Geospatial Technologies and Human Rights Project

Documentation of Villagization: Gambella Region, Ethiopia
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Executive Summary
The Geospatial Technologies and Human Rights Project\(^1\), a part of the Scientific Responsibility, Human Rights and Law Program\(^2\) of the American Association for the Advancement of Science (AAAS), partnered with Human Rights Watch (HRW) in order to investigate concerns regarding villagization in the Gambella region of western Ethiopia. Villagization is a process instigated by the Ethiopian government of relocating rural population into concentrated, permanent settlements. The villagers were agro-pastoralists and practiced shifting cultivation. In Gambella, reportedly, once the people had been moved, the land could be made available for development of commercial agriculture. HRW requested the assistance of AAAS in using high-resolution satellite imagery to document the disappearance of the area's rural population, and to identify the new construction in relocation villages to contribute to a report, “Waiting Here for Death.”\(^3\)

Data Sources
In conjunction with HRW, AAAS staff identified several locations within the Gambella region which likely were targets of villagization. Three locations were chosen (Figure One) and high-resolution satellite imagery was obtained, the details of which are listed in Table One.

Figure One: Case Study Location

\(^1\) srhrl.aaas.org/geotech
\(^2\) srhrl.aaas.org
\(^3\) http://www.hrw.org/reports/2012/01/17/waiting-here-death
Table One: Location and Imagery Information

<table>
<thead>
<tr>
<th>Location</th>
<th>Satellite/Sensor</th>
<th>Image Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gog Jingjor</td>
<td>WorldView-1</td>
<td>12 January 2010</td>
</tr>
<tr>
<td></td>
<td>QuickBird-2</td>
<td>04 May 2011</td>
</tr>
<tr>
<td>Akuna</td>
<td>GeoEye-1</td>
<td>23 June 2009</td>
</tr>
<tr>
<td></td>
<td>GeoEye-1 (via Google Earth)</td>
<td>21 December 2011</td>
</tr>
<tr>
<td>Perbongo and “Gambella 2”</td>
<td>IKONOS</td>
<td>10 March 2007</td>
</tr>
<tr>
<td></td>
<td>GeoEye-1 (via Google Earth)</td>
<td>18 December 2010</td>
</tr>
<tr>
<td></td>
<td>QuickBird-2</td>
<td>04 May 2011</td>
</tr>
</tbody>
</table>

Analysis and Results

A. Gog Jingjor

In January 2010, two small settlements are visible in the area of Gog Jingjor (designated A and B in Figure Two, below), each consisting of a number of primary structures and a comparable number of outbuildings. By May of 2011, however, these outbuildings had been augmented by numerous additional small structures at both settlements (Figure Three). At settlement A, twelve additional buildings were observed to have been constructed, most along the side of the road that leads north-northwest away from the settlement. The expansion of settlement B was more prodigious, with fifty-nine new structures arranged in a quasi-gridlike arrangement southeast of the existing buildings. The dimensions of these new structures are consistently small (approximately 3-4 m²), and given the limitations of the available imagery, their purpose is difficult to discern.

Figure Two: Gog Jingjor Settlement
B. Akuna

In June of 2009, large numbers of small structures are scattered throughout an area centered on 7°54′45″N, 34°39′18.94″E, consistent with HRW’s information concerning the former location of the Akuna community (Figure Four). The structures in question are small – generally three to four meters square, and are often associated with modest cultivated fields, consistent with small-scale subsistence agriculture (Figure Six). Two settlements consisting of larger, more permanent-looking structures are visible to the south, located at 7°53′06″N, 34°39′27″E, and 7°52′55″N, 34°39′39″E; the latter set of coordinates corresponding to those reported by HRW to be a relocation destination.

Consistent with reports of relocation from HRW, by December 2011, the number of structures in the original Akuna community north of the relocation villages has dropped substantially with the removal of 68 structures (Figures Four and Six), while a large number of small new structures have appeared surrounding the alleged relocation center (124 new structures). In addition to the new structures, nearby land has been cleared, presumably for crop production. The area cleared totals approximately 32 hectares, only 0.25 hectares of crop land per new structure (Figure Five).
Figure Four: Evidence of rural displacement and villagization in the Akuna area

Image ©2011 GeoEye, Inc. Location: 7°53'06"N, 34°39'27"E
Figure Five: New structures and cleared lands in Akuna area

Image ©2011 GeoEye, Inc. Location: 7°53’12”N, 34°39’23”E
In 2009, the Akuna farming community is visible, with multiple small structures visible near small agricultural fields. By late 2011, however, all these structures are missing (indicated by circles), and the adjacent fields have been abandoned. Image ©2011 GeoEye, Inc. Location: 7°54'36.2"N, 34°38'53"E
C. Perbongo and “Gambella 2”

Two additional areas of interest, designated Perbongo and “Gambella 2”, were located in close proximity to one another (5km apart). These locations were captured in the same images, from 10 March 2007 and 04 May 2011, and an additional image from 18 December 2010 (Table One). As indicated by HRW, settlement in the Perbongo area was small and concentrated in 2007. By 2010-11, many changes are visible in the area.

Settlement changes occurred in Perbongo over the period between March 2007 to May 2011, and were examined using three images (Table One). In 2007, the only structures visible in the area are several metal-roofed buildings and a very small number of smaller structures (Figure Seven). Between 2007 and 2010, the number of structures visible in the area expanded dramatically, particularly in the southern portion of the image (adjacent to the structures which were apparent in 2007). Also during this period, some clearing and settlement were beginning to occur to the north of the main settlement area, but in a much more dispersed pattern than in the southern area. Finally, between December 2010 and May 2011, at least 20 new structures are observed to have been constructed, mainly in the northern portion of Perbongo.
Figure Seven: Perbongo Settlement Increase

In the above image (collected 04 May 2011), the red circle indicates the existing structures of Perbongo in 2007. The orange box represents the area of growth which occurred in the period from 2007-December 2010. The green box delineates the area where growth occurred between December 2010 and May 2011. Image ©2011 DigitalGlobe, Inc. Location: 34°27’31.15”E, 7°54’11.4”N

Of the three locations examined in this study, the area identified as “Gambella 2” most clearly exemplifies the conversion of land into large industrial-style agriculture. While this conversion occurred on unutilized lands south of Adobo, Figure Eight is an excellent example of an area that has undergone this transformation.
During the same time period as the above agricultural development, Adobo, an area less than three kilometers to the north has been populated with 80 new structures (Figure Nine). This increase in settlement is likely a result of the increased agricultural production and associated employment.
An analysis of satellite imagery for the Gambella region reveals that significant changes took place in the spatial distribution of structures and agriculture between 2007 and 2011. These two metrics tend to be strongly correlated with human activity, and the observed decrease in low-density rural settlement alongside a corresponding increase in higher-density village areas represents a pattern which is consistent with villagization. Furthermore, the area of the newly-cleared land adjacent to these settlements appears to represent a net loss in the per-capita allotment of arable land for the resettled population. The appearance of large-scale industrial agriculture near the areas in question lends further credence to the events reported by Human Rights Watch. While the imagery indicates that this intensive cultivation has thus far been limited to areas that were previously undeveloped, the situation may be different elsewhere in the region. Moreover, when viewed in the context of the observed resettlement trend it appears possible that future development could take place on expropriated land.

Conclusion