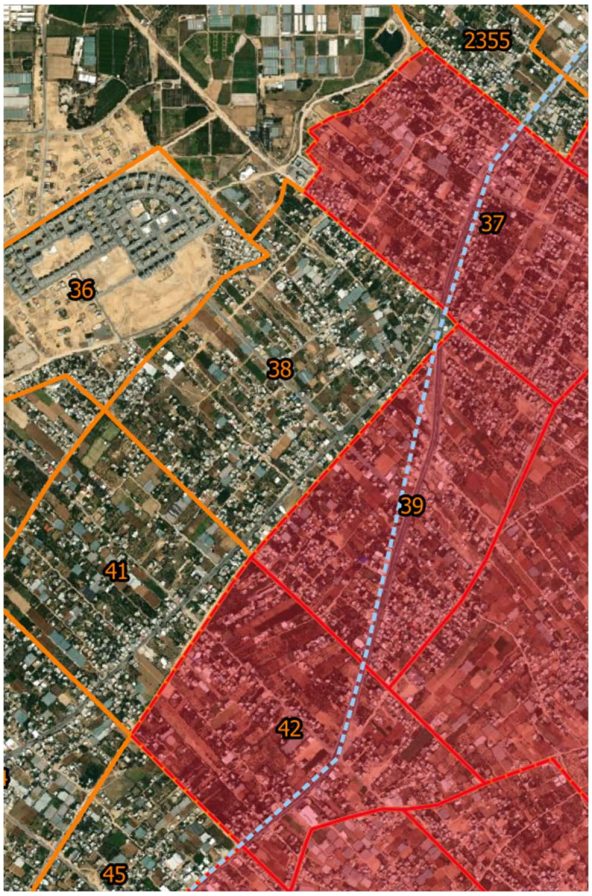
Fig. 5. Apparent discrepancies between vector layer derived from June 28, 2024 State map to High Court (blue outline), and July 1, 2024 COGAT media alert to Gazan civilians and humanitarian agencies (white lines). Yellow is area common to both.

Fig. 6. Zoom-in to illustrate this discrepancy in the northern part of the Humanitarian Area.

Figure 7. Illustrations of divergences between targeting block (orange) and Humanitarian Area- HA (blue dashed) boundaries in the IDF interactive site. To the right we see how the western border was traced using a single straight line, this including the coastal water, versus the blocks that adhere to the coastline.



Below, and more consequentially, we see that the HA boundary bisects some blocks. Thus, when the July 1, 2024 evacuation warnings urged residents of blocks 37, 39, and 42 and others (red shading) to evacuate immediately to the humanitarian zone for their safety (notice to bottom left), residents in the west portions of these zones were defined as being in both the targeted and safe areas.



Translated from Arabic by Google

عاجل# To all the residents and displaced persons present in the areas of Al-Qarara and its neighborhoods, Bani Suhaila and its neighborhoods, including the neighborhoods of Ma'an, Qaizan Al-Najjar, Al-Qurain, Jurt Al-Lot, Al-Manara and Al-Salam, New Abasan and its neighborhoods, Abasan Al-Kabira and its neighborhoods, Al-Khuza'a municipality and its neighborhoods, Al-Fukhari municipality and its neighborhoods, Regional areas, Al-Shouka Municipality and Al-Nasr Municipality in Blocks - 37, 39, 42, 68-84, 114-116, 121-124, 212-225, 231-256, 260, 270, 2270, 2280

For your safety, you must evacuate immediately to the humanitarian zone

Was this translation accurate? Give us feedback so we can improve:

6:03 PM · Jul 1, 2024 · **398.2K** Views

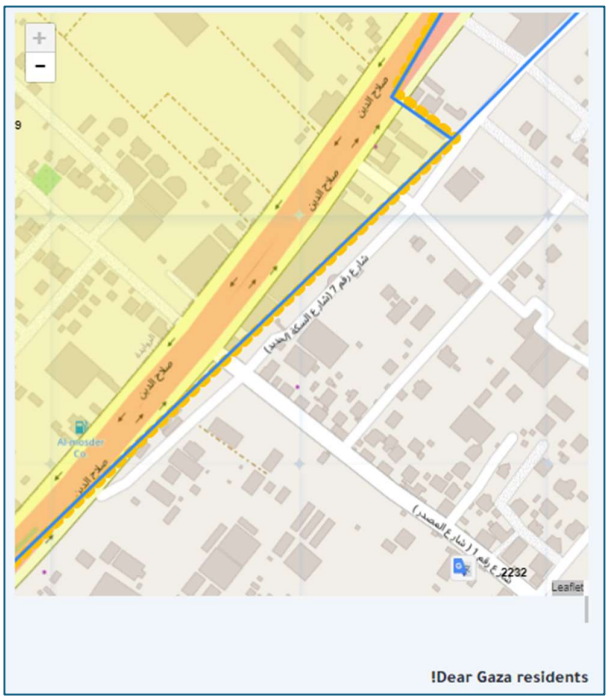
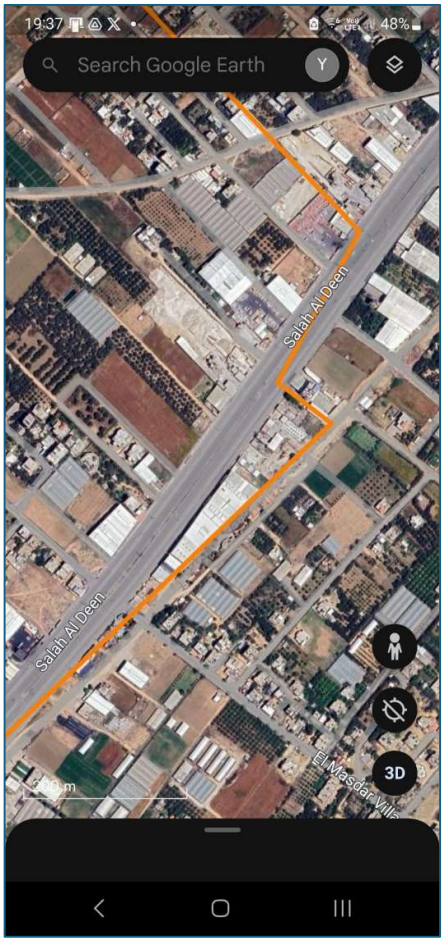
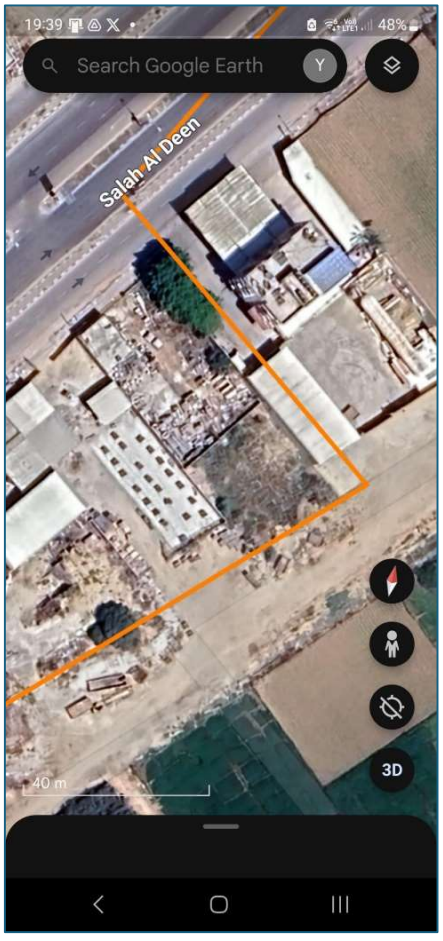



Fig. 8. Screen shot of northeast corner of the HA with IDF basemap and maximum allowed zoom level (right). Below are screenshots of the same area on a phone using the downloadable KML layer overlaid onto the Google satellite basemap at better zoom levels. Several freely available apps allow users to these basemaps of an entire region, allowing offline use, not possible with the IDF map