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SPOTLIGHT

Gang violence in Guatemala City: How Maxar Earth Intelligence can drive meaningful change

Gain a geospatial perspective on real-world problems.

See how Maxar satellite imagery and advanced analytics can be applied to solve the world's most complex challenges.

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GANG POLICY AND PREVENTION MUST CONSIDER THE SOCIAL AND SPATIAL DYNAMICS OF VIOLENCE

With less than 1% of the world's population, Central America's Northern Triangle (El Salvador, Guatemala and Honduras) is considered one of the world's most violent regions outside of active war zones. While these countries have shown a recent decline in total homicides, major urban centers are still recording more than 40 homicides per 100,000 residents. Much of this urban violence is attributed to the region's notorious gangs, Mara Salvatrucha (MS-13) and Barrio-18.

In the early 2000s, gang violence was viewed exclusively as a security issue that required repressive action and mass imprisonment. With ill-equipped judicial systems and severely overcrowded jails, this response strengthened the gangs by improving their communication, structure and extortion schemes. These "iron fist" and "zero tolerance" policies also alienated entire communities of low-income urban areas, which led to extreme distrust of the government and its security forces.

Over the past two decades, countless studies have examined gang violence and the many factors that have varying degrees of responsibility. These range from poor economic opportunities and social exclusion for the most vulnerable to endemic corruption, political turmoil and the erosion of state authority. However, one theme remains consistent across most studies. Heavy-handed security measures will have little effect without simultaneous attempts to address the root causes of violence and improve the social fabric in gang-ridden neighborhoods.

The strategy sounds simple enough. It has even been used in campaign platforms by many political candidates. But getting from theory to implementation is a challenge and requires an understanding of the social and spatial conditions that impact gang violence. This issue of Maxar Spotlight demonstrates how Maxar's suite of Earth Intelligence capabilities can eliminate data challenges and provide truly comprehensive analysis on the sociospatial dynamics of gang violence in specific localities.

SUMMARY OF UNIQUE TOOLS & APPLICATIONS

Human Landscape. Maxar Human Landscape is a foundational human geography dataset that provides rich attribution and metadata at a countrywide scale. Human Landscape + Metro is a similar dataset produced on a much finer scale across a specified urban landscape. By leveraging high-resolution satellite imagery and other unique tools and resources to significantly enrich publicly available information, Human Landscape + Metro provides a level of detail and fidelity not available in other open-source geospatial datasets.

Maxar On-the-Ground Surveying. Maxar maintains access to a global network of data collectors that can monitor local sentiment and significantly enrich or validate satellite-derived data and other sources of information. Maxar On-the-Ground Surveying provides valuable insight from both direct engagement (face-to-face interviews) and nonintrusive collection (photographs and other media).

Signature Analyst™. Maxar Signature Analyst™ is a geospatial pattern analysis tool that utilizes proprietary algorithms to predict where events are likely to occur, based on the signature and pattern of previous events. For this assessment, Signature Analyst™ was used to identify areas with the highest likelihood for gang violence in Guatemala City's Zone 18.

GANG-MARKED NEIGHBORHOOD IN GUATEMALA CITY (SAUL MARTINEZ)

QUALITY DATA DRIVES QUALITY INTELLIGENCE

Guatemala City has one of the highest homicide rates in Latin America, with 42.5 homicides per 100,000 residents. The city is administratively divided into 22 zones. The study area for this Spotlight is Zone 18. Located on Guatemala City's northern edge, Zone 18 is the largest and most violent zone. Its diverse topography is marked by densely packed urban shanty towns and a few middle-class neighborhoods that stand out as constant reminders of the city's deep inequality.

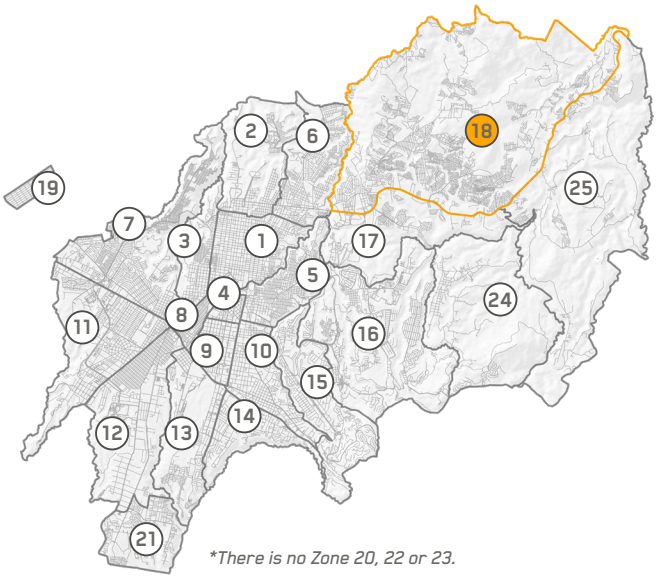
Access to reliable data is the most fundamental requirement for understanding characteristics of gang violence. It is the foundation for crime prevention and police policy, and the data must be able to address key questions like:

- What are the signatures (attractors and repellers) of gang activity in a given area?
- What presence, level of engagement and trust does local law enforcement have in a given area?
- What are the entities within a given area that are best suited to lead rehabilitation programs?
- What opportunities exist for strengthening social interaction and community involvement, particularly for the youth in a given area?

Without this type of information, government officials, security personnel and other stakeholders remain reactionary. And unfortunately, this has plagued security operations and gang-prevention strategies in Guatemala City's Zone 18. Critical maps pertaining to services and transportation infrastructure are often inaccurate or incomplete because of the area's complex terrain, poor urban development, irregular street patterns and gang-ridden neighborhoods.

In addition, the National Police lack a standardized process for collecting and storing vital information like crime reports and witness interviews. They also lack the resources and training for analyzing this data in order to understand crime dynamics. Sometimes information is documented on paper and stored in file cabinets, and sometimes it is digitally stored on hard drives or USBs.

GUATEMALA CITY'S ADMIN ZONES



*There is no Zone 20, 22 or 23.

EL LIMON, ZONE 18, GUATEMALA CITY (MAXAR ON-THE-GROUND SURVEYING)

According to multiple studies, rarely is crime data used for anything more than depicting total events across the city's administrative zones, and many times the information is lost or damaged.

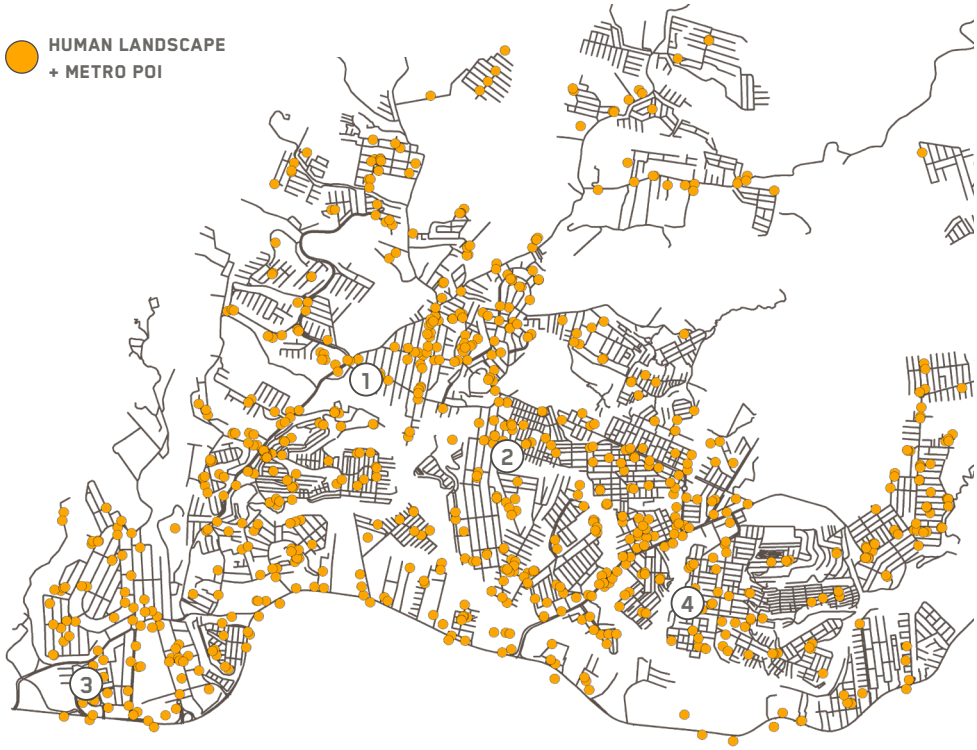
Maxar is uniquely positioned to provide sophisticated analysis of major urban centers like Guatemala City by leveraging its robust Earth Intelligence capabilities and satellite imagery. The following pages showcase Maxar Human Landscape and Maxar On-the-Ground Surveying.

HUMAN LANDSCAPE

Maxar Human Landscape + Metro is a foundational human geography dataset that provides rich attribution and metadata on a very focused and localized level. By leveraging high-resolution satellite imagery and other unique data sources and research, this Human Landscape dataset provides a level of detail and fidelity not available in other open-source geospatial datasets. Some of the enriched data layers for Guatemala City's Zone 18 include:

- Schools (differentiated by public versus private)
- Churches (differentiated by denomination)
- Parks and recreational areas (differentiated by quality)
- Bus stops
- Commercial points of interest (differentiated by type)
- Roads (differentiated by type and direction)
- Pedestrian and vehicle traffic
- Gang neighborhoods (differentiated by group)

ZONE 18 HUMAN LANDSCAPE + METRO POI



LA MAYA | ONE-LANE ROAD

SANTA FAZ | RECREATION POI

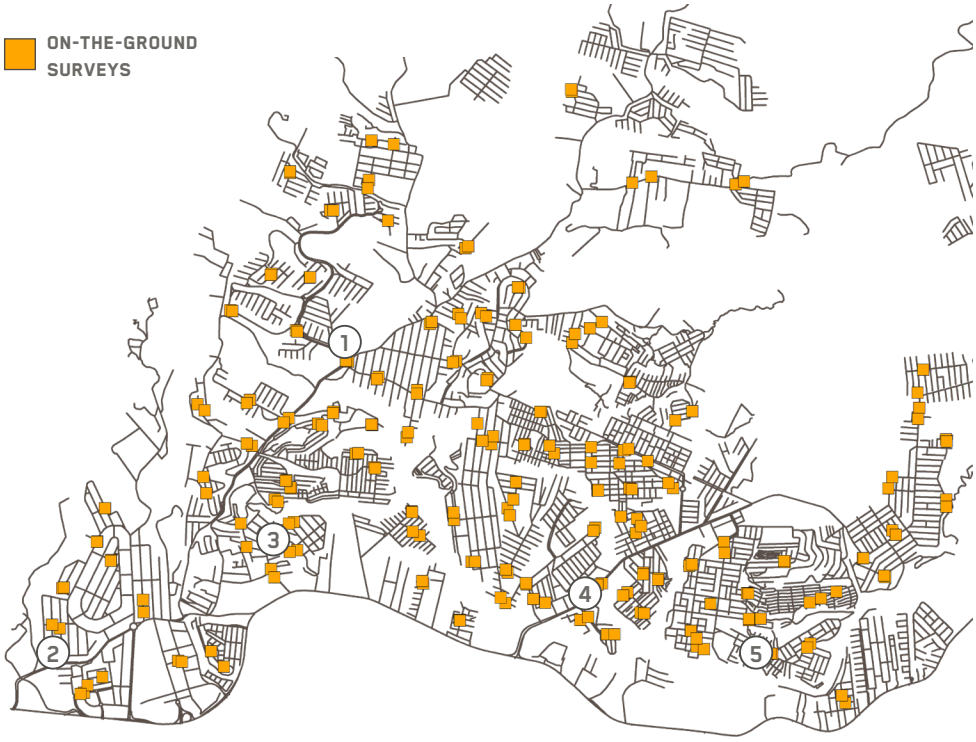
LOS ALAMOS | JUNE 8, 2020 | WORLDVIEW-3

EL PARAISO II | FEBRUARY 27, 2017 | WORLDVIEW-3

ON-THE-GROUND SURVEYING

With access to a global network of data collectors, Maxar On-the-Ground Surveying improves tactical awareness and helps enrich and validate Human Landscape data. Administered in local languages by polling professionals familiar with the area, Maxar On-the-Ground Surveying can obtain previously unknown geospatial information as well as current public sentiments. For this Spotlight, Maxar fielded a local data collection team across Zone 18 in March 2020 (prior to any COVID-19-related restrictions) to obtain public insights on each neighborhood's mobility and traffic (pedestrian/vehicle), gated areas, street lighting, public sanitation, gang presence, police presence and perceived safety. Where applicable, photographs were also gathered to validate the information and sentiment (see below).

ZONE 18 SURVEY LOCATIONS



LOS OLIVOS | GATED ENTRANCE

ATLANTIDA | SAFE AREA

JUANA DE ARCO | UNSAFE AREA

SAN RAFAEL III | HEAVY TRAFFIC

EL PARAISO II | OBSERVED POLICE

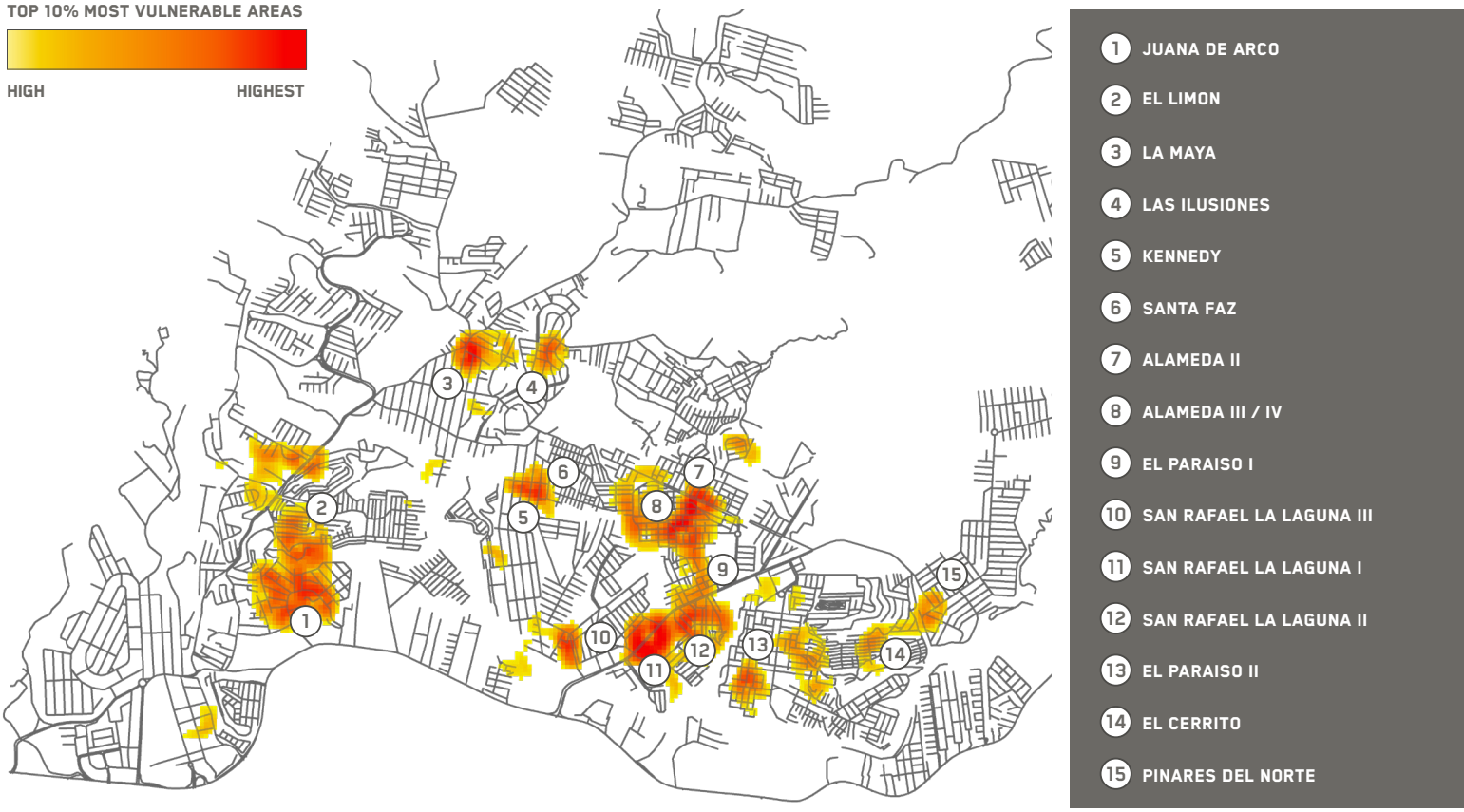
PREDICTIVE GEOSPATIAL MODELING AND DATA-DRIVEN INSIGHTS

Maxar Human Landscape and On-the-Ground Surveying data was used to support predictive modeling of gang violence in Guatemala City's Zone 18 via Maxar's Signature Analyst™. Signature Analyst™ is an empirically based pattern-discovery and extrapolating tool that is capable of analyzing thousands of geospatial data layers without the dependency of prior knowledge or expert opinion. Through proprietary algorithms, Signature Analyst™ models where events are likely to occur based on the spatial and environmental signature of previous events. It also evaluates the statistical significance of specific geographic features or points of interest in relation to event data.

According to a sample dataset of targeted killings over the past year, Signature Analyst™ identified the following neighborhoods as most vulnerable to gang violence: Juana de Arco, El Limon, San Rafael La Laguna (I/II/III), El Paraiso (I/II), El Cerrito, Pinares del Norte, Alameda (II/III/IV), Kennedy, Santa Faz, La Maya and Las Ilusiones.

According to the model, the top attractors of gang violence in Zone 18 included poor street lighting, no observed police presence, issues with public sanitation, close proximity to public schools and notable pedestrian traffic. A primary repeller was gated neighborhoods.

SIGNATURE ANALYST™ MODEL: VULNERABILITY TO GANG VIOLENCE IN ZONE 18



CONCLUSION

Interestingly, the statistical significance of certain geospatial features changed depending on the event type. For example, armed robbery and theft occurred more frequently near bus stops and retail/services POI. And while discarded (and often wrapped) bodies were found more frequently in areas without an observed police presence, they also displayed attractors to areas with good street lighting, public sanitation and limited pedestrian traffic. These results demonstrate that gang violence in Guatemala City is not random, but that there are in fact unique signatures for specific event types.

"Crime is generally not randomly or evenly distributed across urban spaces and an analysis of the location of crime in an urban space can help police to understand how crimes occur in a city and to develop responses accordingly."

- INTRODUCTORY HANDBOOK ON POLICING URBAN SPACE, UNITED NATIONS OFFICE ON DRUGS AND CRIME (2011)

This Spotlight demonstrates the power of Maxar's data collection and enrichment. By improving both the quantity and quality of data, policymakers and security personnel can better develop operations and engagement strategies around the nuanced and evidence-based dynamics of gang violence.

More in-depth studies on Zone 18 should examine the characteristics and patterns of violence across specific gang territories, as well as evaluate the possible factors for an uncharacteristically high number of female victims. Future analysis should also include additional data such as school enrollment and domestic disputes, because family dysfunction, low parental support and higher dropout rates are often correlated to youth participation in gang violence.

"As police, together with local authorities, develop clearer ideas about when and where crimes occur, they can develop a more robust notion about how to respond to crimes. They can think about how police resources need to be distributed across space, the types of relations police need to develop with the population and the ways that urban space may be managed or restructured to control crime."

- INTRODUCTORY HANDBOOK ON POLICING URBAN SPACE, UNITED NATIONS OFFICE ON DRUGS AND CRIME (2011)

FOR A BETTER WORLD

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Our unique approach combines decades of deep mission understanding and a proven foundation of commercial technology to deliver solutions with unrivaled speed, scale and cost-effectiveness.

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