SPOTLIGHT

Identifying vulnerable urban areas in Algiers through remote sensing

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MAXAR

MODELING SOCIAL AND ECONOMIC VULNERABILITY WITHOUT A CENSUS

Many countries around the world go years without conducting a nationwide census. Unfortunately, this often hinders socioeconomic development and the implementation and monitoring of critical programs. This lack of data affects economic growth, public health systems, public security and even crisis response. It also limits government accountability and transparency. It is no wonder, then, that countries with outdated social statistics and reports of corruption also experience significant social unrest.

Fortunately, advancements in remote sensing provide a means to evaluate population vulnerability in the absence of census data. In countries with high unemployment and income inequality, it is the most vulnerable that are left marginalized. It is now possible for governments, intergovernmental organizations and NGOs alike to identify this demographic at scale by analyzing a city's layout, development and distribution of services.

This issue of Maxar Spotlight focuses on Algiers, Algeria. Comprised of an extremely young population (70% under 30 years of age), this major North African capital city has experienced significant urbanization and development since its most recent census in 2008. Despite substantial

ANTI-GOVERNMENT DEMONSTRATION IN ALGIERS ON DECEMBER 11, 2019
(RYAD KRAMDI, AFP/GETTY IMAGES)

government spending and subsidy programs—benefiting middle and high-income households the greatest—little has been done to improve the prospects of Algiers' most vulnerable.

This Spotlight utilizes high-resolution building footprint data and Human Landscape data to identify specific neighborhoods in Algiers that are more likely to be disengaged from politics and the economy. These are locations where the government should prioritize neighborhood revitalization efforts and improve community engagement, outreach and messaging.

SUMMARY OF UNIQUE TOOLS & APPLICATIONS

Ecopia Building Footprints powered by Maxar
Maxar has partnered with Ecopia.ai to offer an innovative, complete 2D vector dataset of building footprint polygons available anywhere in the world. Created using Maxar basemaps and Ecopia's proven, semi-automated process of machine learning artificial intelligence, Ecopia Building Footprints powered by Maxar deliver current, accurate, and scalable building footprints. For this assessment, building footprint data was used to provide calculations on the physical properties of Algiers' built-up areas. When combined with the availability of services, urban form measurements (building size, building density and building complexity) can differentiate lower class neighborhoods from middle- and upper-class neighborhoods.

Human Landscape
Maxar Human Landscape is a foundational human geography dataset that provides rich attribution and metadata at a countrywide scale. Each dataset comprises 60+ individual data layers across thirteen standard human geography themes. By leveraging high-resolution satellite imagery to significantly enrich thousands of publicly available and conflated data sources into up-to-date and analysis-ready foundational data, Human Landscape reduces operating costs and accelerates time-to-mission for complex geospatial analysis or taskings. For this assessment, Human Landscape was used to provide an assessment for the availability of certain services throughout Algiers.

URBAN FORM ANALYSIS

According to data from The World Bank, Algiers is among North Africa's fastest growing cities. Its population has also grown increasingly discontent with the government. Many fiscal policies and well-intended subsidies have favored the wealthy, and corruption continues at all levels of leadership. Significant income inequality and a high unemployment rate, particularly for those under 30 years of age (roughly 26%), have shown no signs of abating. These factors have contributed to social unrest, emigration and the pervasive growth of Algiers' informal economy. Following a year of widespread protests and the resignation of 20- year president Abdelaziz Bouteflika, the future peace and stability of Algiers appears to be in flux.

This Spotlight provides an assessment of Algiers' more socially and economically vulnerable neighborhoods by modeling the city's urban form. The assessment is based on the notion that lower class neighborhoods have specific physical properties. It is intended to demonstrate how Maxar satellite imagery and machine-learning processes can generate building footprint polygons and urban form measurements at speed and scale.

Urban form is defined as the physical properties that comprise a city's built-up areas, such as building sizes, building density and building complexity. It can also include the distribution of and access to certain features or services. By using Maxar Human Landscape and Ecopia Building Footprints powered by Maxar, each of these factors were measured across Algiers on a one kilometer fishnet grid. The map series on the next several pages depicts the process and methodology for each calculation, which was then applied to an aggregate vulnerability model.

ALGIERS, ALGERIA - ECOPIA BUILDING FOOTPRINTS POWERED BY MAXAR

Algiers

ALGERIA

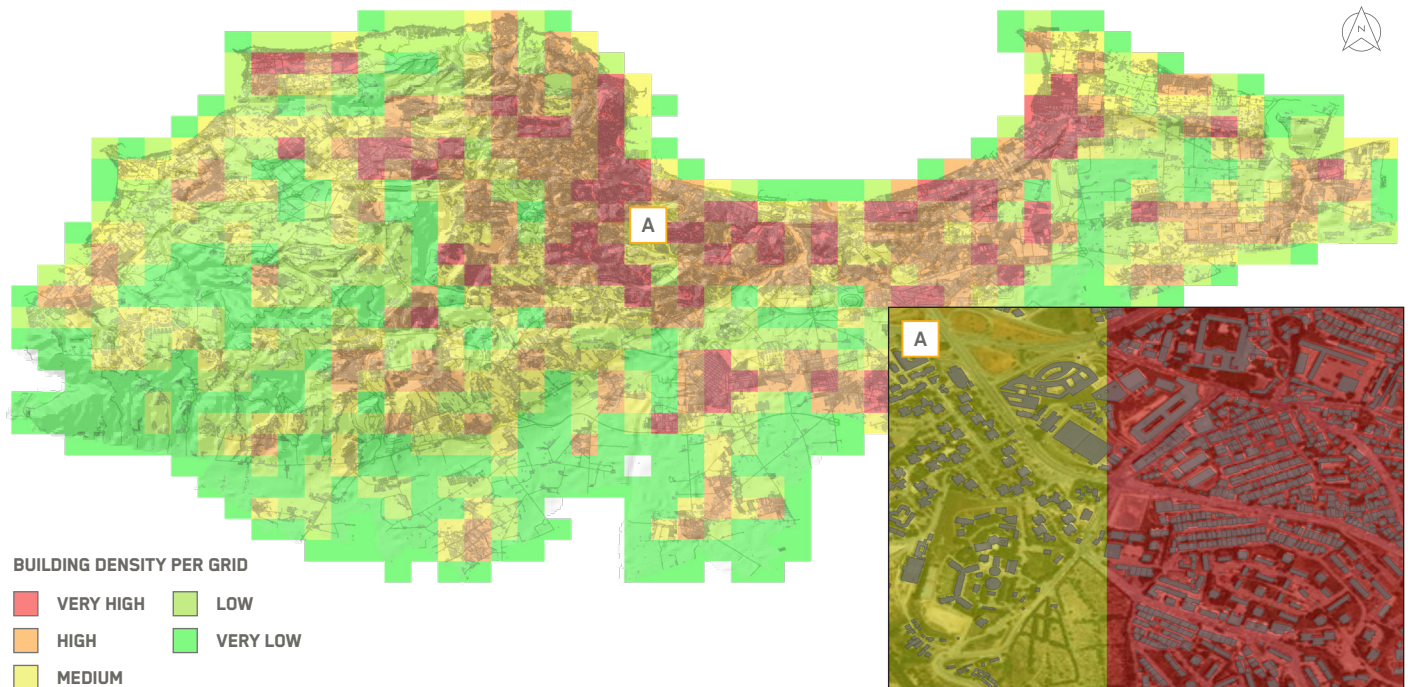■ BUILDING FOOTPRINTS

— ROADS

A INSET (SAMPLE)
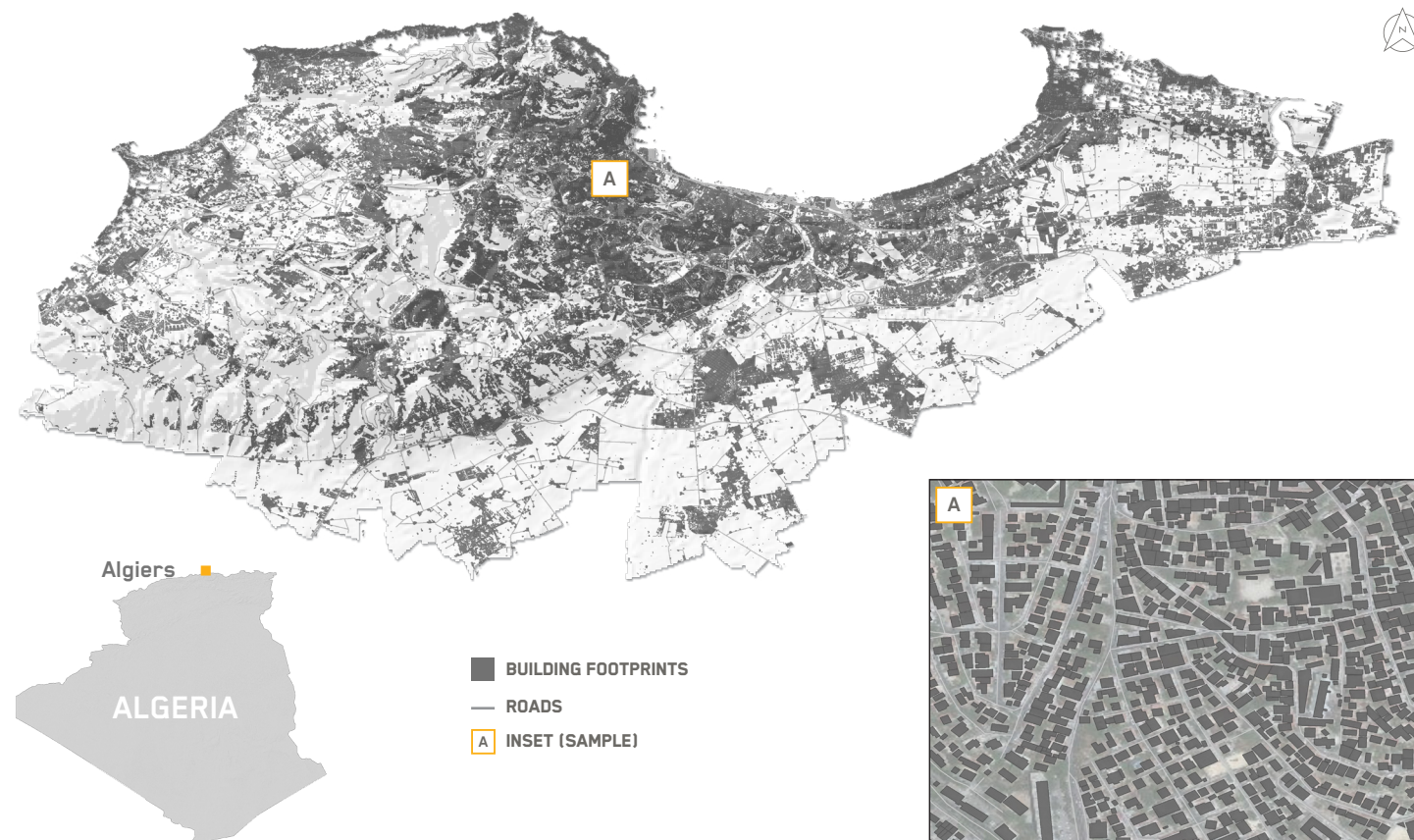
MEASURING AVERAGE BUILDING SIZE
(TOTAL AREA OF BUILDING FOOTPRINTS PER GRID CELL DIVIDED BY NUMBER OF BUILDINGS)
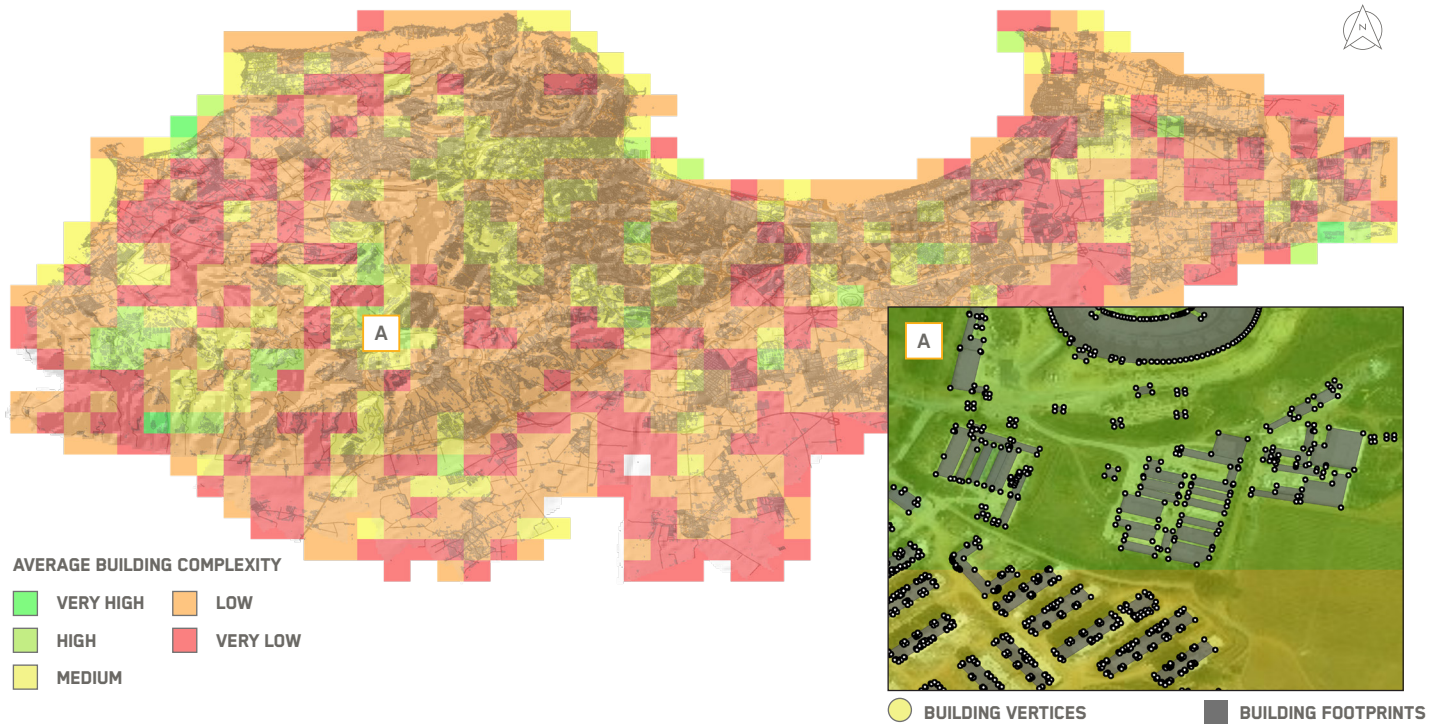

AVERAGE BUILDING SIZE

- VERY LARGE
- LARGE
- MEDIUM
- SMALL
- VERY SMALL
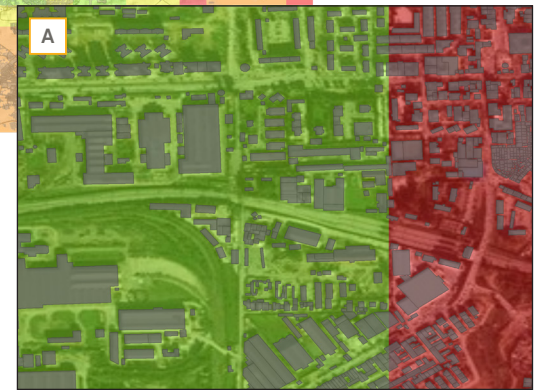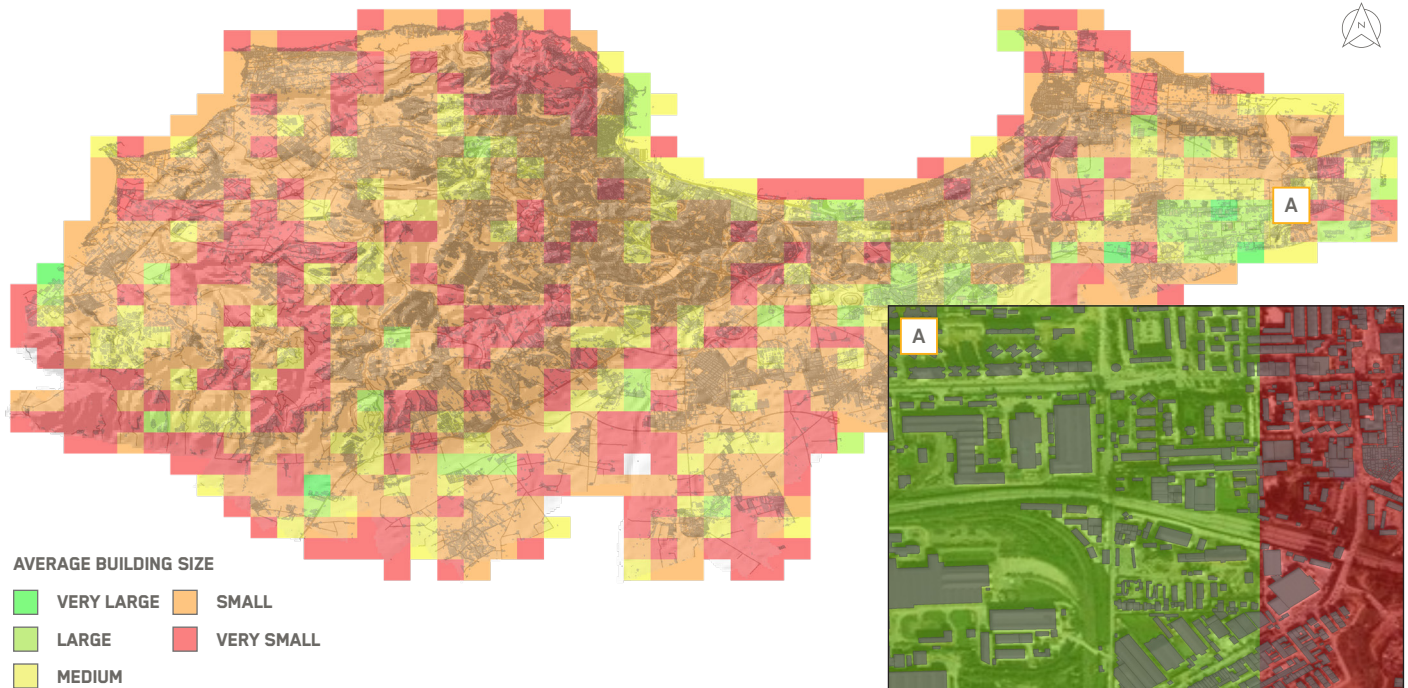
BUILDING FOOTPRINTS

MEASURING BUILDING DENSITY
(TOTAL AREA OF BUILDING FOOTPRINTS PER GRID CELL DIVIDED BY TOTAL AREA OF GRID CELL)
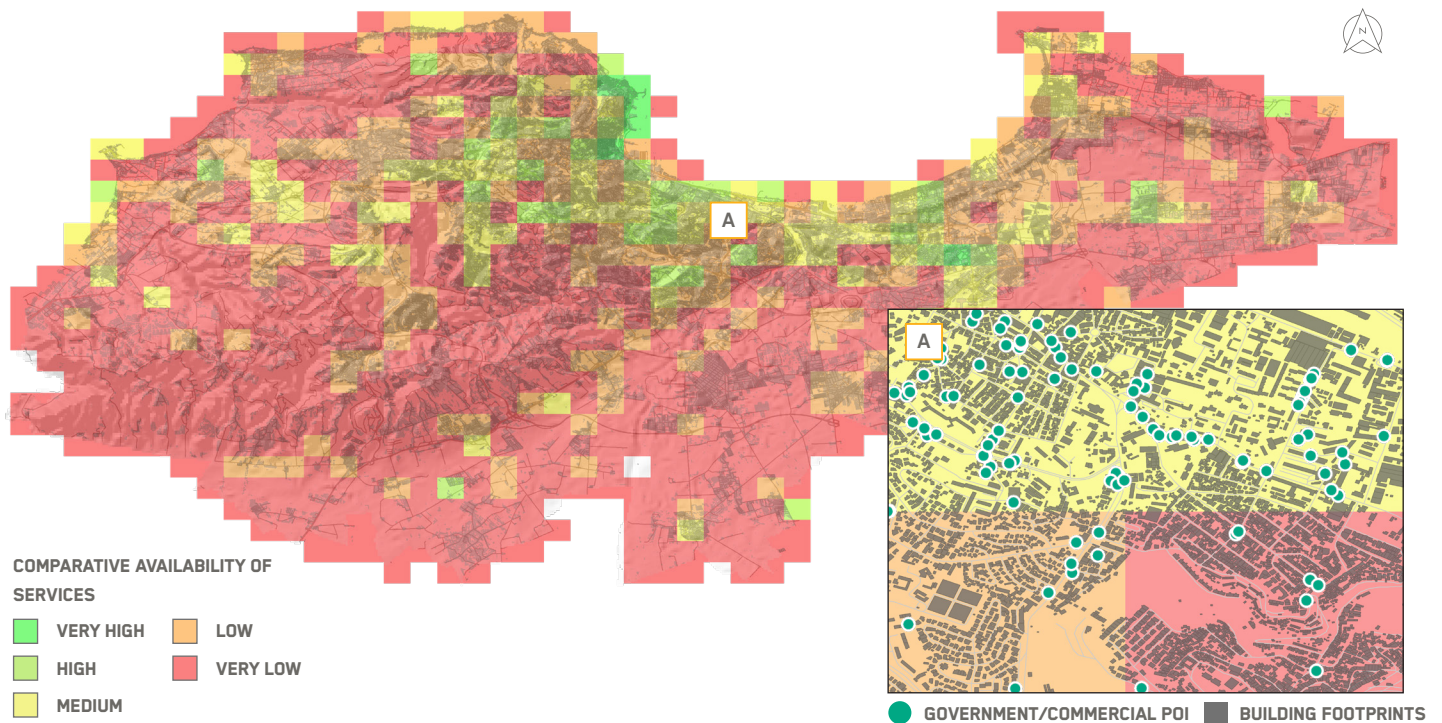

BUILDING DENSITY PER GRID

- VERY HIGH
- HIGH
- MEDIUM
- LOW
- VERY LOW

BUILDING FOOTPRINTS

MEASURING BUILDING COMPLEXITY
## (TOTAL NUMBER OF VERTICES PER GRID CELL DIVIDED BY NUMBER OF BUILDINGS)

AVERAGE BUILDING COMPLEXITY

- VERY HIGH
- HIGH
- MEDIUM
- LOW
- VERY LOW

○ BUILDING VERTICES ▪ BUILDING FOOTPRINTS

MEASURING ACCESS TO SERVICES
(TOTAL GOVERNMENT AND COMMERCIAL POINTS OF INTEREST (POI) DIVIDED BY NUMBER OF BUILDINGS)

COMPARATIVE AVAILABILITY OF SERVICES

- VERY HIGH
- HIGH
- MEDIUM
- LOW
- VERY LOW

● GOVERNMENT/COMMERCIAL POI ▪ BUILDING FOOTPRINTS

VULNERABILITY MODEL
(AGGREGATE OF BUILDING SIZE, BUILDING DENSITY, BUILDING COMPLEXITY AND PROXIMITY TO POI)

Algiers

ALGERIA

■ BUILDING FOOTPRINTS

— ROADS

☐ MOST VULNERABLE NEIGHBORHOODS

VULNERABILITY SCALE

HIGH   VERY HIGH
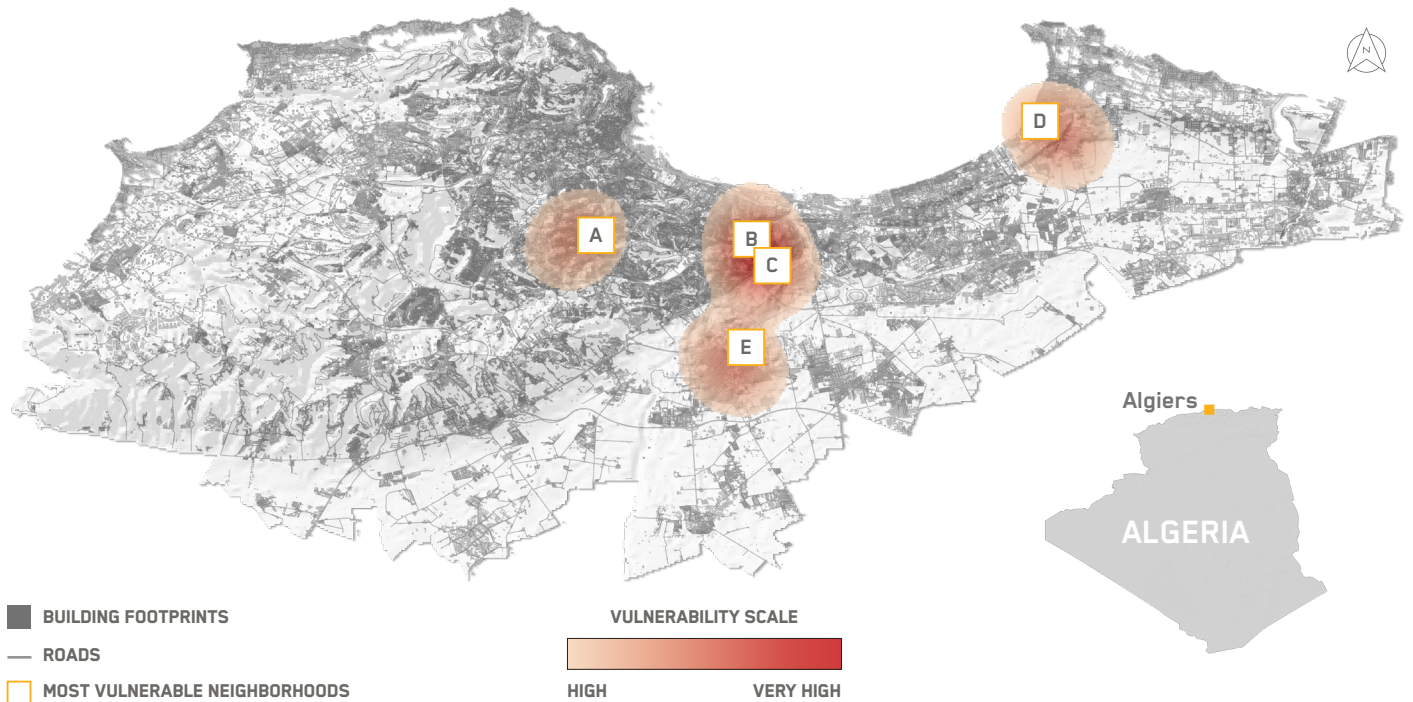
A BIRKHADEM

The suburb of Birkhadem is especially vulnerable to violent crime and conflict; there is significant insecurity and tensions between locals and the Algerian police. Foreign media reporting describes Birkhadem as a "no man's land." Stories of police inaction and their inability to enforce laws or even regulate traffic are common. However, high-profile theft reporting indicates that the Algerian police have not completely withdrawn their involvement from the neighborhood.

B BACHDJARAH

An eastern suburb of Algiers, Bachdjarah is reportedly facing mounting insecurity and discontent. Parts of the district are marred by poor living conditions and employment opportunities. Its youth, which feel especially marginalized, are forced to find work in the informal trade. The district is littered with trash and flooded with street vendors. During parliamentary elections in 2017, polling stations were desolate in comparison with other parts of the capital.

BIRKHADEM | MARCH 6, 2020 | WORLDVIEW-2

BACHDJARAH | APRIL 8, 2020 | WORLDVIEW-3

C SOUTHERN BOUROUBA

Most recent reporting on the suburb of Bourouba pertains to complaints about a lack of public infrastructure and services. Reports from locals suggest that trash is often not picked up by the government and the inhabitants clean the streets on their own. Locals also state that authorities have abandoned their neighborhood, which is consistent with the lack of crime reporting in recent years.

D EASTERN BORDJ EL KIFFAN

The parts of eastern Bordj El Kiffan that are away from the beach and other public infrastructure are susceptible to violent crime. Online reviews of housing developments and schools in the area highlight local sentiment and concerns about the lack of security. The government has made attempts in recent years to relocate families in the area from slums to newer government-funded developments.

E. BORDJ EL KIFFAN | MARCH 6, 2020 | WORLDVIEW-2

E SOUTHERN BOUROUBA

The suburb of Baraki is reportedly dilapidated and lacks the necessary upkeep and standards for public infrastructure. The poor living conditions in this area certainly contribute to increased crime and instability, although the police are reportedly involved in the area. In the past year, there has been a prevalence of reported drug interdictions by police who have broken up smuggling rings dealing in both marijuana and synthetic drugs. Foreign media reporting has also depicted videos of insecurity and police brutality against local protestors.

BARAKI | APRIL 8, 2020 | WORLDVIEW-3

CONCLUSION

Inadequate housing, unemployment, underemployment and limited access to essential services are often byproducts of deficient government planning and failed policies amid significant population change. While the Algerian government has appeared committed to principles of sustainable urban development and social cohesion, the country's economic crisis and political turmoil have either delayed or slowed many projects. Because of these issues, confidence and trust in the Algerian government is declining, which is most evident in select urban areas in Algiers. Understanding this vulnerability is essential for shaping development and allocating government investment where it is needed the most. Algiers accounts for the third-highest urban area population across all of North Africa, unfortunately, its most current census is more than a decade old and grossly outdated. This Spotlight demonstrates how Maxar remote-sensing and Earth Intelligence capabilities can analyze population vulnerability in the absence of current demographic data, providing extremely cost-effective data and analysis for urban planning initiatives and/or targeted population engagement.

FOR A BETTER WORLD

Maxar is a trusted partner and innovator in Earth Intelligence and Space Infrastructure. We deliver disruptive value to government and commercial customers to help them monitor, understand and navigate our changing planet; deliver global broadband communications; and explore and advance the use of space.
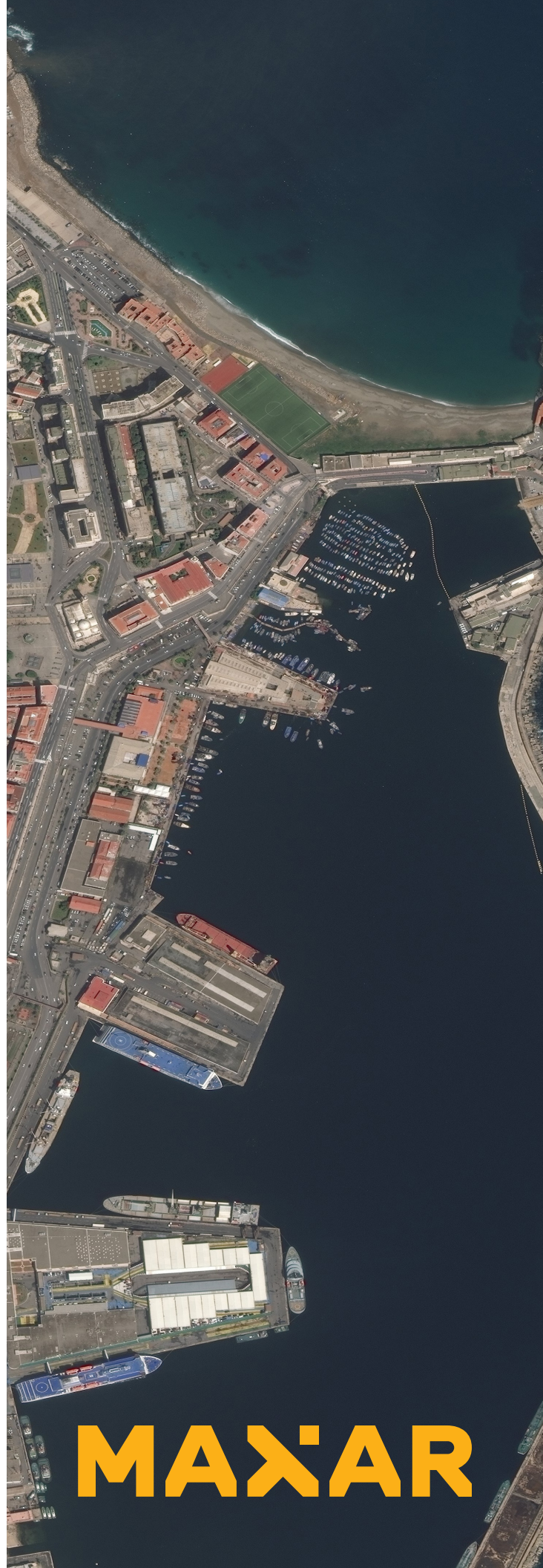
Our unique approach combines decades of deep mission understanding and a proven foundation of commercial technology to deliver solutions with unrivaled speed, scale and cost-effectiveness.

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