WEBINAR

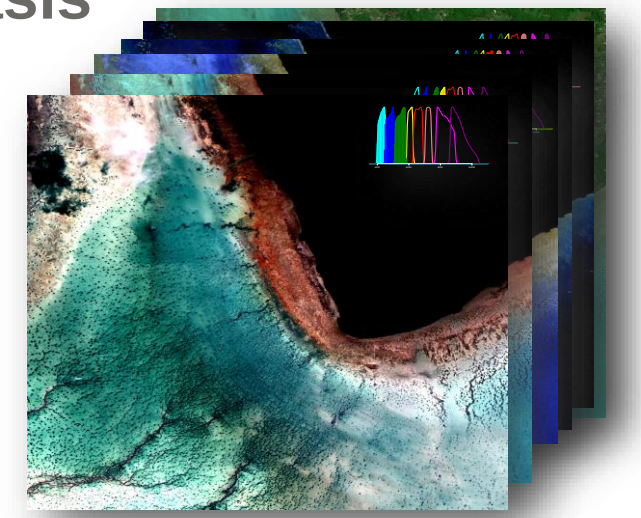
COVID-19 RESPONSE USING IMAGERY AND GEOSPATIAL DATA

Leveraging Imagery for COVID-19 Response

Kumar Navulur

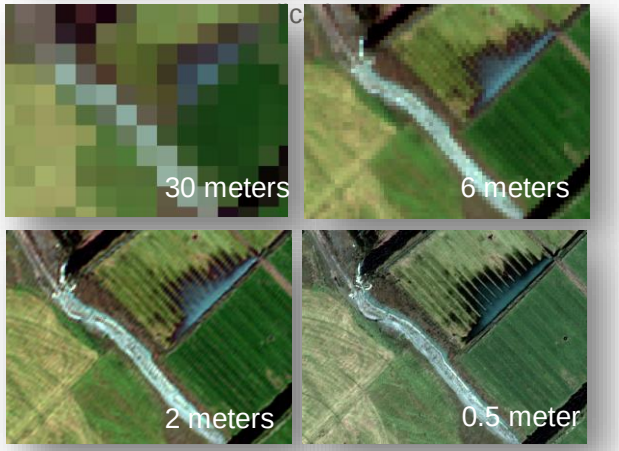
April 2020

Maxar satellite constellation is capturing images of our planet on a daily basis

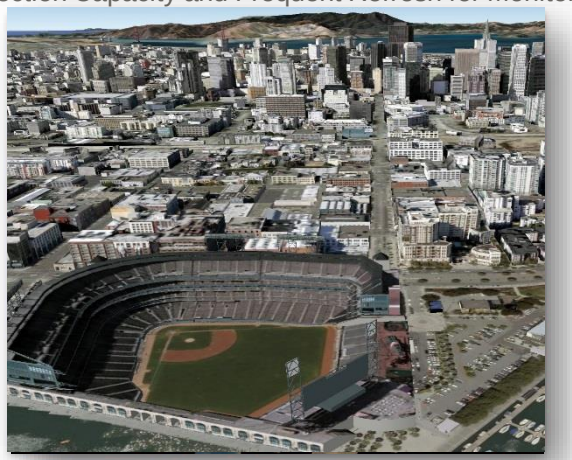


Increasing Number of Spectral bands for Mapping c

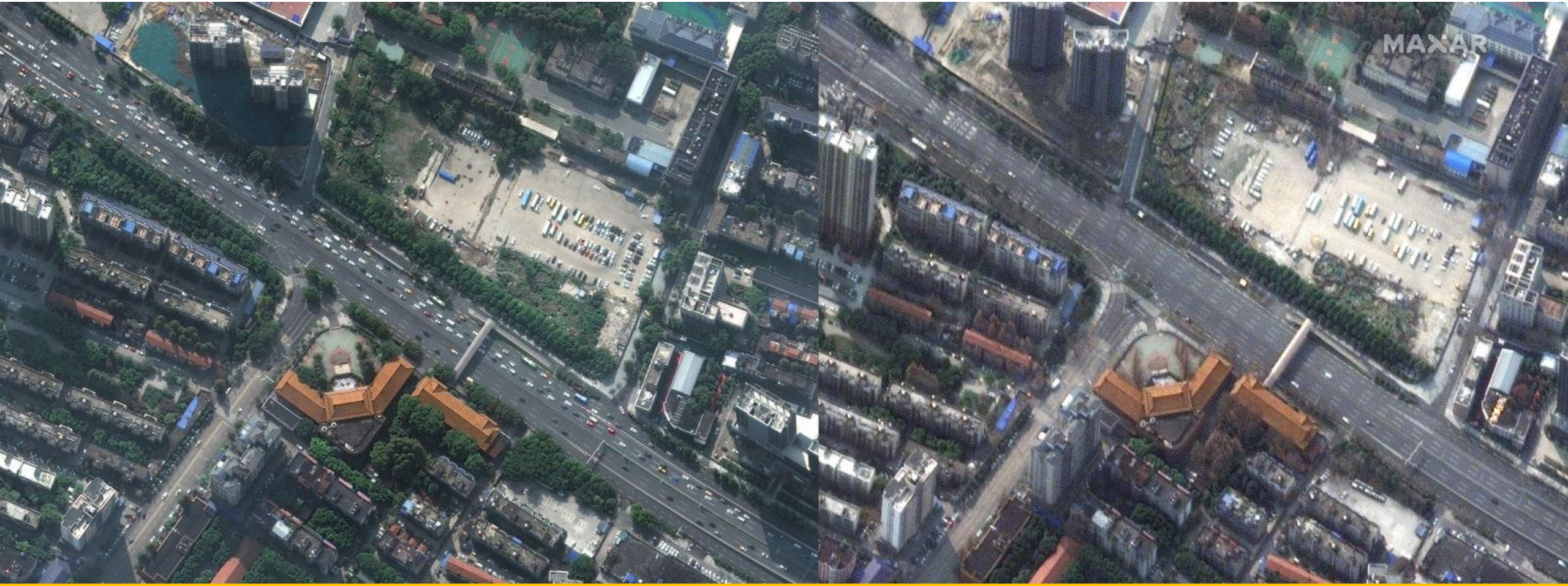
Global Collection Capacity and Frequent Refresh for Monitoring Changing



Increasing Spatial Resolution for Monitoring Areas



Large Scale Computing and Global Infra-Structure Allows Making Maps in Days



A main street in Wuhan

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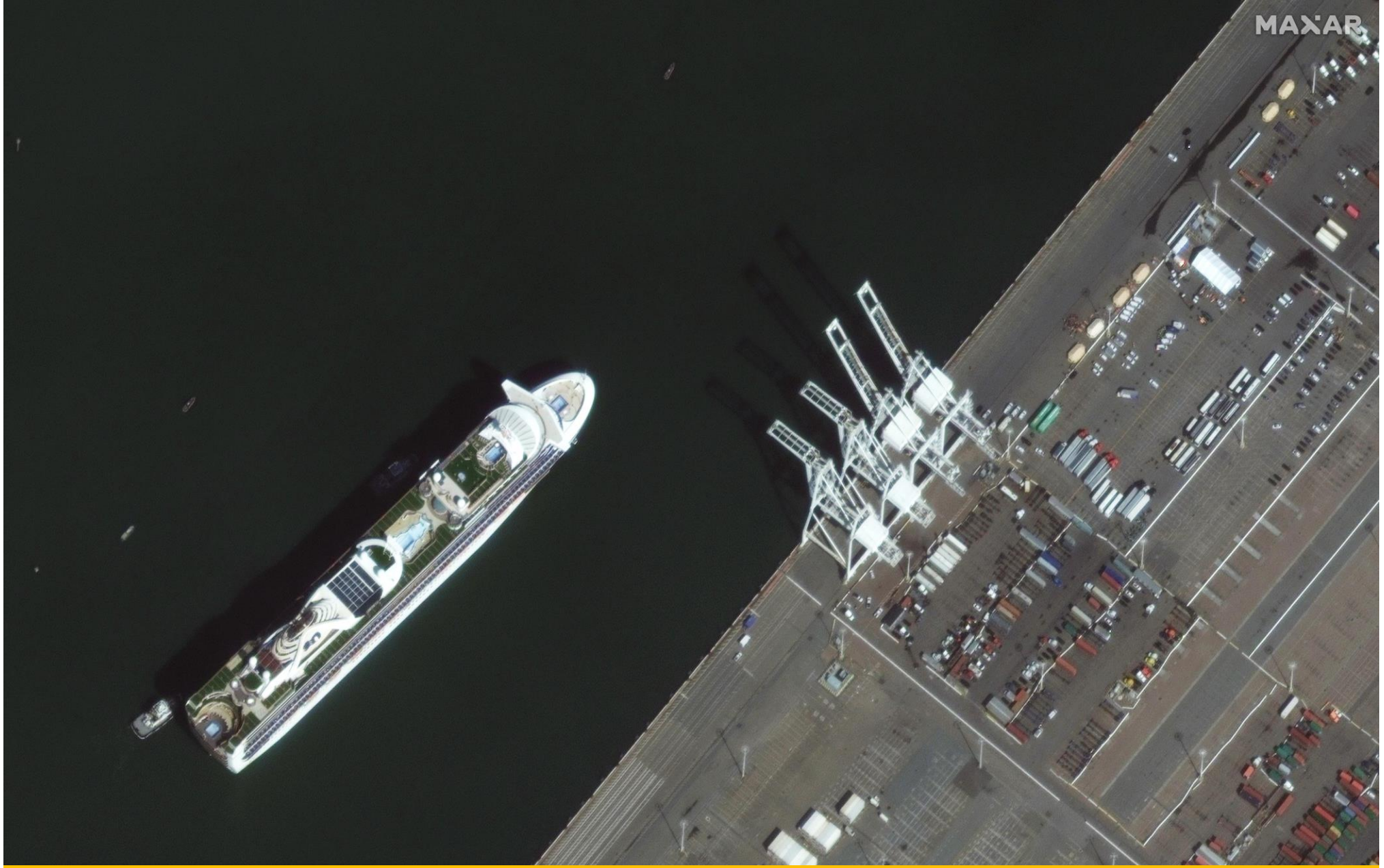
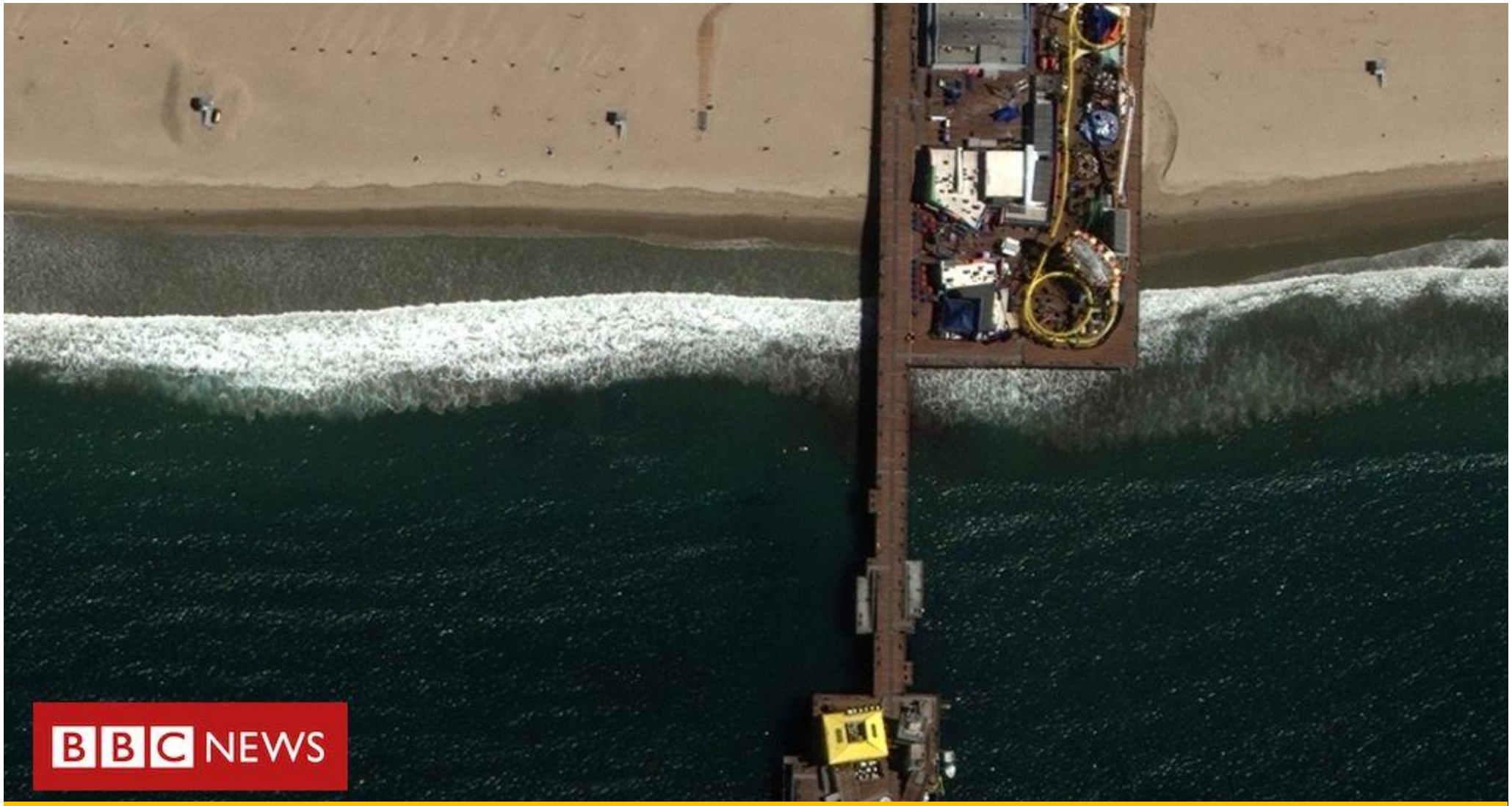
Satellite images reveal Russia is rapidly building a 500-bed hospital in a field outside Moscow to handle a surge in coronavirus cases

Satellite images potential mass graves in Iran



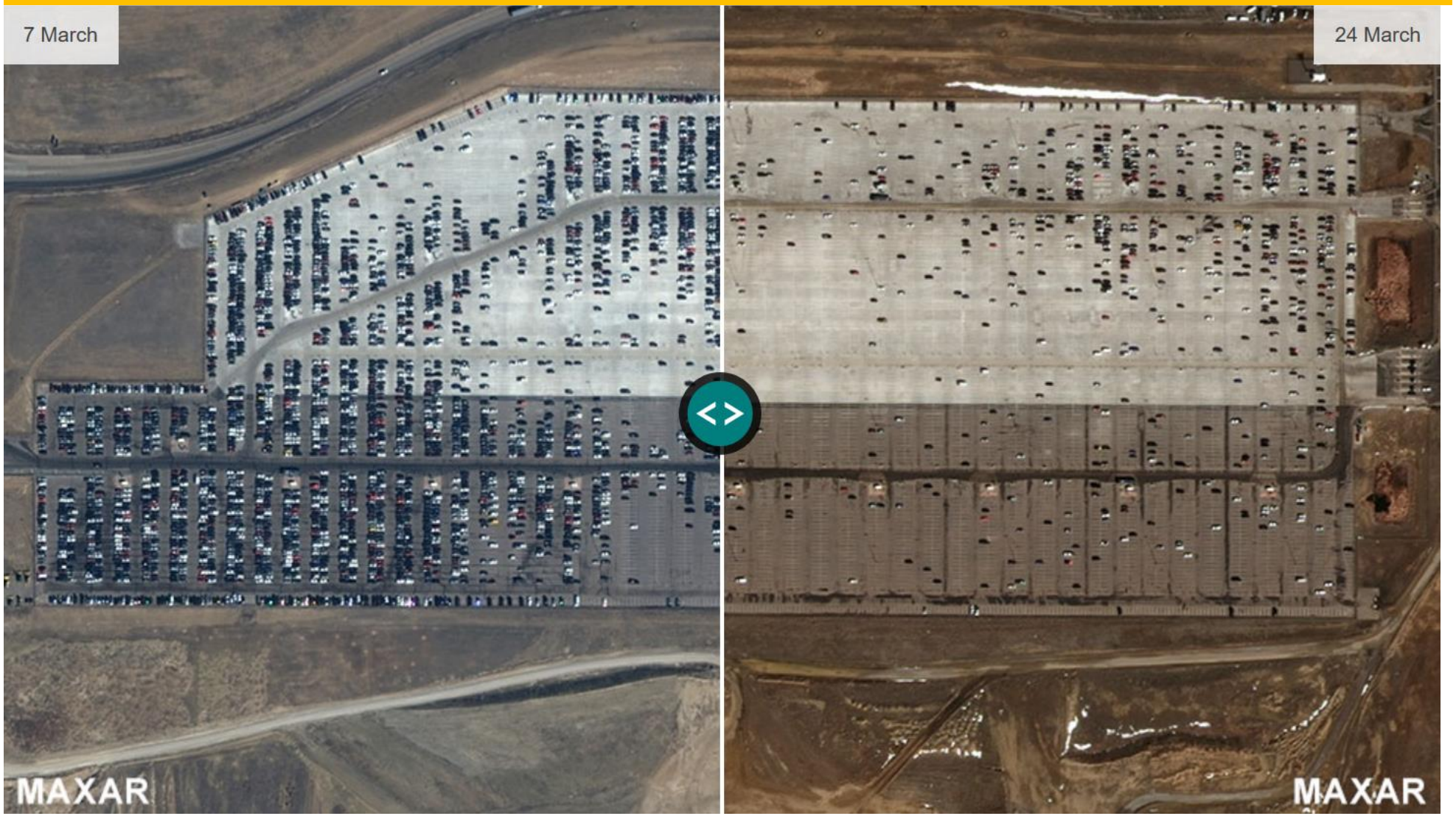
Thousands on virus-hit cruise ship wait their turn to leave



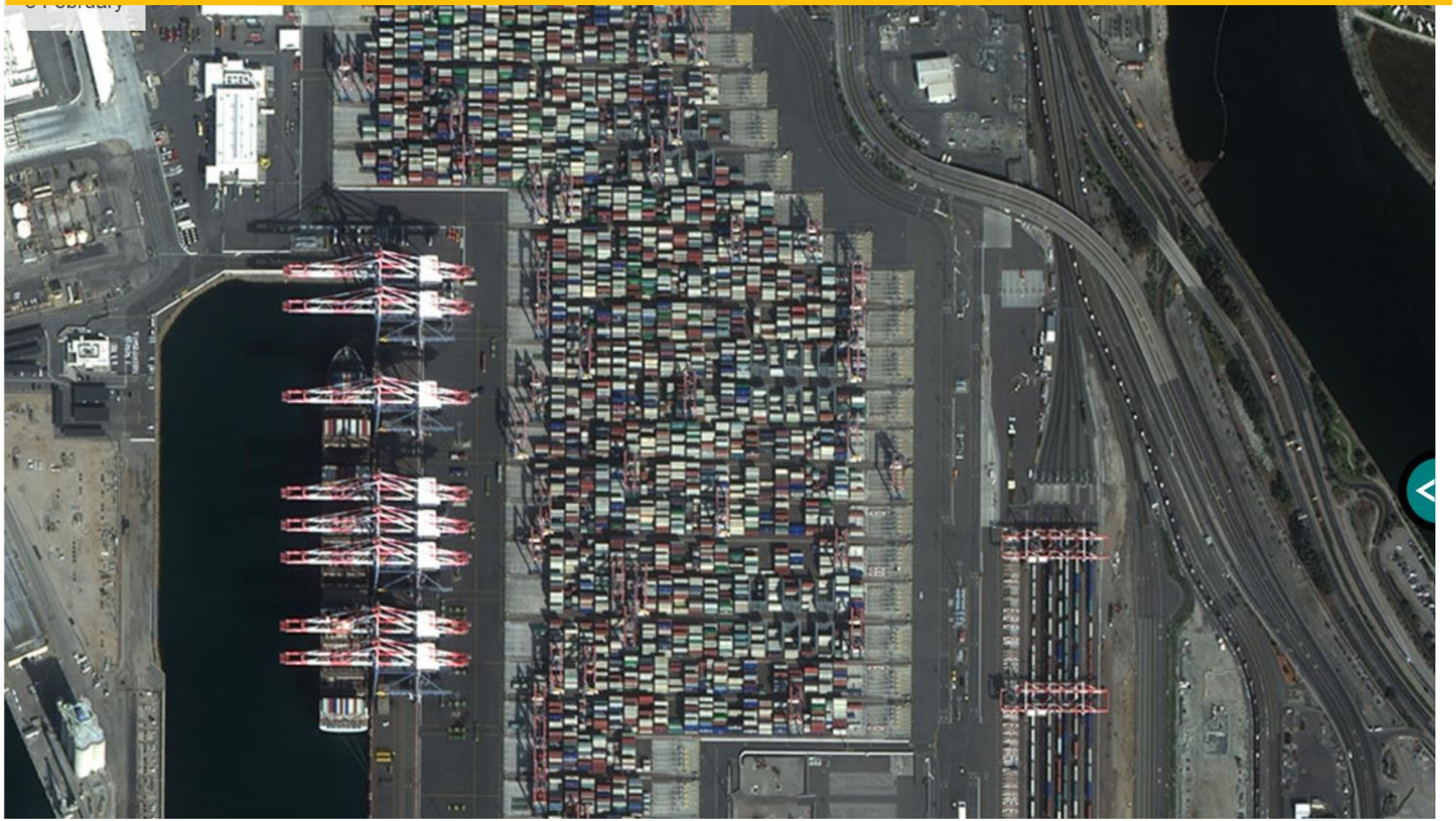
Social Impact due to COVID-19

Source: https://www.bbc.com/news/world-51948578

Socia/Economic Impact due to COVID-19, Denver International Airport



Economic Impact due to COVID-19, Long Beach, CA, USA



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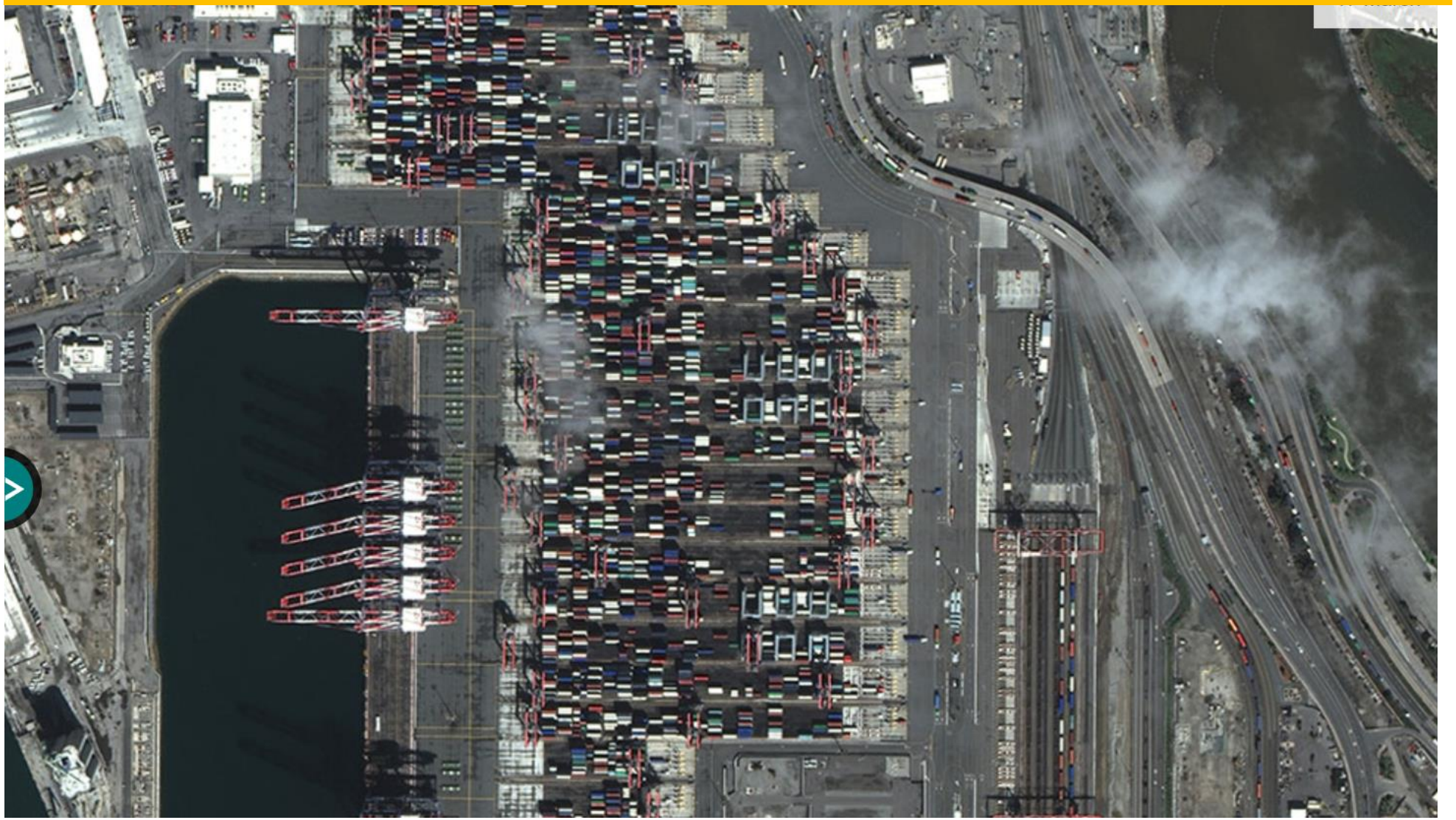
Economic Impact due to COVID-19, Long Beach, CA, USA



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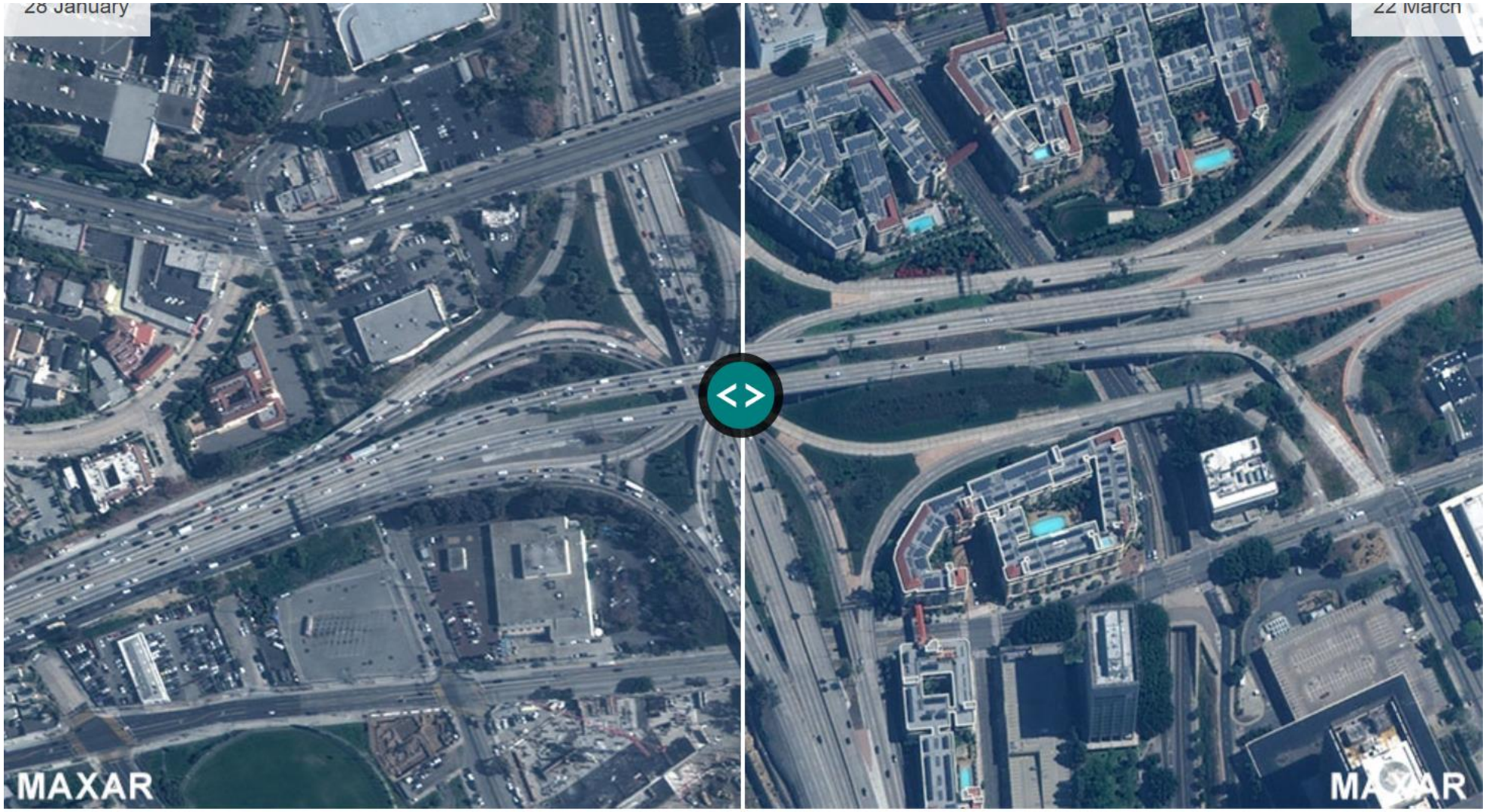
Environmental Impact due to COVID-19, 101 interstate in downtown Los Angeles.



And people aren't flying either - as Maxar Technologies' satellite images of Denver International Airport in Colorado show.

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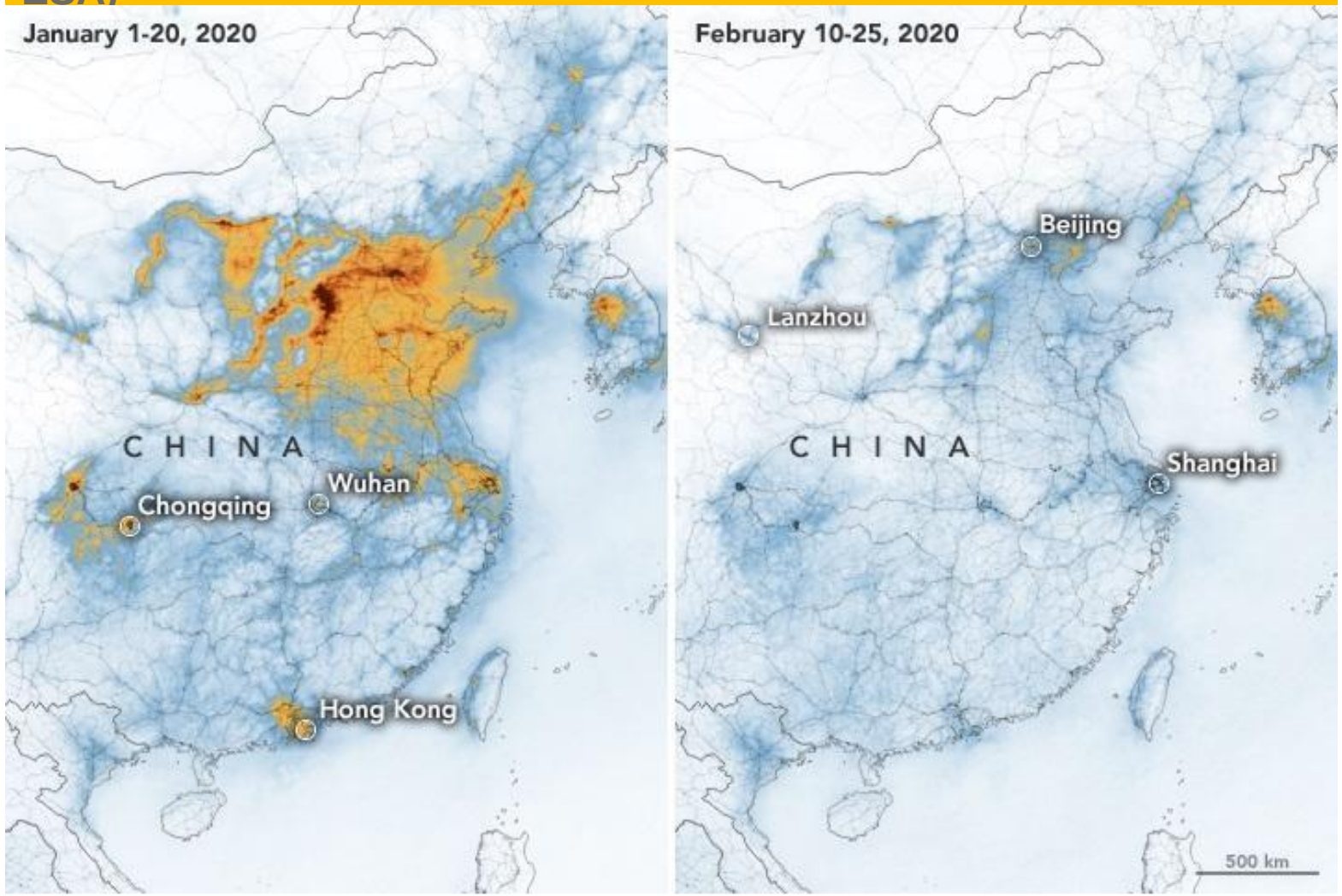
Environmental Impact due to COVID-19, China (Source: NASA and ESA)



WEBINAR

INFECTIOUS DISEASE RESPONSE PLANNING WITH GEOSPATIAL DATA

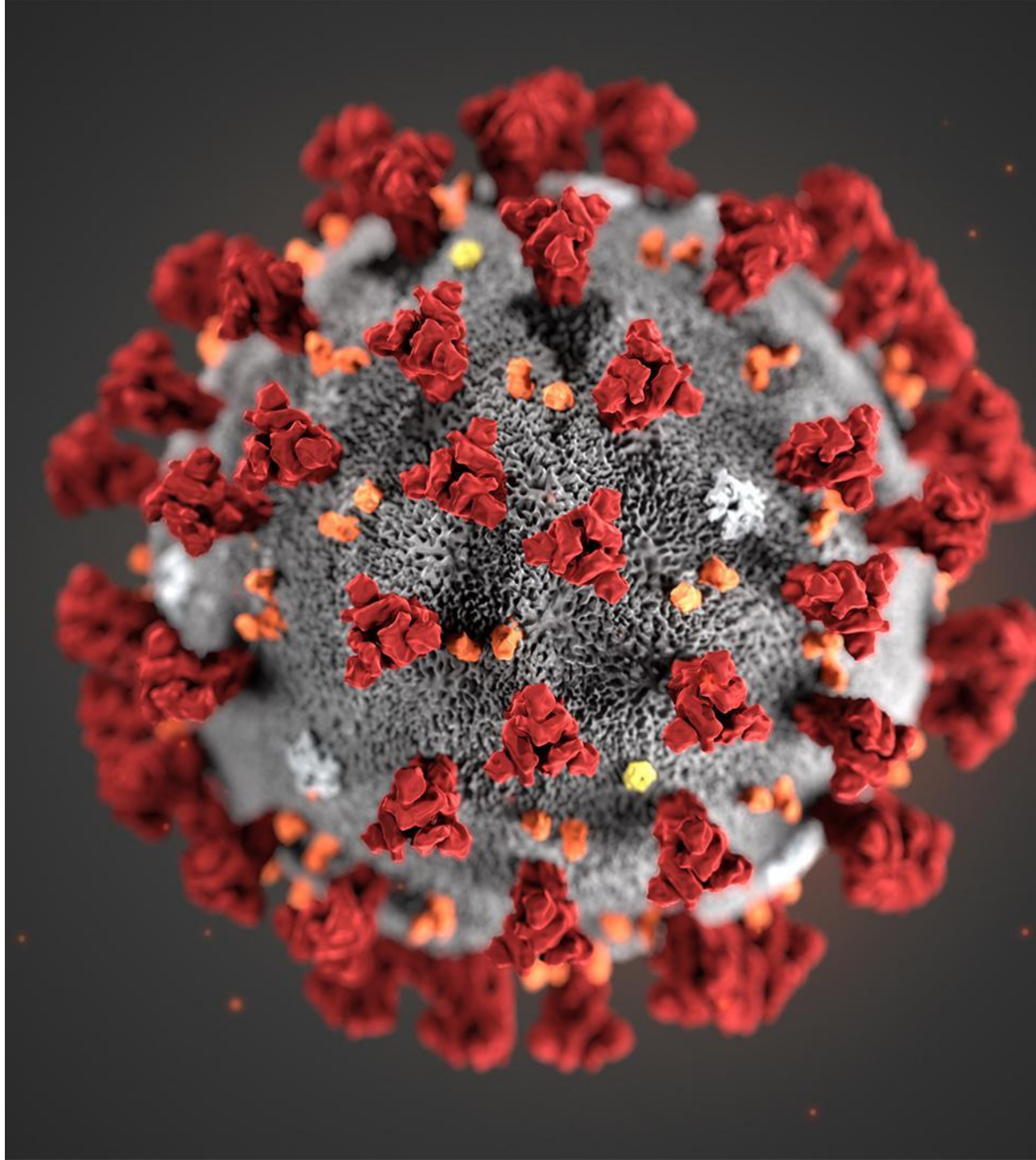
Infectious disease response planning with geospatial data

Alicia Williams

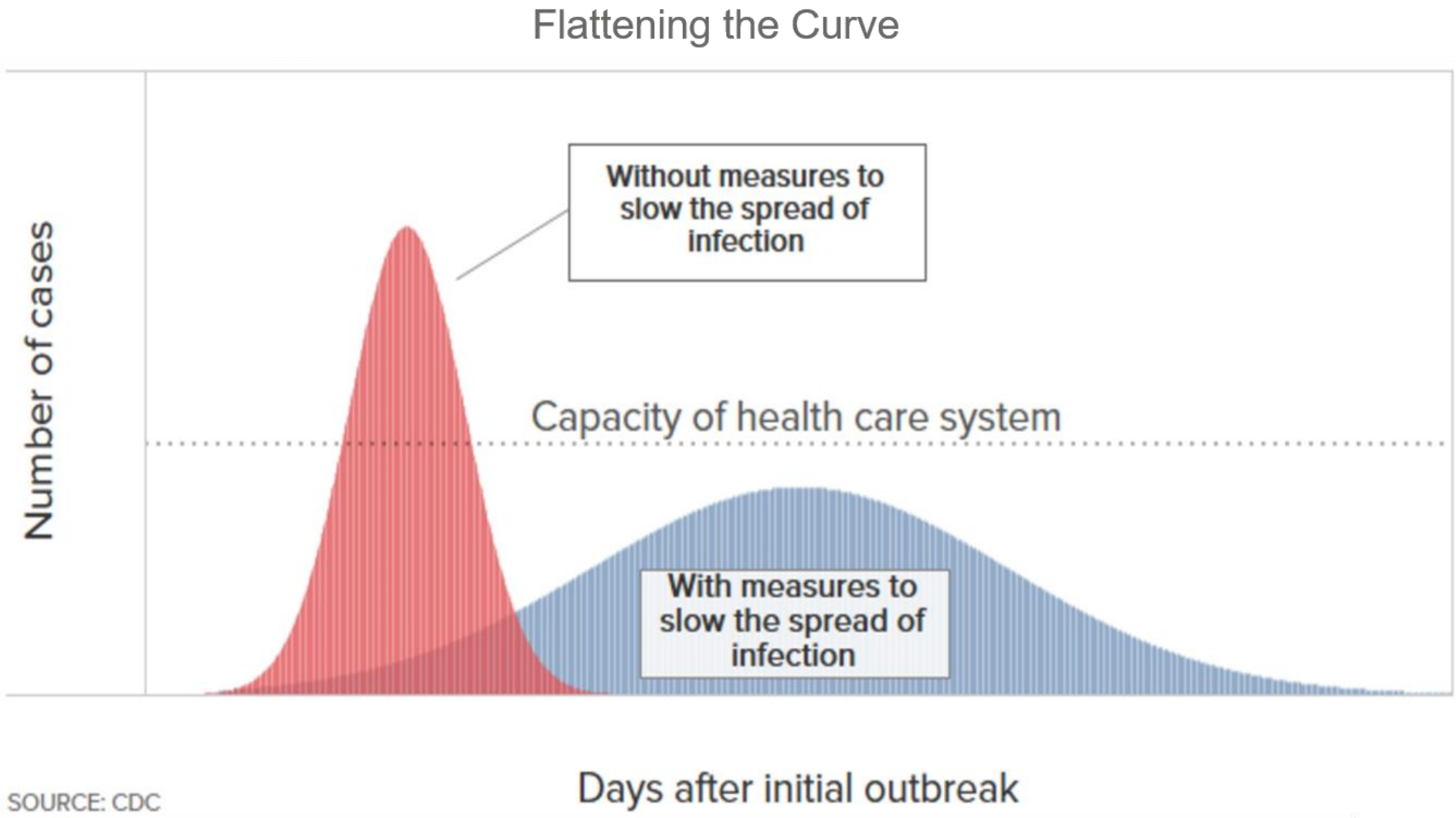
April 2020

Infectious disease modeling

- Infectious diseases are estimated to be responsible for more than 15 million deaths globally each year
- Human mobility along with socioeconomic conditions are all important factors in modeling pandemics.



Geospatial data for infectious disease modeling



Urgent need for data

- February 19th - Iran announces its first deaths from COVID-19
- March 1st - Large trenches are visible, mass graves for COVID-19 victims

Beheshte Masoumeh Cemetery, Qom
WorldView-3: March 1, 2020

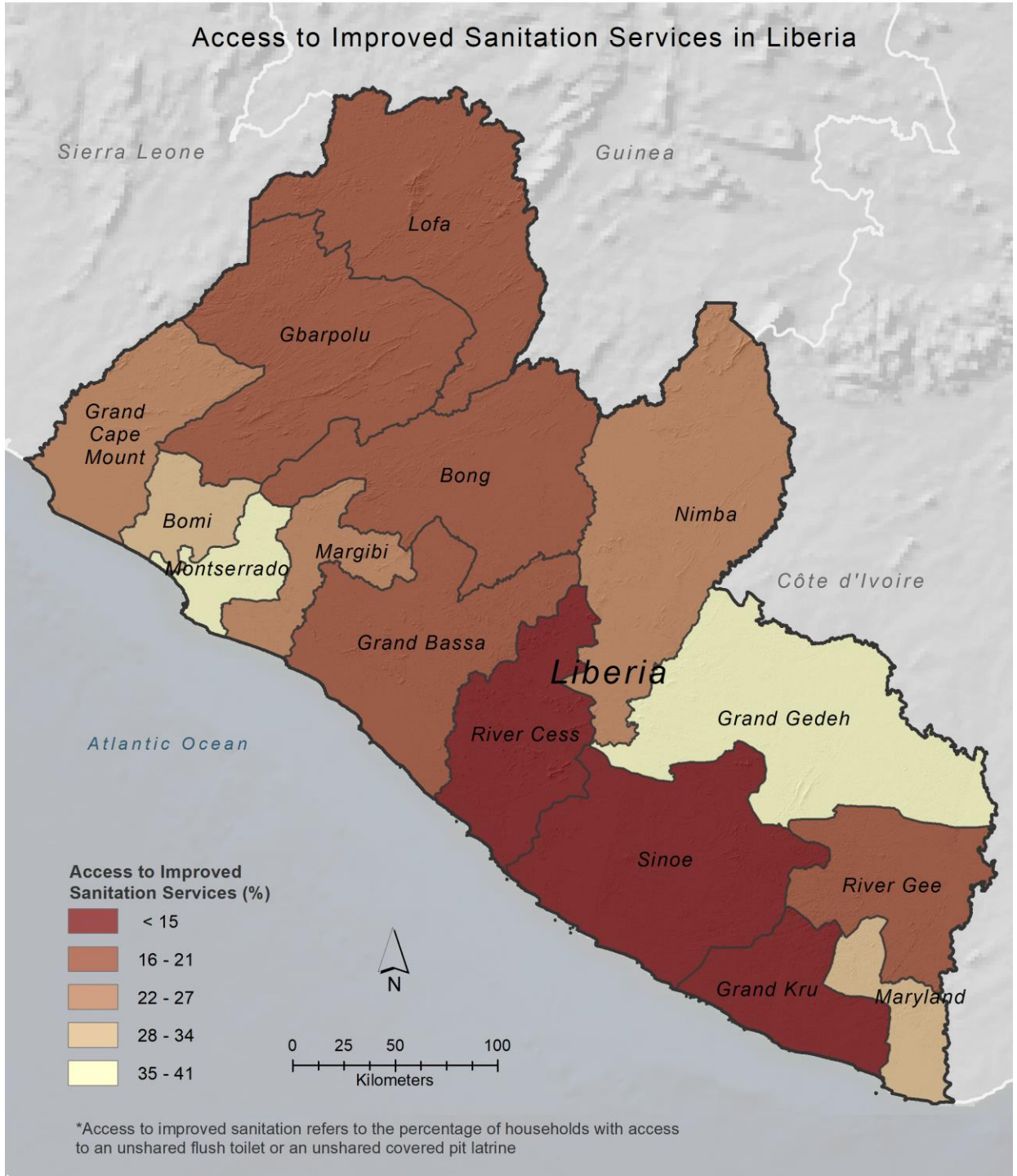
Ebola disease modeling

Timely Transport

- Maxar human landscape datasets identified the locations of **key points of interest** (POIs), such as medical facilities and clinics, in disease-affected areas like Monrovia, Liberia.

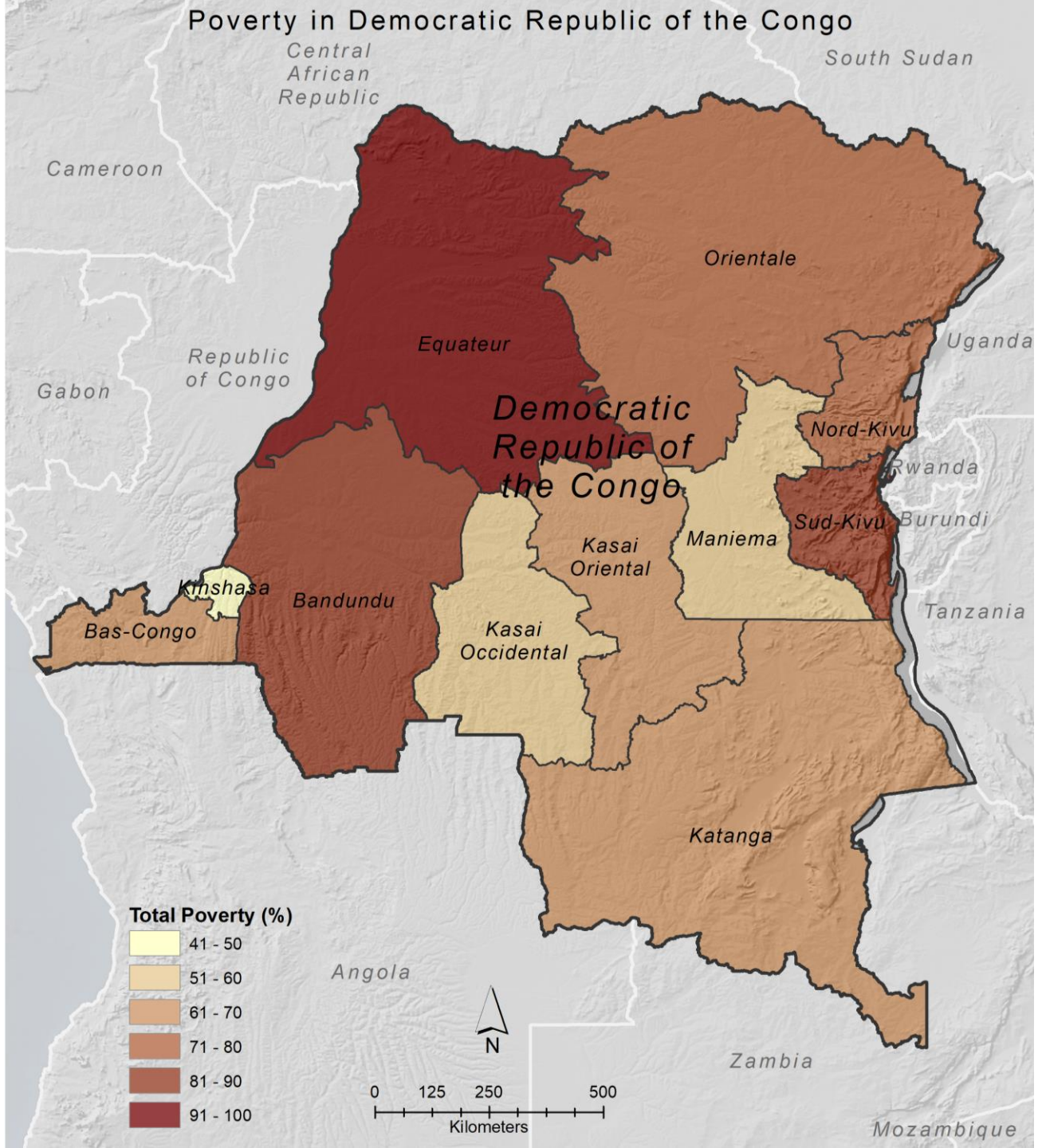
Sanitation Services

- **Sociocultural layers**, such as access to improved sanitation services, were important for modeling the Ebola outbreak in Liberia in 2014.



Population Density

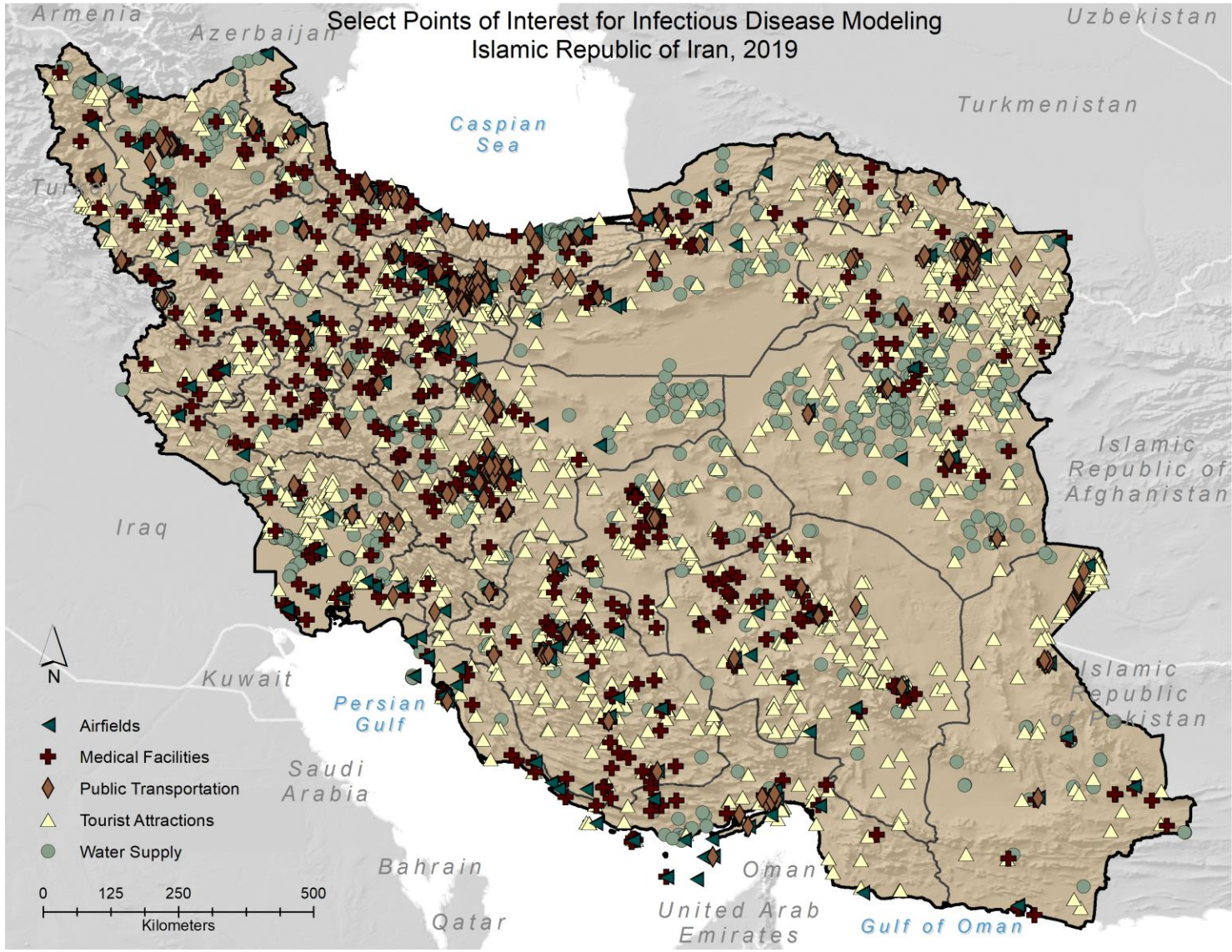
- **Sociocultural layers** informed response teams where high-density populations were located, specifically low-income communities with higher risk of contracting the disease.



COVID-19 disease modeling

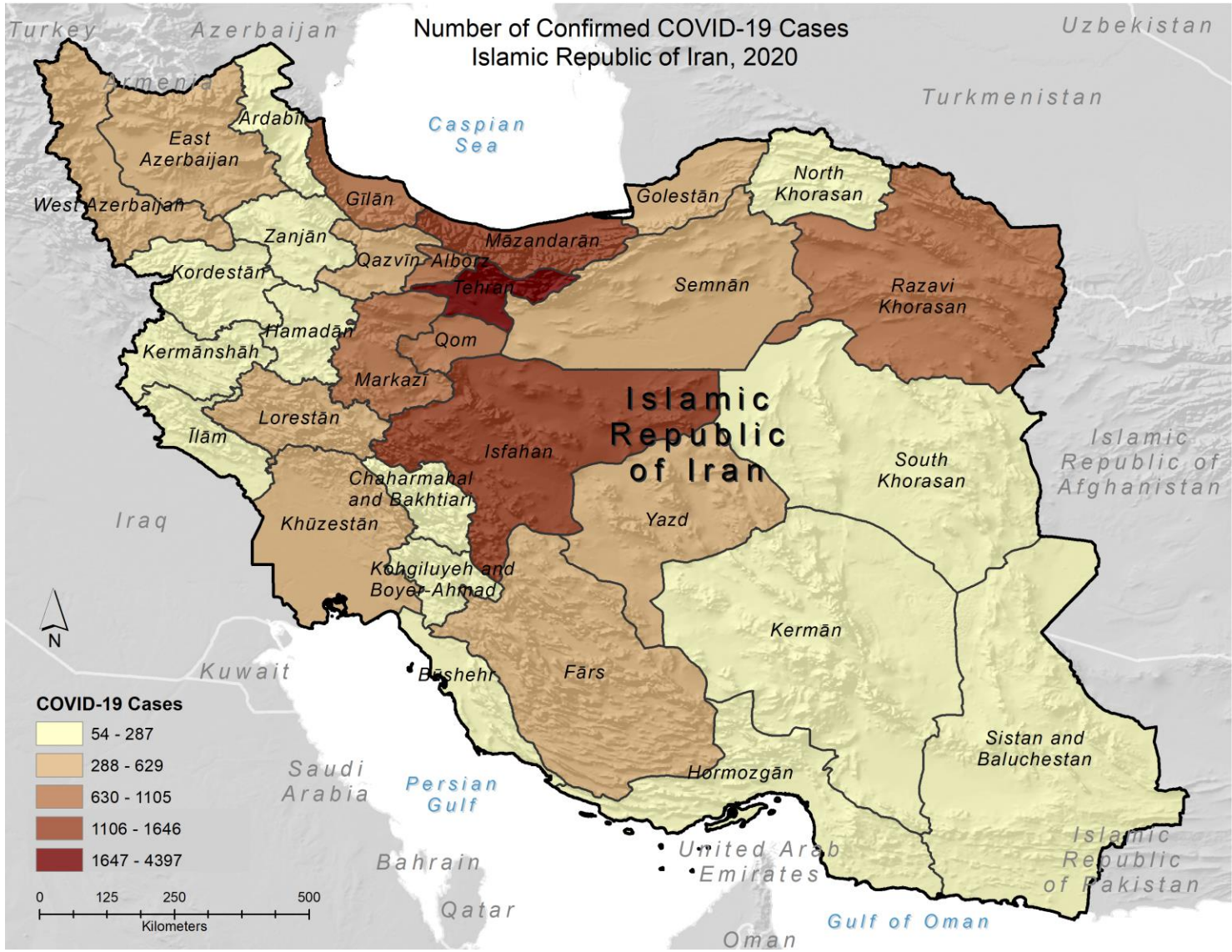
Disease modeling POIs

- Key points of interest (POI) layers in Iran were mapped to model infectious disease outbreaks.



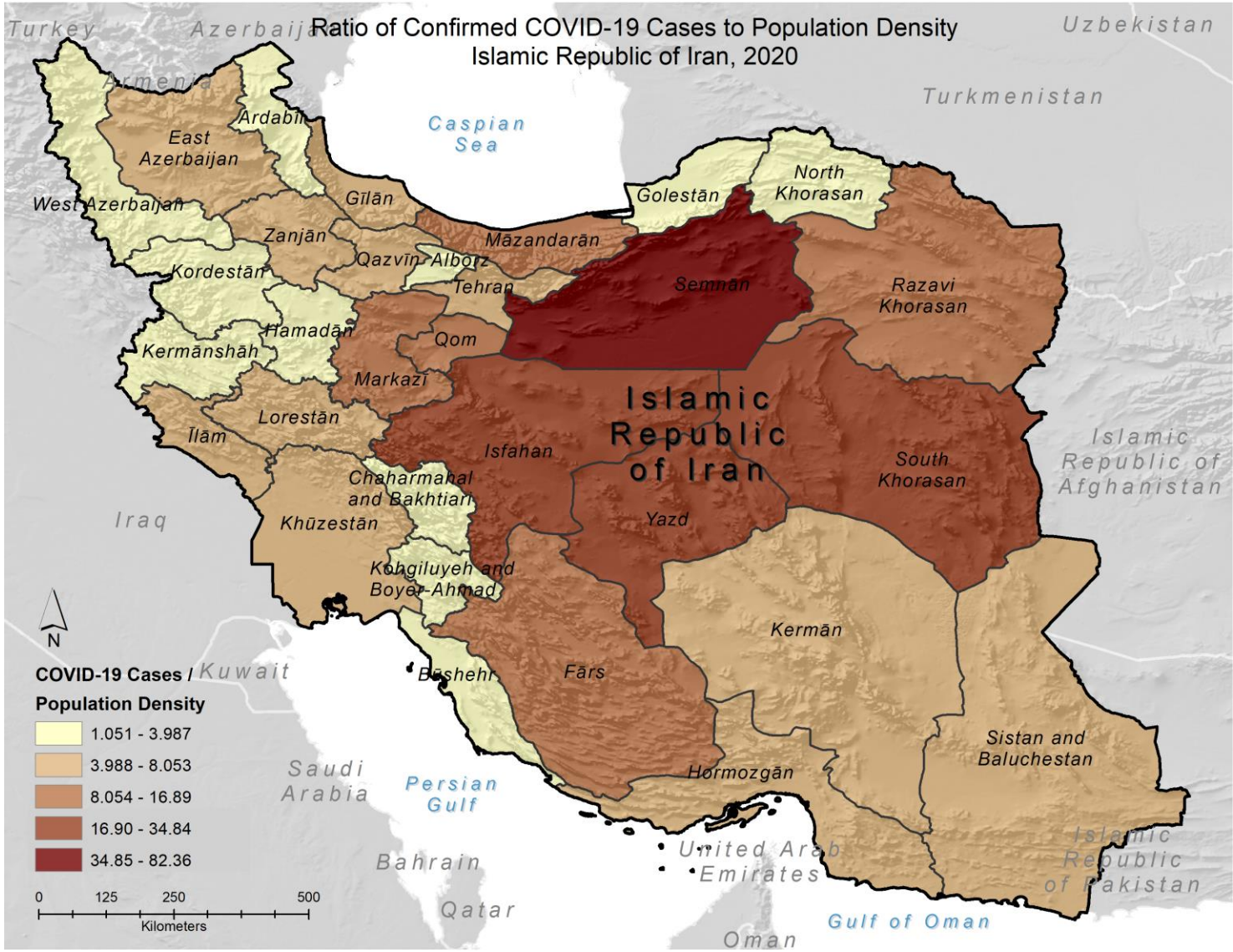
COVID-19 Cases

- Tehran: 4,397 cases
- Isfahan: 1,646 cases
- Semnan: 593 cases



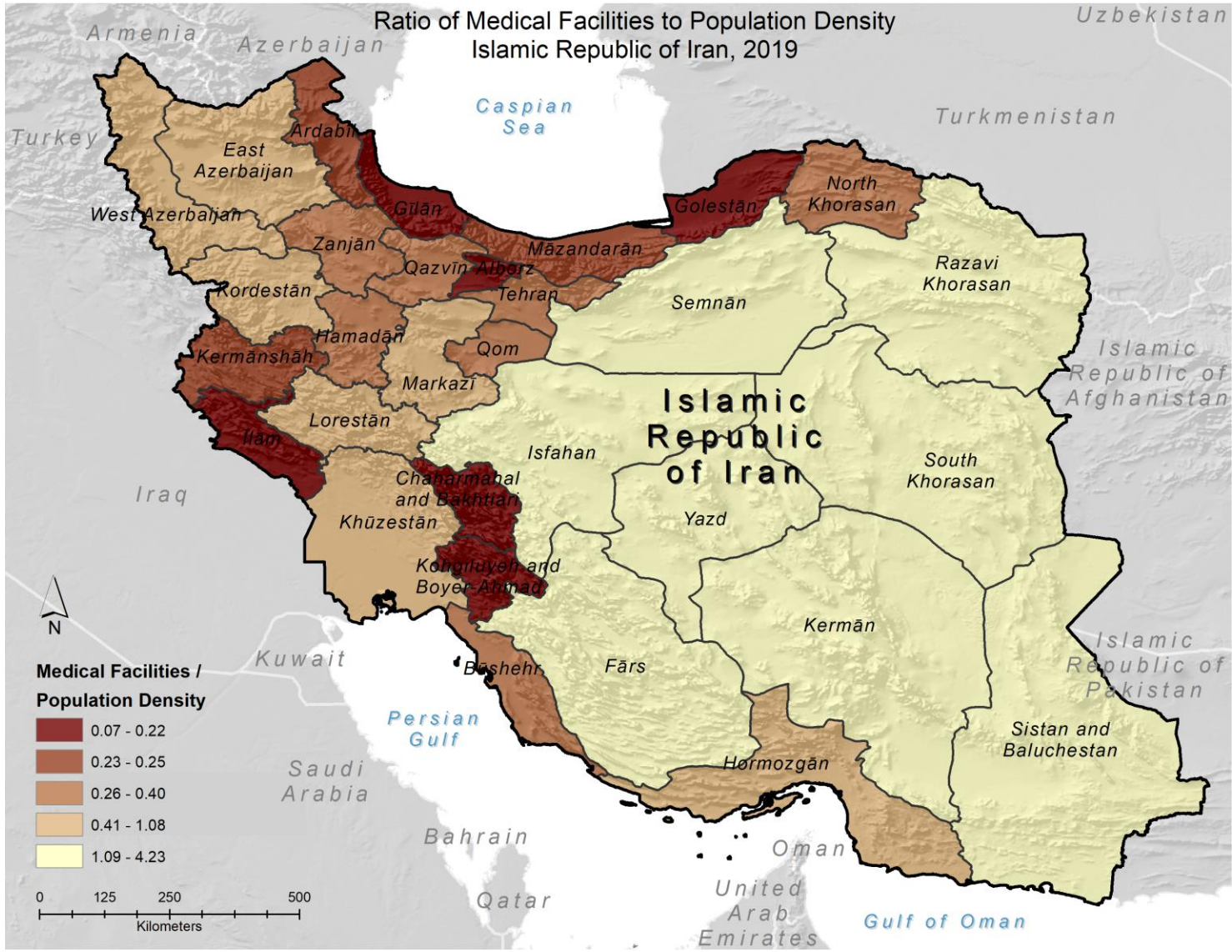
COVID-19 Cases by Population

- When normalized by population density, Semnan becomes the standout
- While more research needs to be done, this could very well be due to proximity to Tehran



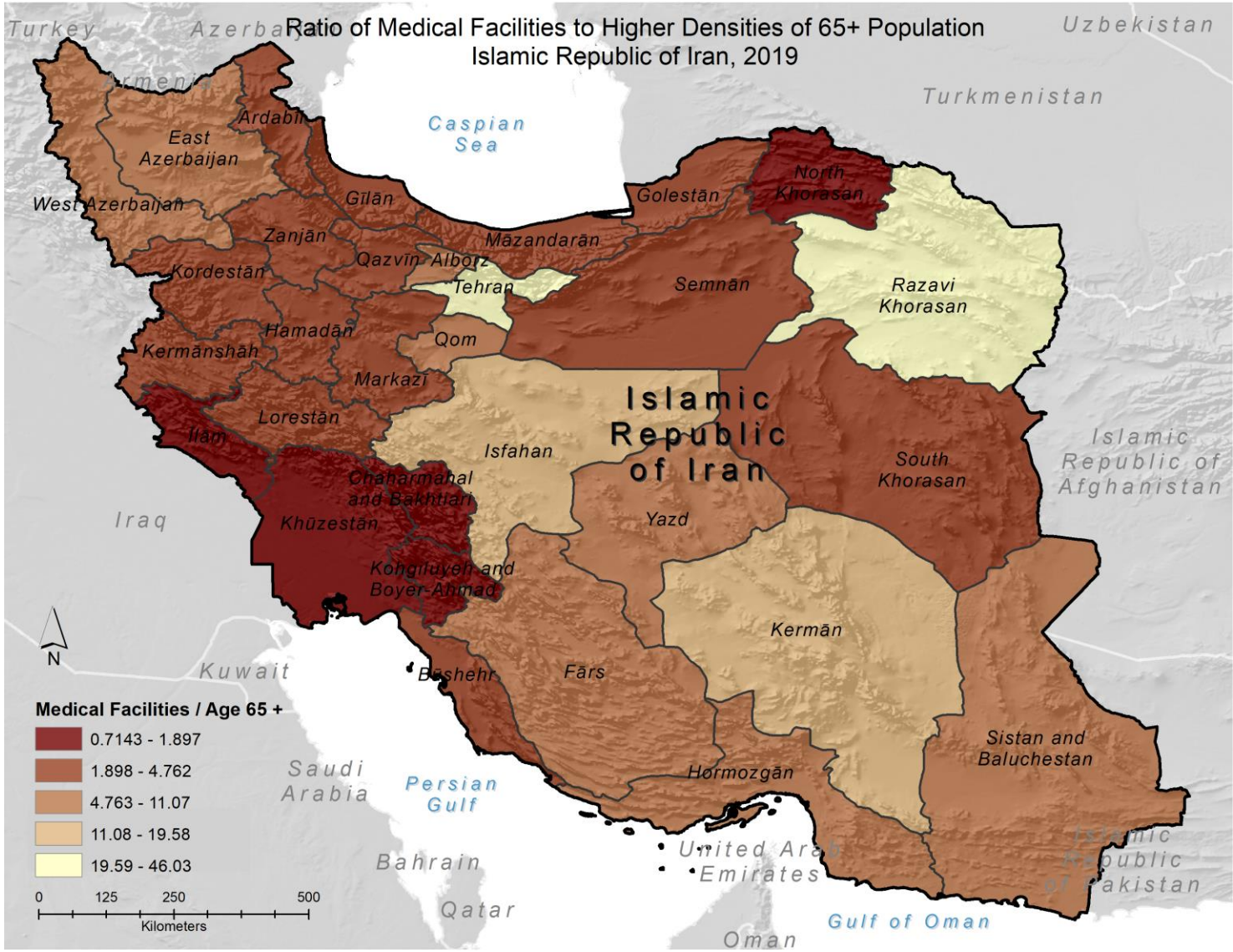
Medical facilities by Population

- The ratio of medical facilities to population density quickly identifies at-risk communities.
- The provinces in darker red colors indicate locations where the number of medical facilities is far lower that necessary, compared to population.

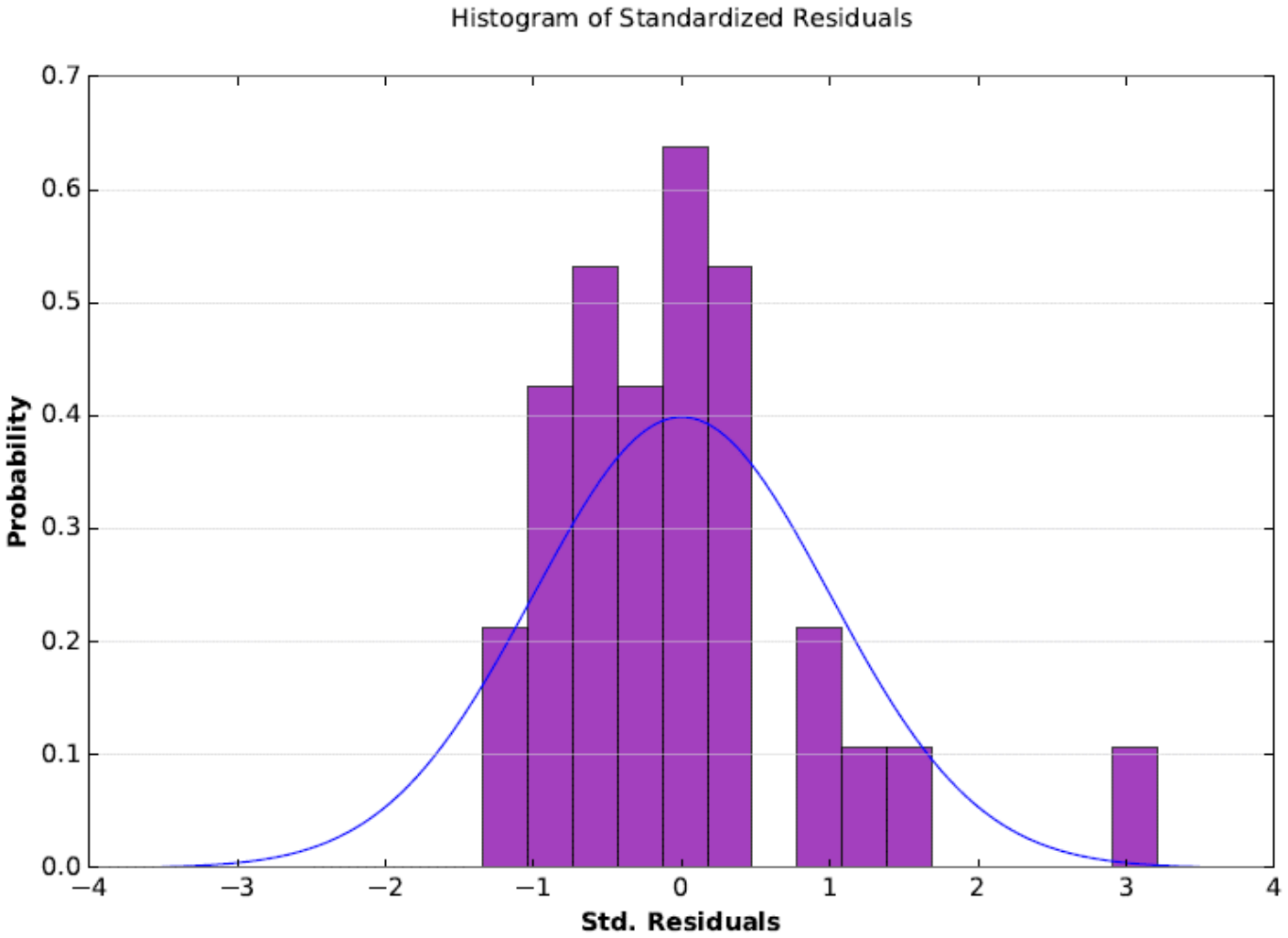


Medical Facilities by Age 65+

- Ratio of medical facilities by population density of ages 65 and over.
- Khuzestan is one of the standouts here.

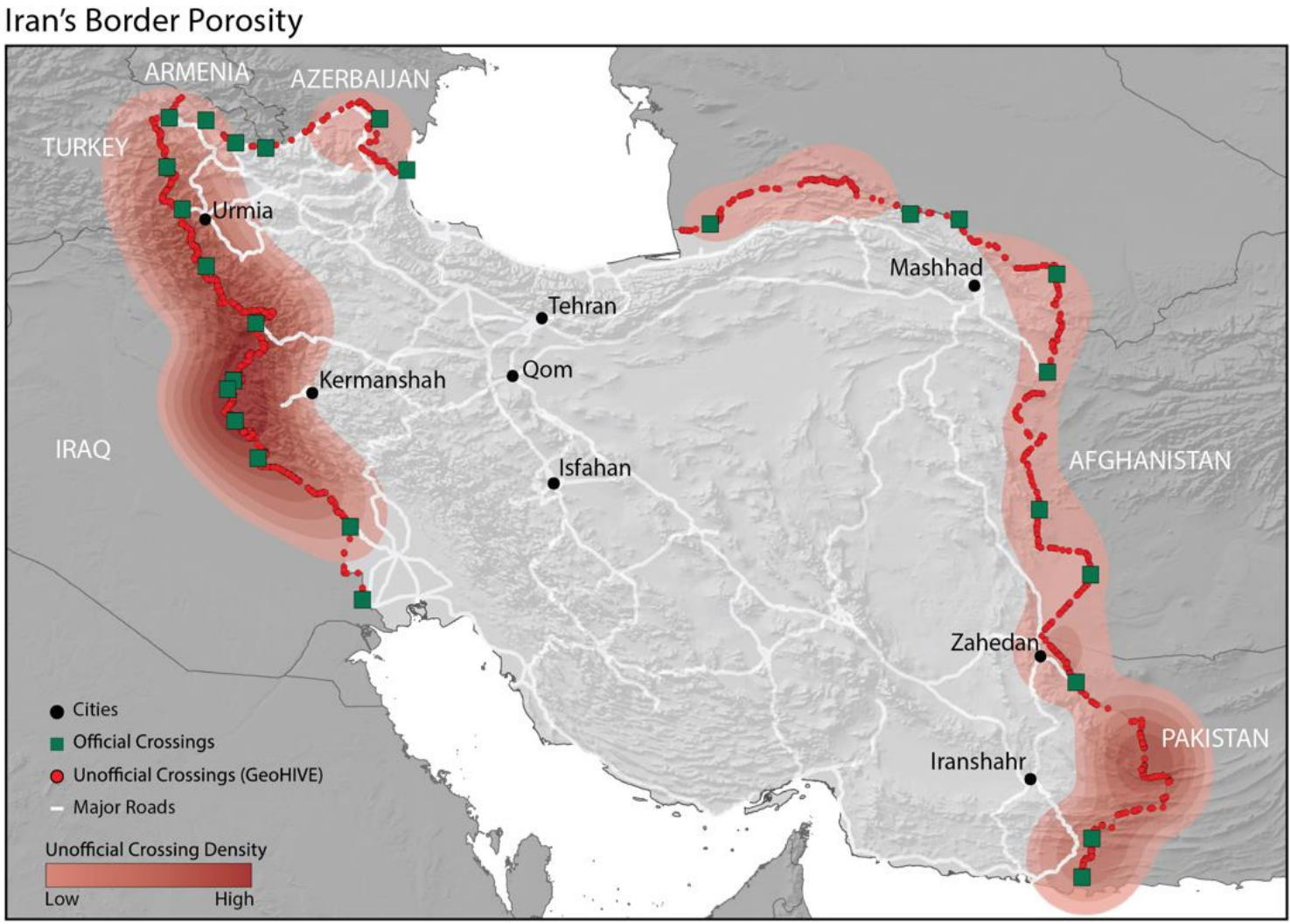


Use case examples



Border porosity

- This analysis reveals how established smuggling networks increase risks of COVID-19 outbreaks in neighboring countries



Analysis-ready geospatial data

Why use Maxar Data?

- **80%** of the work of a data scientist is data cleaning and preparation, rather than actually mining or modeling data.*
- **Analysts can jump straight into analytics!**
- Our data has been validated, is easy to understand, and ready to use!

*Source: “Cleaning Big Data: Most Time-Consuming, Least Enjoyable Data Science Task, Survey Says.” Forbes. March 23, 2016. www.forbes.com.

How geospatial data can help

Imagery Basemaps — Foundational view of your area of interest

Building Footprints — Identify where population is located

Human Landscape — Determine available critical services where people congregate

Imagery basemaps

- Maxar imagery basemaps provide an accurate, consistent and actionable satellite image layer to support mapping, visualization and analytics at local, regional and global scale.

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Building footprints

- Ecopia Building Footprints – powered by Maxar – are GIS-ready polygons generated by the most sophisticated and advanced high-resolution satellite imagery, artificial intelligence, and cloud-computing power available.
- Enables users to detect and classify infrastructure at scale, with precision!

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Human Landscape

- Country-by-country datasets
- Geospatial data across 8 core themes
- **60+ data layers** per country
- Delivery in ready-to-use, **easy to navigate** formats
- Data compiled from hundreds of sources by expert analysts
- Designed to support **advanced analytics** within the ESRI platform

Human Landscape disease modeling layers

- Medical facilities
  - Hospitals
  - Urgent care facilities
  - Pharmacies
- Sociocultural Layers
  - Population density
  - Access to services (internet)
  - Access to clean water
  - Access to updated sewage systems
  - Access to education
  - Employment rates
- Airfields
- Tourist Attractions
- Cultural point of interest
- Roads
- Public transportation hubs
- Water infrastructure locations
- Recreational points of interest

*Poh-Chin Lai, Chun Bong Chow, Ho Ting Wong, Kim Hung Kwong, Yat Wah Kwan, Shao Haei Liu, Wah Kun Tong, Wai Keung Cheung & Wing Leung Wong (2015) An early warning system for detecting H1N1 disease outbreak – a spatio-temporal approach, International Journal of Geographical Information Science, 29:7, 1251-1268, DOI: 10.1080/13658816.2015.1030671

Human Landscape difference

- Data is collected at the lowest administrative level possible
- Information is vetted against multiple sources
- Machine learning or crowdsourcing is used to validate data
- Expert analysts enhance the data
- Quality control
- Finalize deliverable

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Data validation with GeoHIVE

Is this a parking lot?

Data validation with machine learning

- **90% +** Accuracy!

Is this point on a building?

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The Human Landscape difference

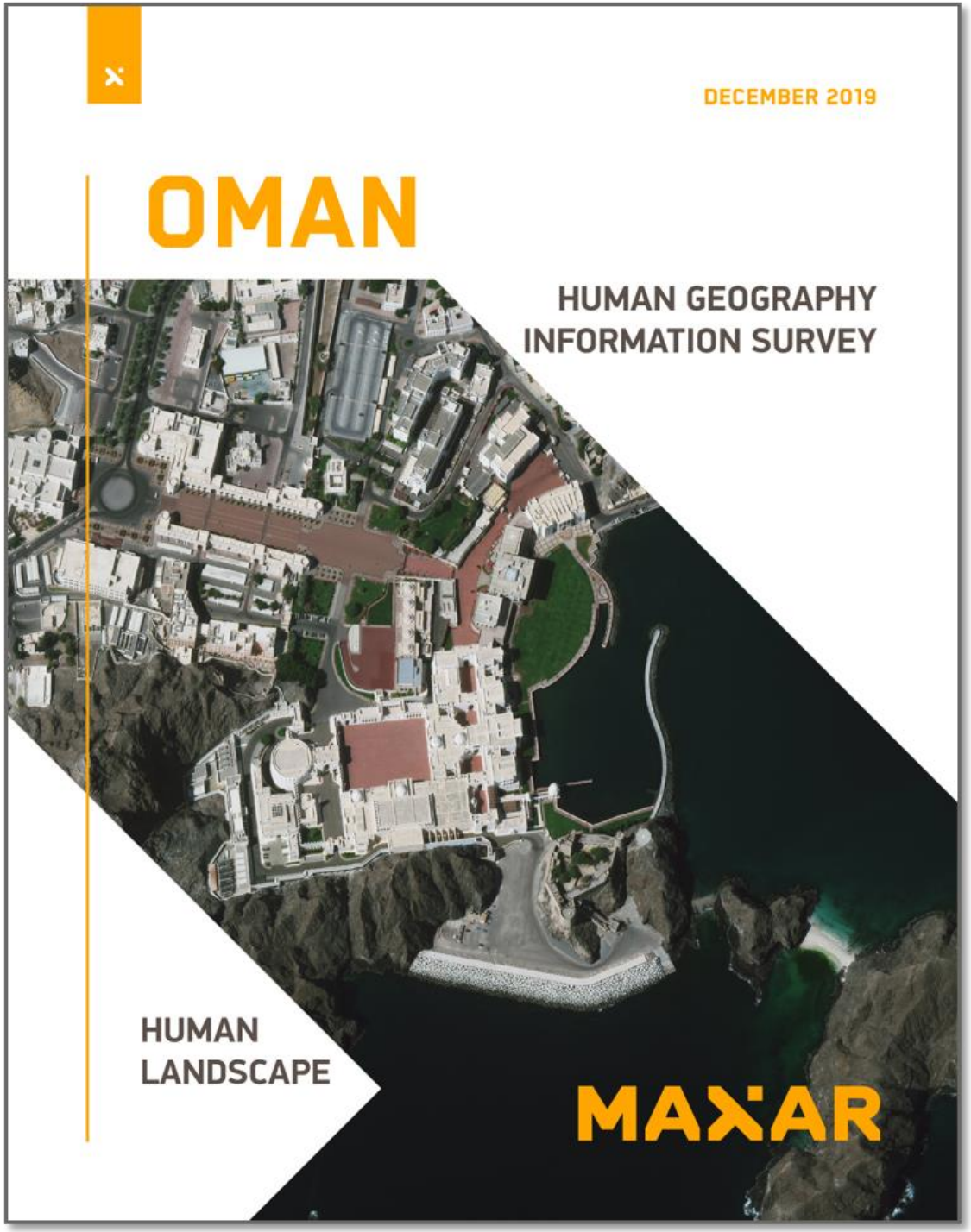
- Attributes add depth to the spatial data
- Multiple sources are used to fill in as many attributes as possible
- Easy access to attributes within the feature class

Airfields

NAME	TYPE1	ICAO	IATA	RUNWAY	N_RUNWAYS	R1_SURFACE	R2_SURFACE	R_LENGTH	R_WIDTH	USE	CUSTOMS	SPA_ACC	CONF_IMAGE
Aghajari Airport	Commercial	OIAG	AKW	Paved	1	Asphalt	<Null>	2113	45	Regional	<Null>	1 - High	Confirmed
Ahwaz Airport	Commercial	OIAW	AWZ	Paved	1	Asphalt	<Null>	3398	45	Regional	No	1 - High	Confirmed
Arak Airport	Commercial	OIHR	AJK	Paved	1	Asphalt	<Null>	2990	45	Local	No	1 - High	Confirmed
Ardabil Airport	Commercial	OITL	ADU	Paved	1	Asphalt	<Null>	3299	45	Regional	<Null>	1 - High	Confirmed
Asaloyeh Airport	Commercial	OIBI	AOY	Paved	1	Asphalt	<Null>	3604	45	Regional	<Null>	1 - High	Confirmed
Bam Airport	Commercial	OIKM	BXR	Paved	1	Asphalt	<Null>	3385	45	Regional	<Null>	1 - High	Confirmed
Bandar Lengeh Airport	Commercial	OIBL	BDH	Paved	1	Asphalt	<Null>	2500	45	Regional	No	1 - High	Confirmed
Bojnord Airport	Commercial	OIMN	BJB	Paved	1	Asphalt	<Null>	3225	45	Regional	<Null>	1 - High	Confirmed
Dasht-E Naz Airport	Commercial	OINZ	SRY	Paved	1	Asphalt	<Null>	2648	45	Regional	<Null>	1 - High	Confirmed
Dayrestan International Airport	Commercial	OIKQ	GSM	Paved	1	Asphalt	<Null>	4226	45	International	Yes	1 - High	Confirmed
Fasa Airport	Commercial	OISF	FAZ	Paved	1	Asphalt	<Null>	1982	30	Regional	<Null>	1 - High	Confirmed

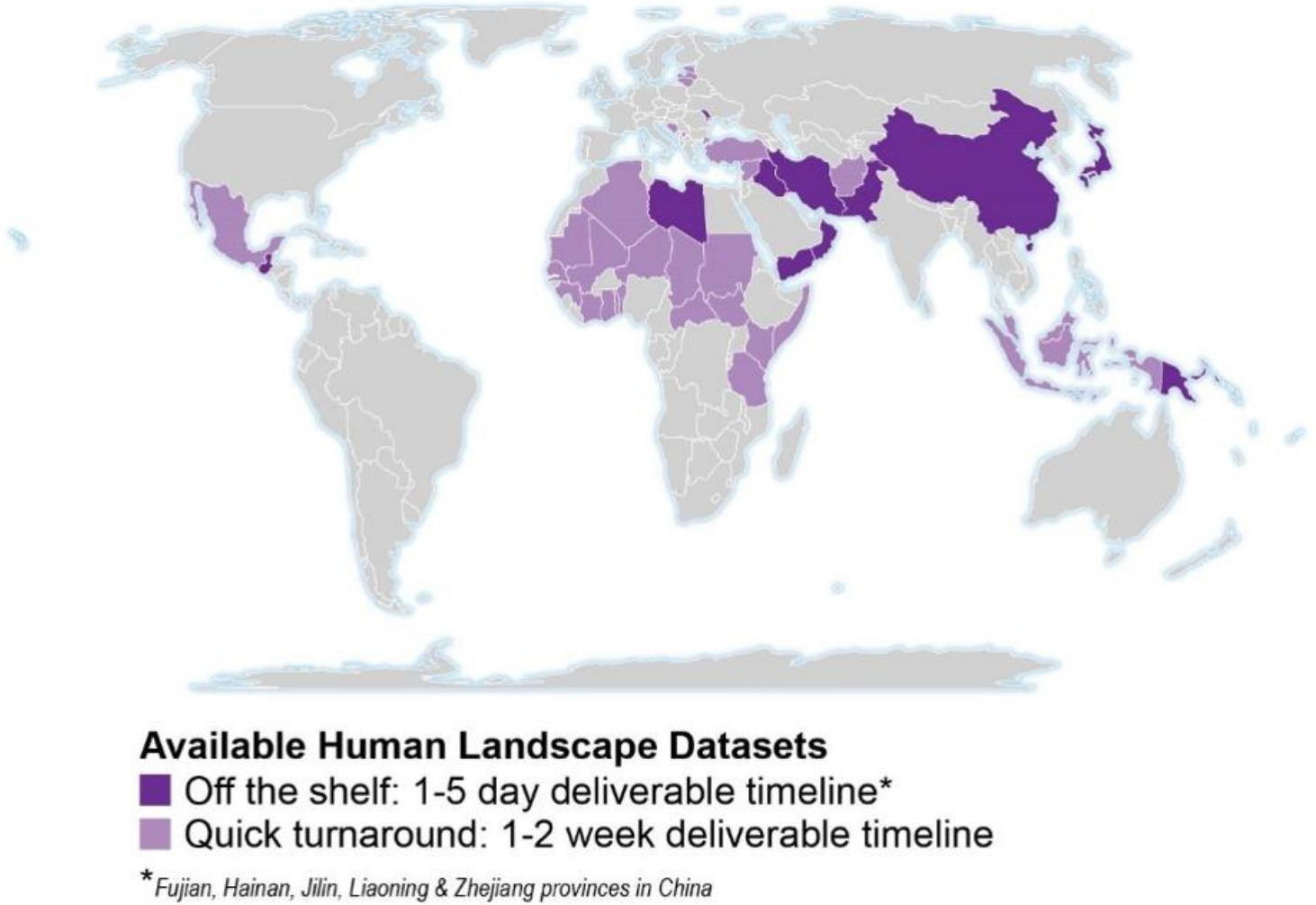
Human Landscape deliverable

- Packaged geodatabase file
- A symbolized ArcMap document or ArcGIS Pro Project
- A booklet describing the data delivered



Human Landscape availability (COVID Response)

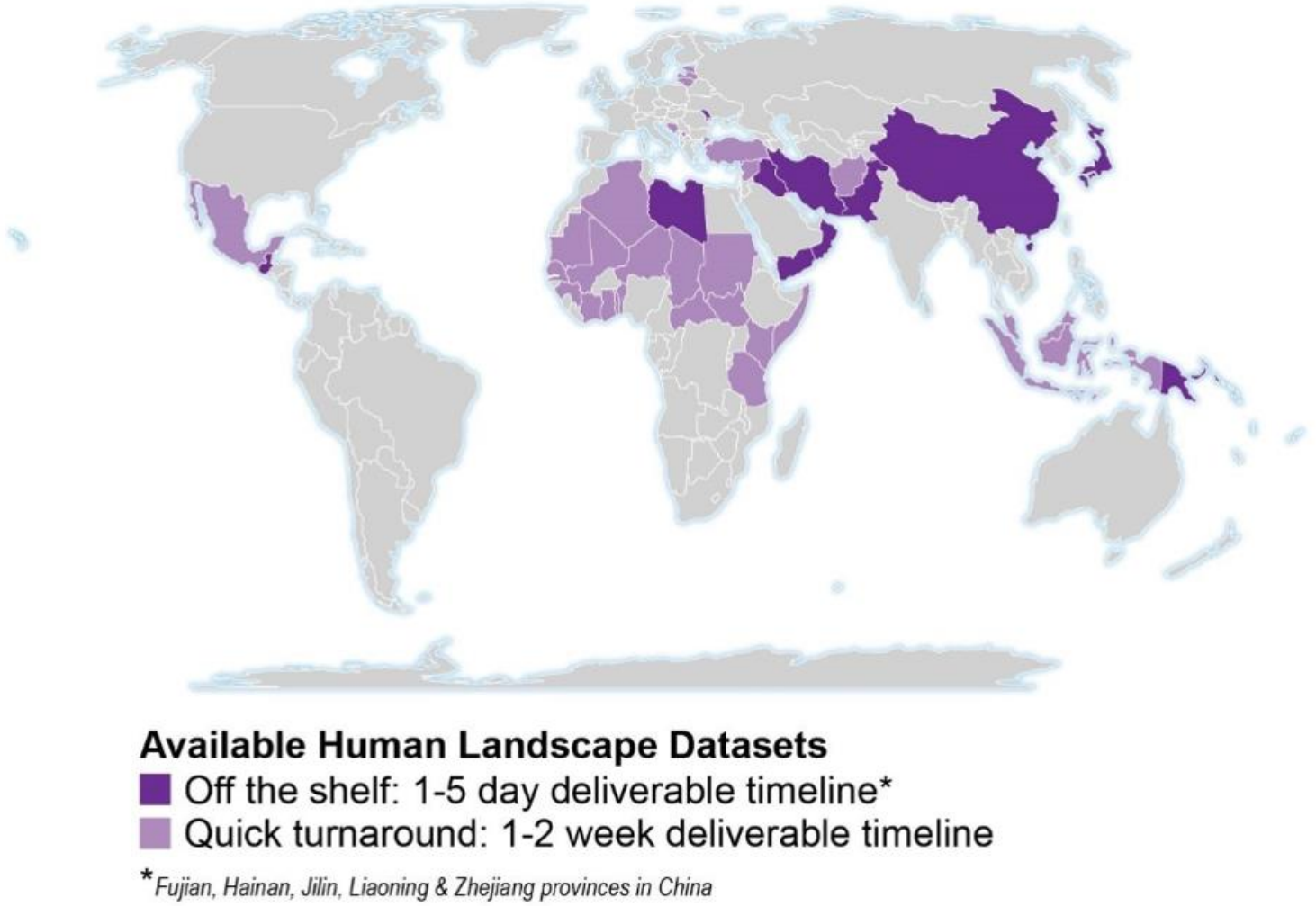
- Off the shelf (immediate delivery):
  - Guatemala
  - Iran, Islamic Republic of
  - Iraq
  - Japan Northern Territories
  - Libya
  - Moldova
  - Oman
  - Pakistan
  - Papua New Guinea
  - Yemen
  - Fujian, Hainan, Jilin, Liaoning & Zhejiang China



Available Human Landscape countries listed represent those that have been completed since 2018.

Human Landscape availability (COVID Response)

- Recent production (1-2 week delivery):
  - Afghanistan
  - Algeria
  - Benin
  - Bosnia and Herzegovina
  - Central African Republic
  - Chad
  - Côte d'Ivoire (Ivory Coast)
  - Estonia
  - Ghana
  - Guinea
  - Indonesia
  - Kenya
  - Kosovo
  - Latvia
  - Lithuania
  - Malaysia
  - Mali
  - Mauritania
  - Mexico
  - Niger
  - Nigeria
  - Senegal
  - Somalia
  - South Sudan
  - Sudan
  - Syria
  - Tanzania
  - Togo
  - Turkey



Available Human Landscape countries listed represent those that have been completed since 2016.

Spotlights: On-Demand Analysis

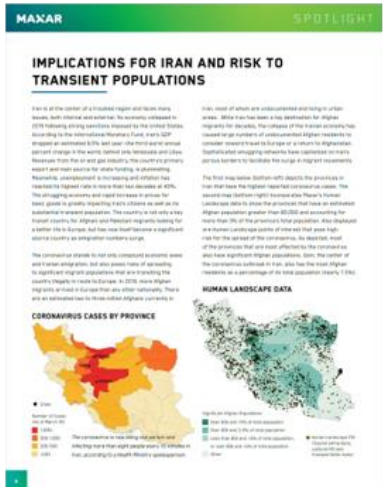
Regions Impacted

:

Assess the Timeline

Visualize the change

Understand Implications



Sign up at: explore.maxar.com/spotlight-signup

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Contact Information

- Follow-up questions: **Camille.Cassidy@maxar.com**
- Spotlight registration: **https://explore.maxar.com/spotlight-signup**

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