

Geospatial Technologies and Human Rights Project

Documentation of Petrochemical Release:
Bodo, Nigeria



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In late 2008 and early 2009, oil spills were reported near the town of Bodo, in the Niger Delta region of southern Nigeria. In order to investigate the veracity of these reports, and determine, if possible, the scope of the reported oil spills, Amnesty International-USA requested the assistance of the Geospatial Technologies and Human Rights Project of the American Association for the Advancement of Science (AAAS).

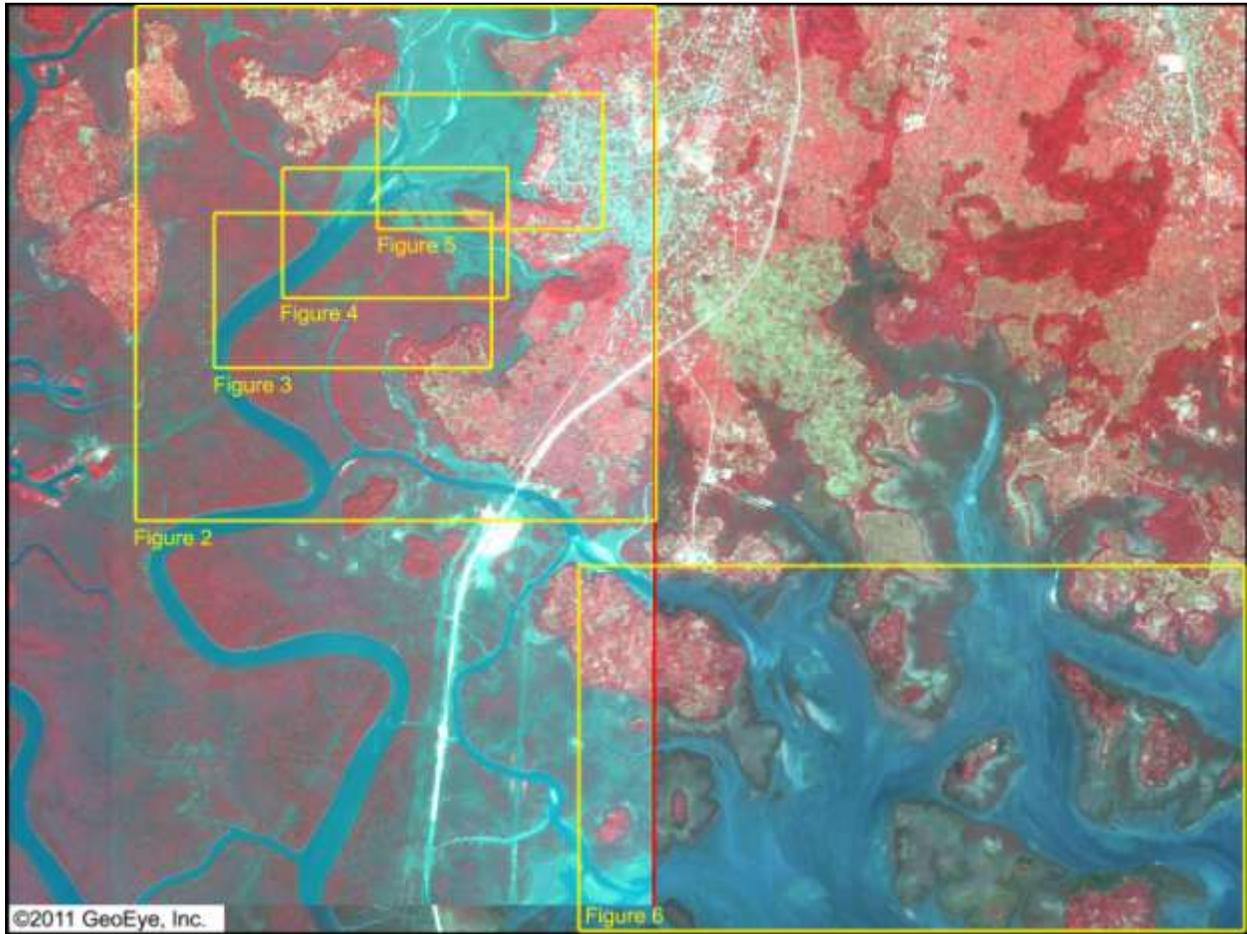
Imagery acquired on 4 December 2006, several years prior to the reported oil spill, was obtained by AAAS in order to serve as a baseline for subsequent observations. This imagery indicates a relatively minor ecological impact from the development of petrochemical infrastructure in the region. Pipelines and extraction facilities are visible, however most riparian vegetation appears healthy, and no pollutants are readily visible in the tidal rivers and streams that encircle Bodo.

By 26 January 2009, the date of the second image obtained by AAAS (Figure 2), the situation had changed. Large swaths of vegetation – especially in proximity to waterways – appear dead. A rainbow effect is visible in the main waterway leading to Bodo (Figure 4), and the tidal flats adjacent to the settlement (on which the boats of local residents are visible) have changed from a muddy yellow to an oily grey color (Figure 5). In order to quantify the extent of the damage, AAAS performed a supervised multispectral classification on the January 2009 image, which indicated that approximately three square kilometers of vegetation had been destroyed – a result which agrees with estimates derived through visual interpretation and quantification.

Imagery was also obtained to examine any changes to the area since 2009. AAAS acquired an image of the Bodo area dated 8 January 2011 (Figure 6), which clearly shows the continued presence of petrochemicals in the area. A timeline of the oil spill can be seen in Figure 3, which focuses on one area near Bodo. Considerable degradation is apparent between the image taken prior to the oil spill and that taken soon after the spill. Between the recent post-spill imagery and another taken nearly two years after the spill, however, little improvement is visible.

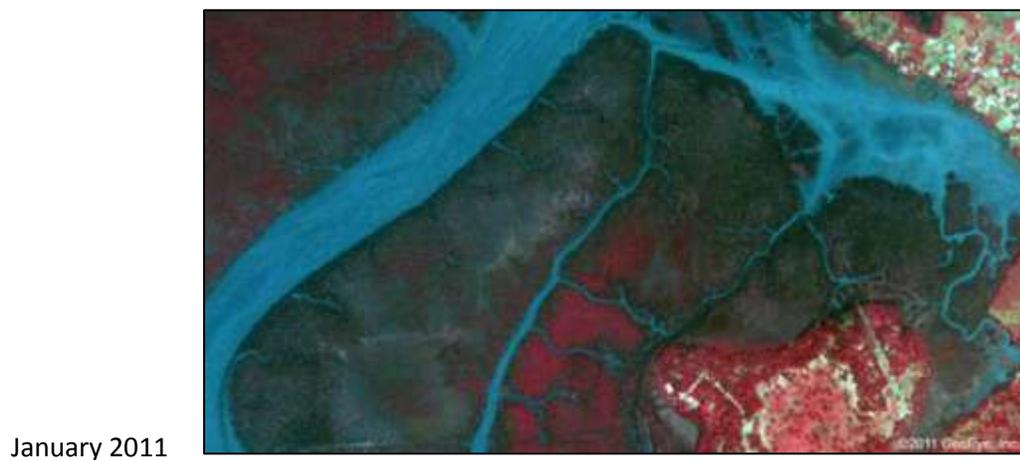
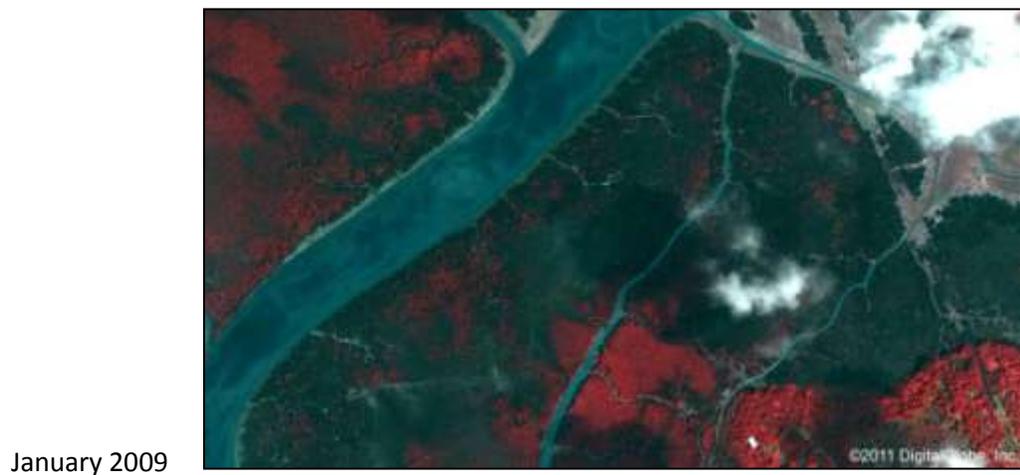
The evidence provided by these images, in addition to ground-based photographs acquired by Amnesty International, corroborates reports that petrochemicals were released into the environment near Bodo during the reported timeframe. While reliable estimates of the exact volume of crude oil cannot be determined with the available information, the spatial extent of the affected area and the high level of destruction of plant life suggest that the amount was significant.

Figure 1. Overview of the affected area prior to the reported oil spill



This image of the affected area shows the town of Bodo (above, center), the intertidal zone (upper left) and adjacent waterways. In this false-color image, healthy vegetation appears bright red. The locations of figures on the following pages are highlighted in yellow. Note: differences in color between left and right sides of the image are a result of imagery which was collected on different days and times.

Figure 3. Close-up of vegetation death southwest of Bodo town



False-color imagery of waterways southwest of Bodo between 4 December 2006 (top) and 26 January 2009 (middle) appear consistent with reports of an oil spill, with vegetation death concentrated primarily near the river and its tributaries, while areas further inland appear less affected. Two years later, in January 2011, (bottom), little recovery is visible.

Figure 4. Effects of a reported petrochemical spill near Bodo, Nigeria



True-color satellite imagery of waterways southwest of Bodo also reveal signs of petrochemicals. Between 4 December 2006 (top) and 26 January 2009 (bottom), the river has developed the rainbow sheen characteristic of an oil slick and adjacent tidal flats have changed color from a sandy yellow to an oily grey.

Figure 5. Focus on the river near Bodo Town



The streams and tidal flats directly adjacent to the town of Bodo appear similarly affected by the reported oil spill. The rainbow slick visible in the channels and discoloration of the intertidal zone on 26 January 2009 (bottom) is consistent with ground-based information obtained by Amnesty International and contrasts the 04 December 2006 image (top) which is unaltered by oil.

Figure 6. Lingering effects of the spill



On 8 January 2011, over two years after the reported spill, an oil slick stretching for more than five kilometers remains visible in the waterways southeast of Bodo town. North is to the left.