

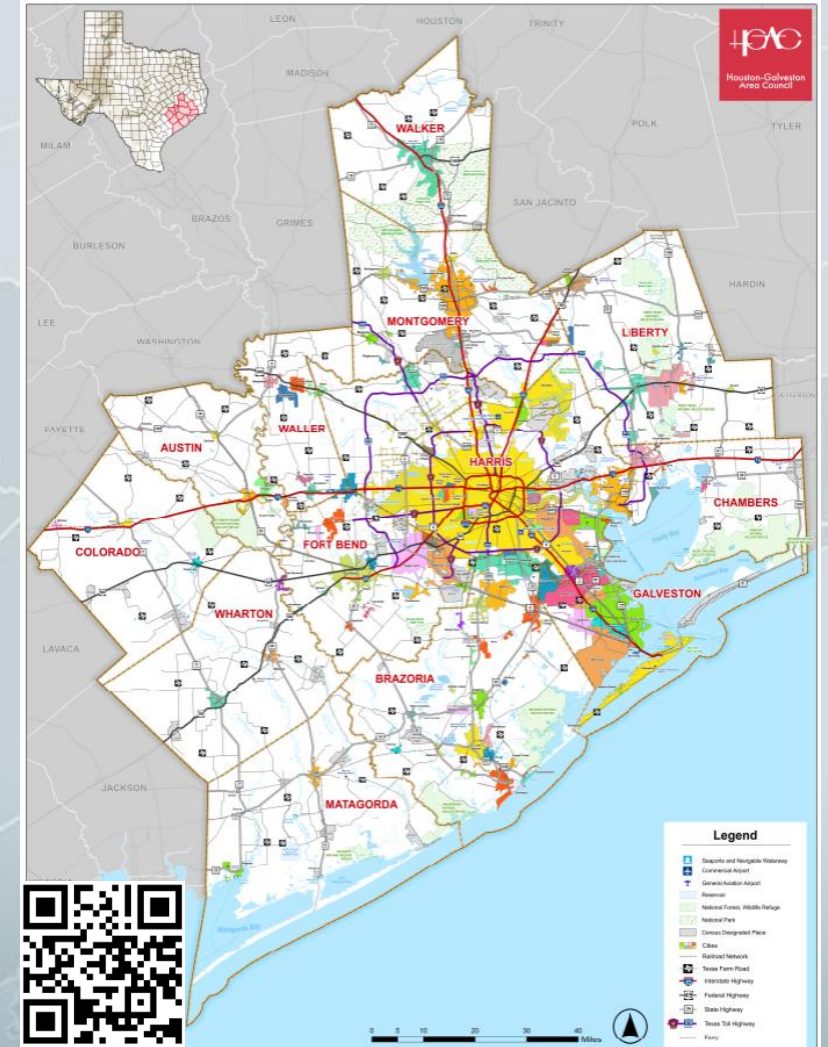
H-GAC's Geospatial and Data and Analytics Solutions

Thushara Ranatunga, PhD

**Galveston Bay Estuary Program
March 12, 2025**

Who We are

- H-GAC is a voluntary association of local governments serving the 13-county Gulf Coast Planning Region of Texas.
- Mission: To promote regional cooperation and planning, ensuring the orderly development and welfare of our communities.
- Service Area: Covers 12,500 square miles, home to over 7 million residents.
- Key Programs:
 - Transportation Planning
 - Community and Environmental Planning
 - Public Safety and Homeland Security
 - Workforce Development
 - Aging and Disability Resources
 - Data Analytics and Research



Department Charge

- Data Analytics & Research uses data and technology to support informed decision-making across the H-GAC region.
- We serve H-GAC departments, local / member governments, communities and businesses, state agencies, and nonprofit organizations.



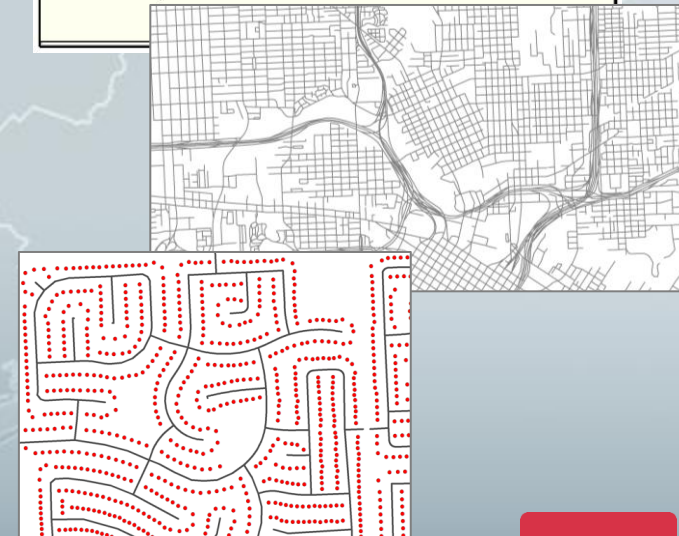
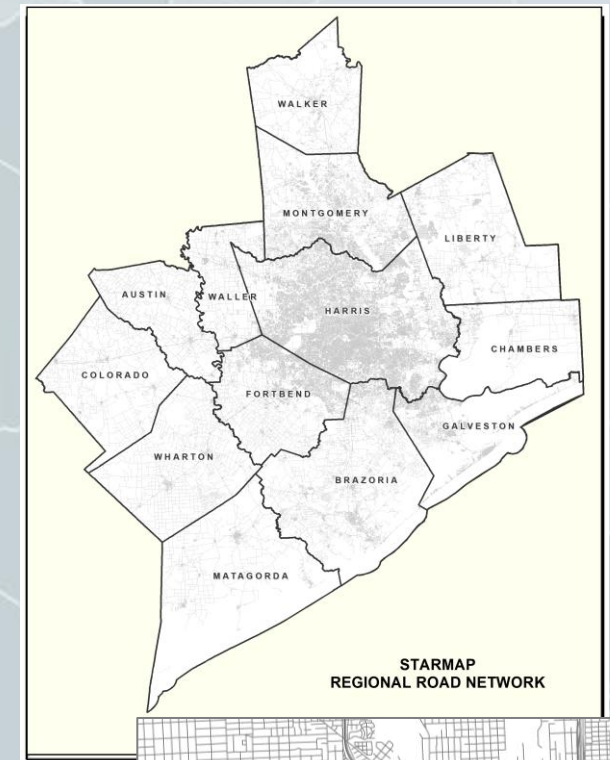
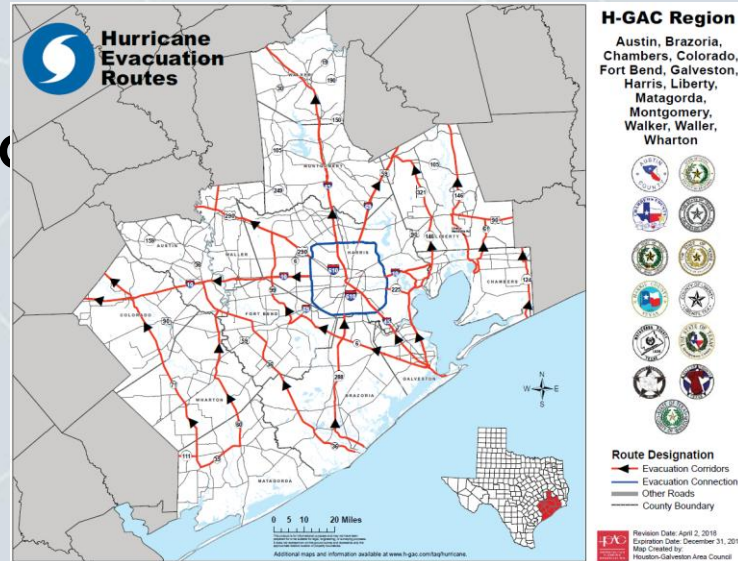
Data Creation

■ Data Types

- Demographic & Economic
- Transportation
- Health
- Education
- Environmental
- Technology

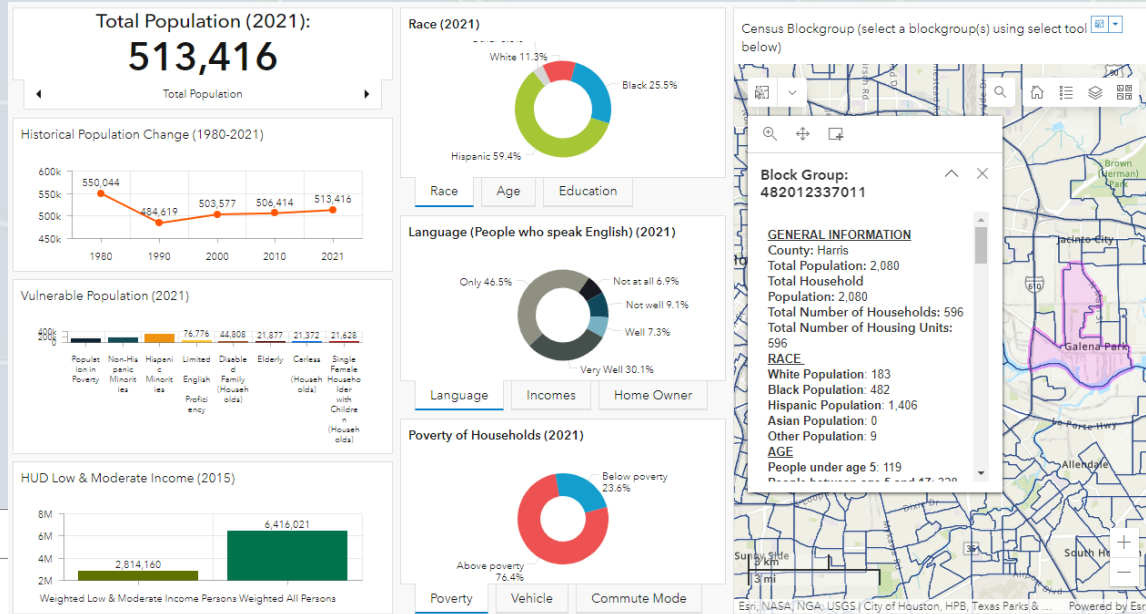
■ Products & Uses

- Transportation Network
- Southeast Texas Addressing and Referencing Map (STAR*Map)
- Other Cartographic Outputs

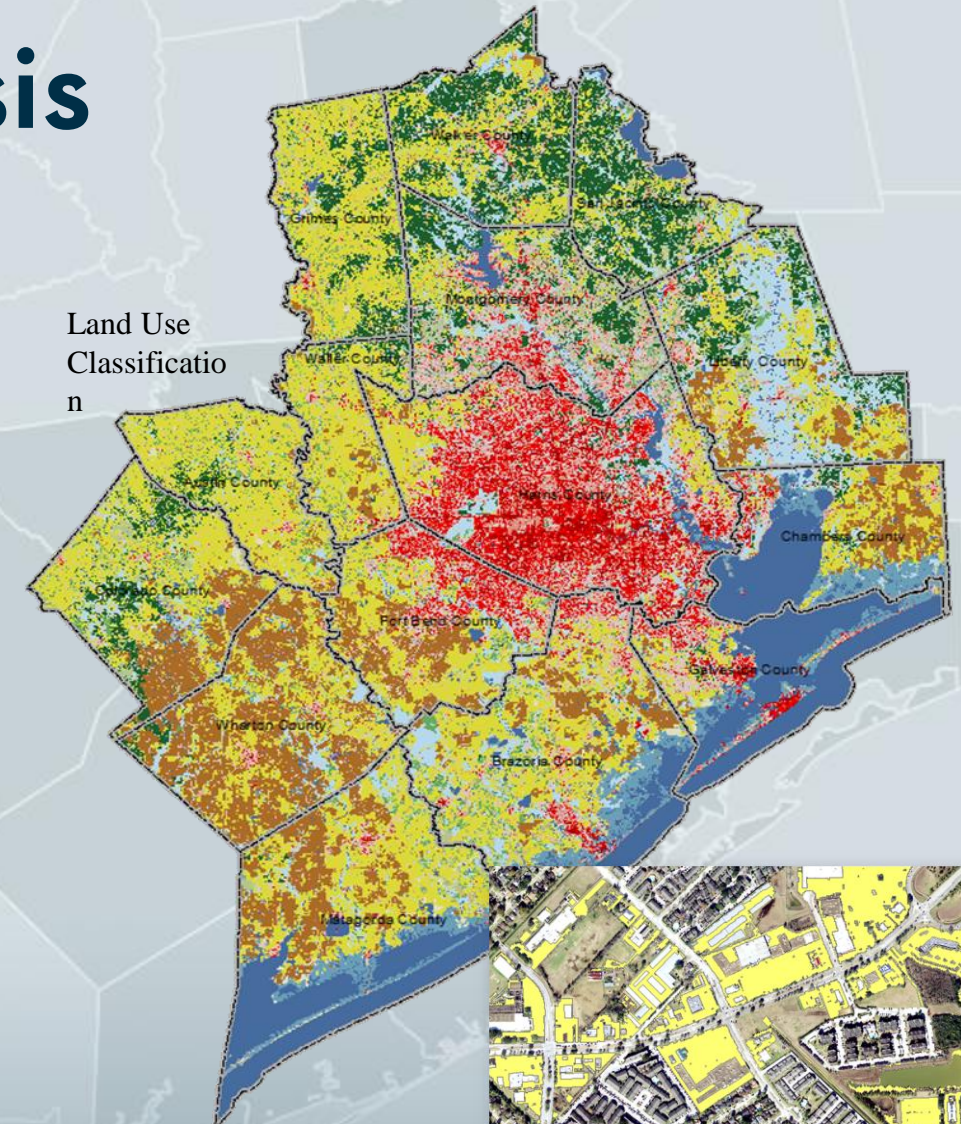


Data Analysis

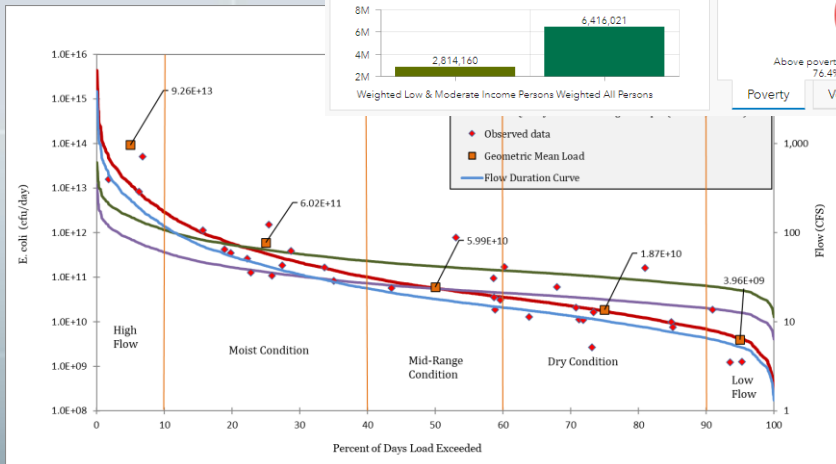
■ Data Research & Advanced Analysis



Land Use Classification



Socio-Demographic Data Analysis

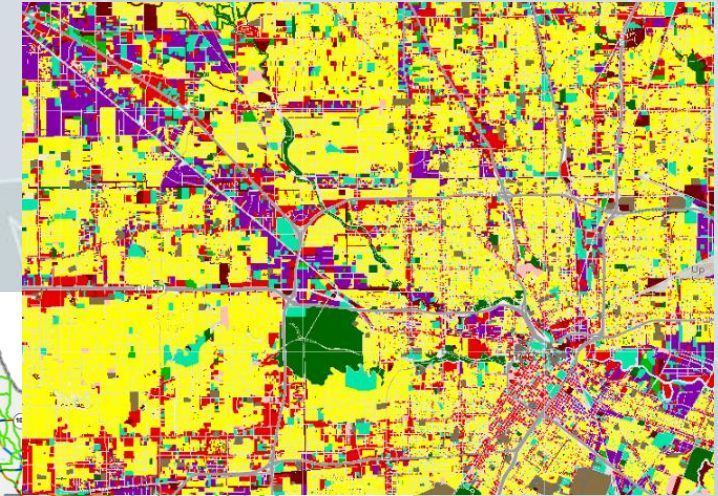
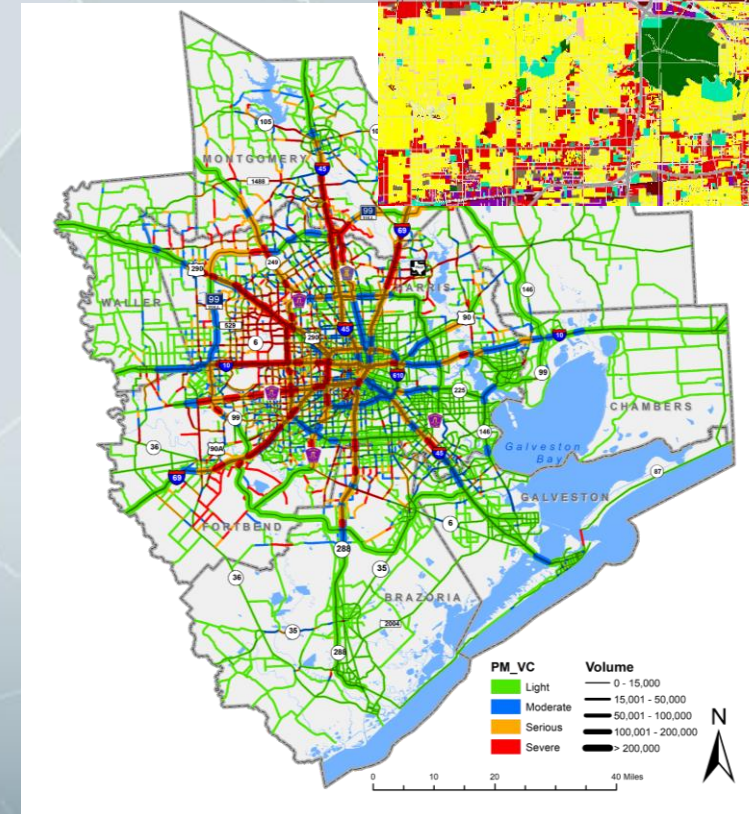
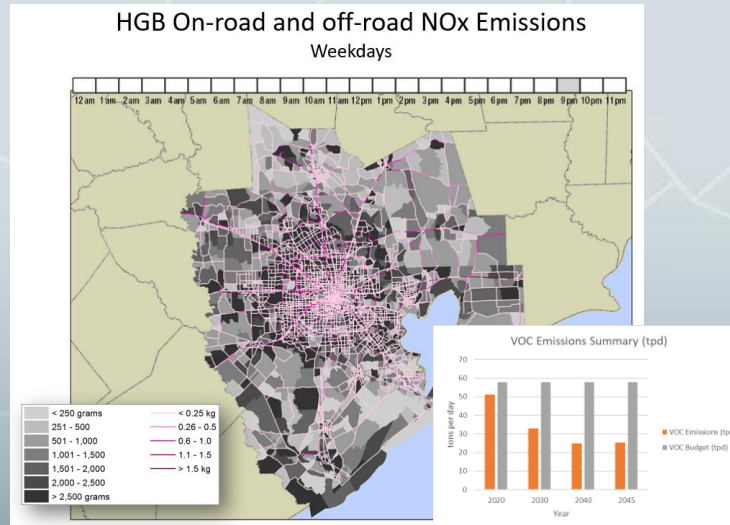
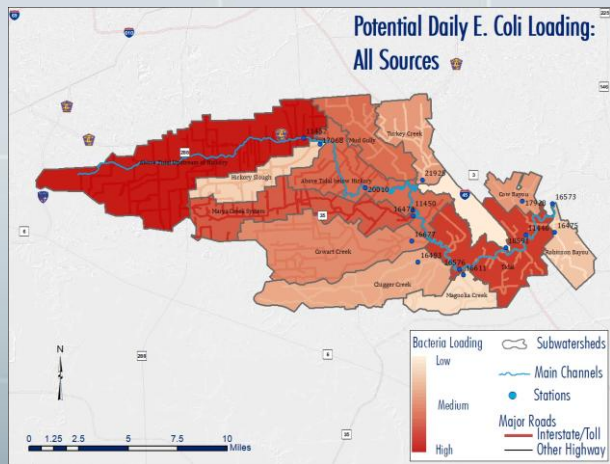


Environmental Data Analysis

Feature Extraction

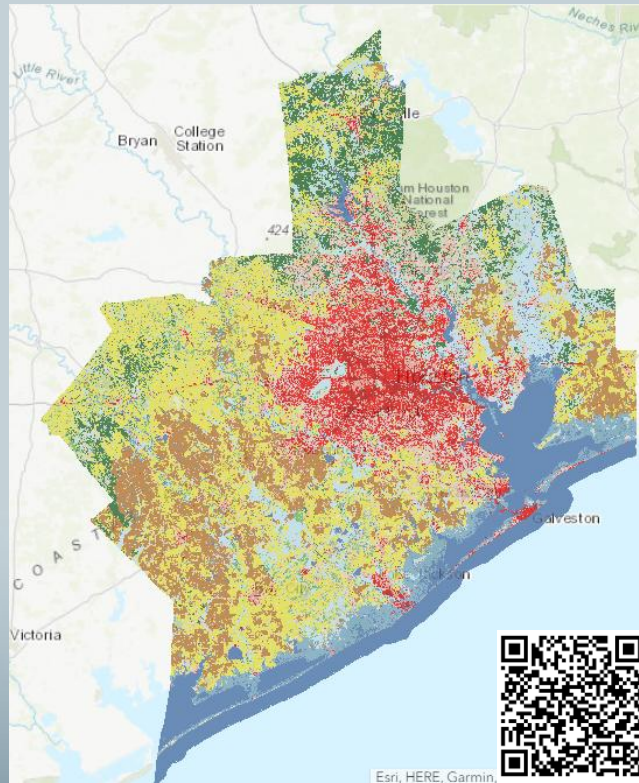
Data Modeling & Forecasting

- Travel Demand Modeling
- Regional population, employment, and land use forecasts
- Environmental
 - Air Quality Modeling & Conformity
 - Water Quality Modeling

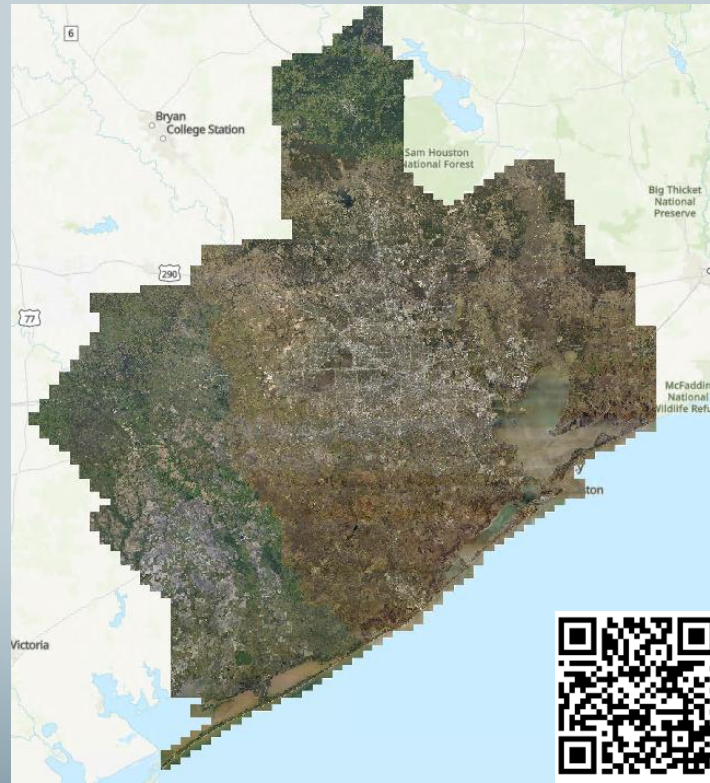


Geospatial for Environmental Monitoring

Land Uses and Land Cover



HGAC Aerial Imagery

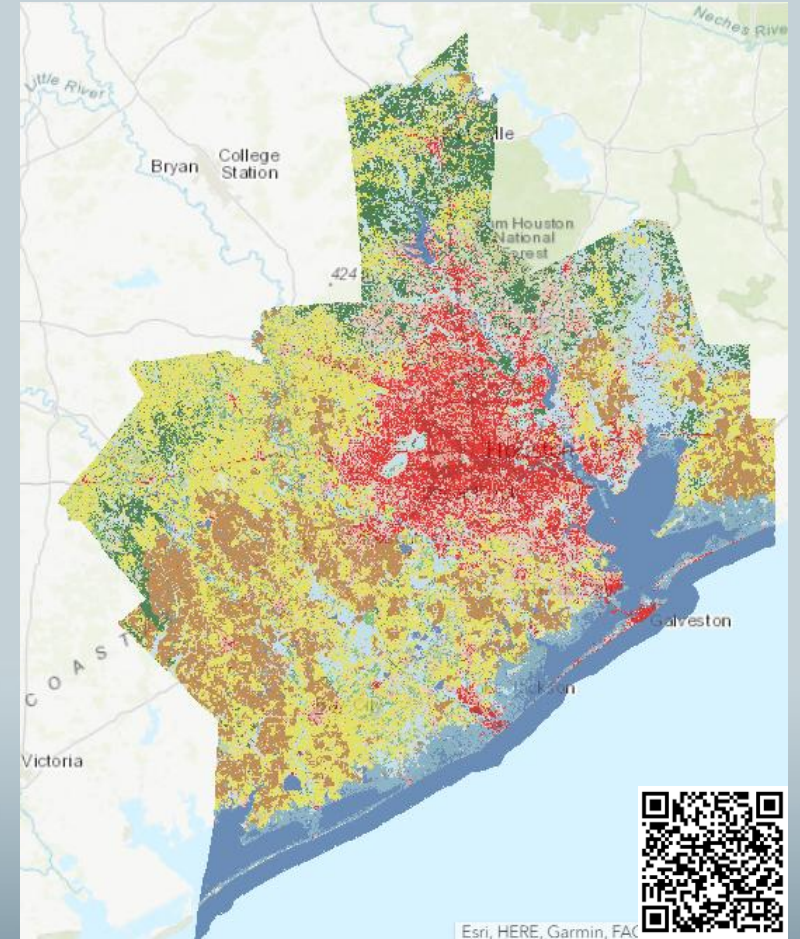


HGAC Lidar



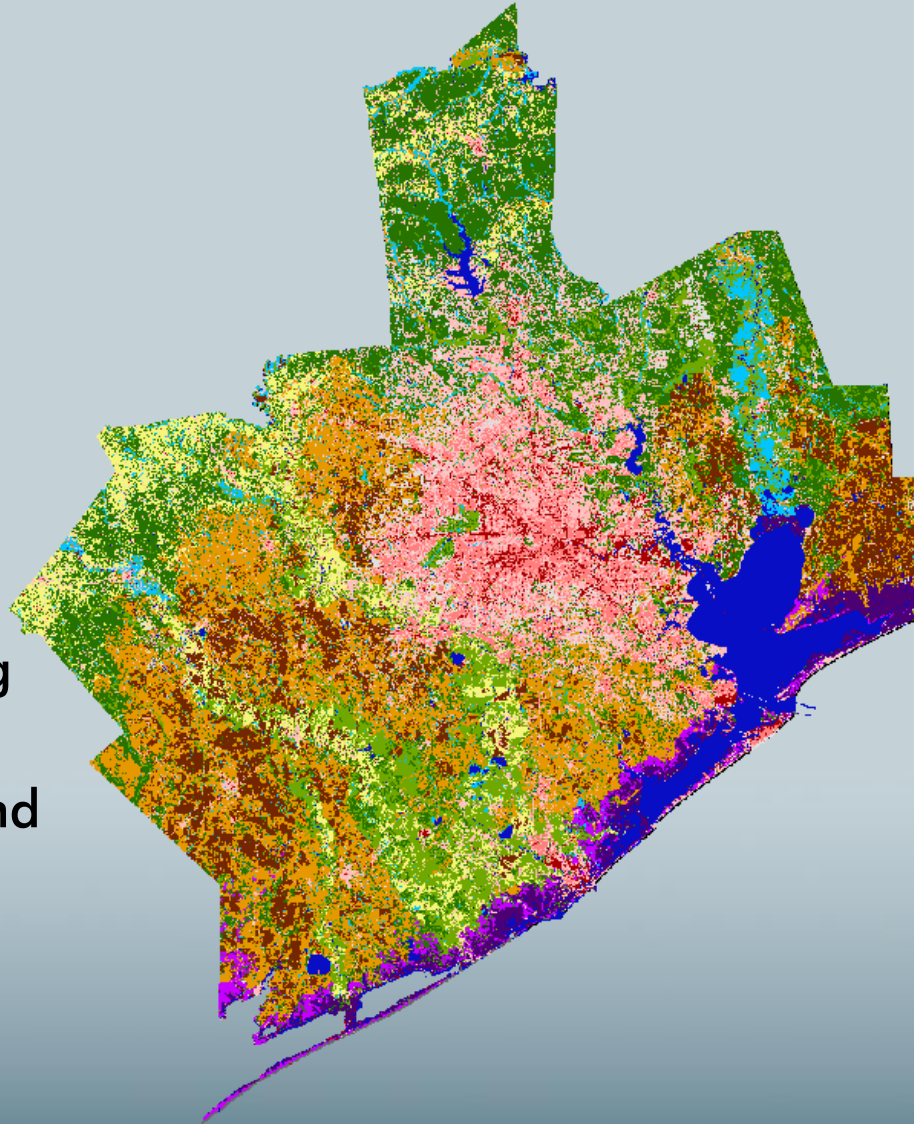
H-GAC Land Cover Data

- High-resolution land cover classification (1992-2022) created using deep learning techniques for better accuracy
- Application for environmental modeling usage:
 - ☒ Watershed Characterization: Land cover data informs hydrologic models (runoff rates, pollutant sources)
 - ☒ Change Detection: Comparing land cover over time to identify urban growth, wetland loss
 - ☒ Vegetation Indices: Using NDVI to map green cover & detect habitat loss



H-GAC Ecological Land Cover Data

- 14 Classes dataset
 - 7 Ecological and 7 Non-Ecological Land types
 - 5-meter resolution
 - H-GAC 13 counties
- Data Was Developed
 - NAIP Imagery
 - TPWD Ecological Mapping Data
 - H-GAC Land Use and Land Cover Data

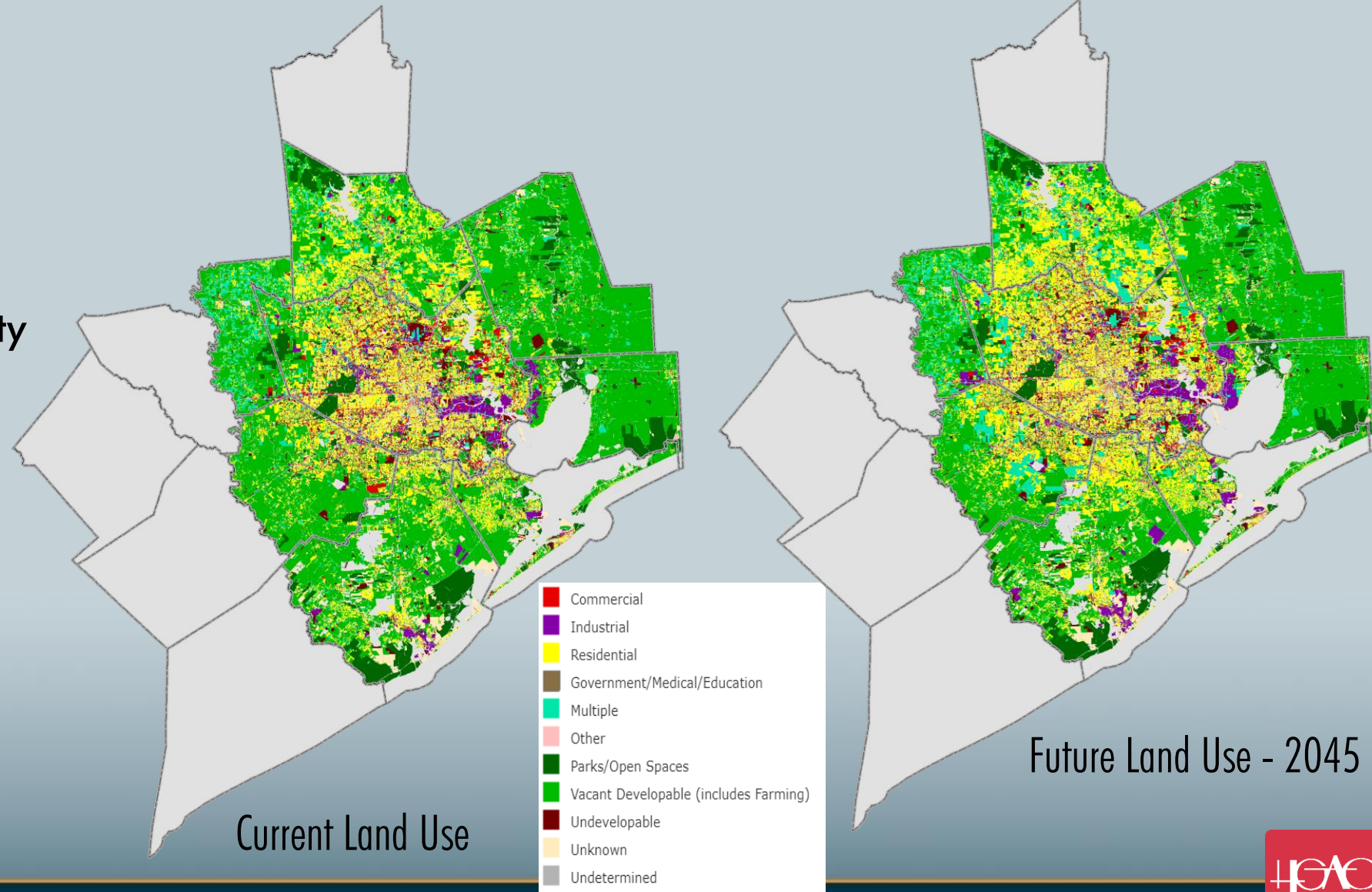


	Upland Forest
	Bottomland Forest
	Prairies
	Tidal Prairies
	Non-Prairie Grasslands
	Freshwater Wetlands
	Tidal Wetlands
	Barren Lands
	Row Crops
	Open Water
	Developed High Intensity
	Developed Medium Intensity
	Developed Low Intensity
	Developed Open Spaces

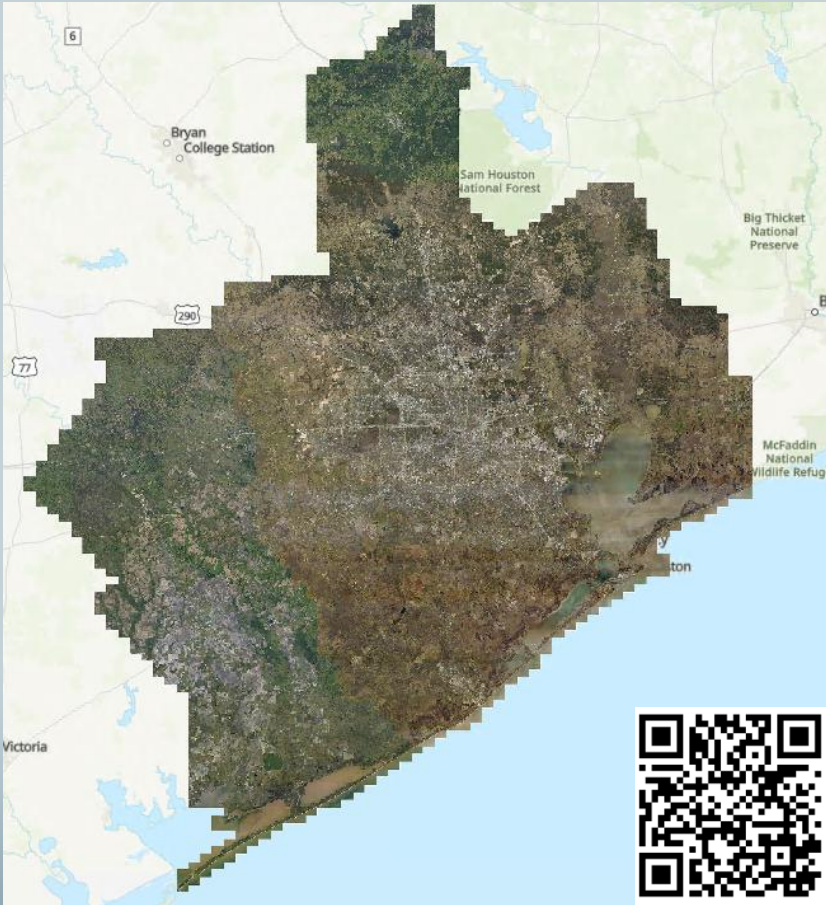
H-GAC Land Use Data

■ Different Classification with 11 Land Use Classes

- Based on Land parcel data
- Data for H-GAC 8 county (metropolitan area)
- Use County appraisal data land use classifications
- Apply H-GAC socioeconomic models and produce forecast (2045)



H-GAC Aerial Imagery



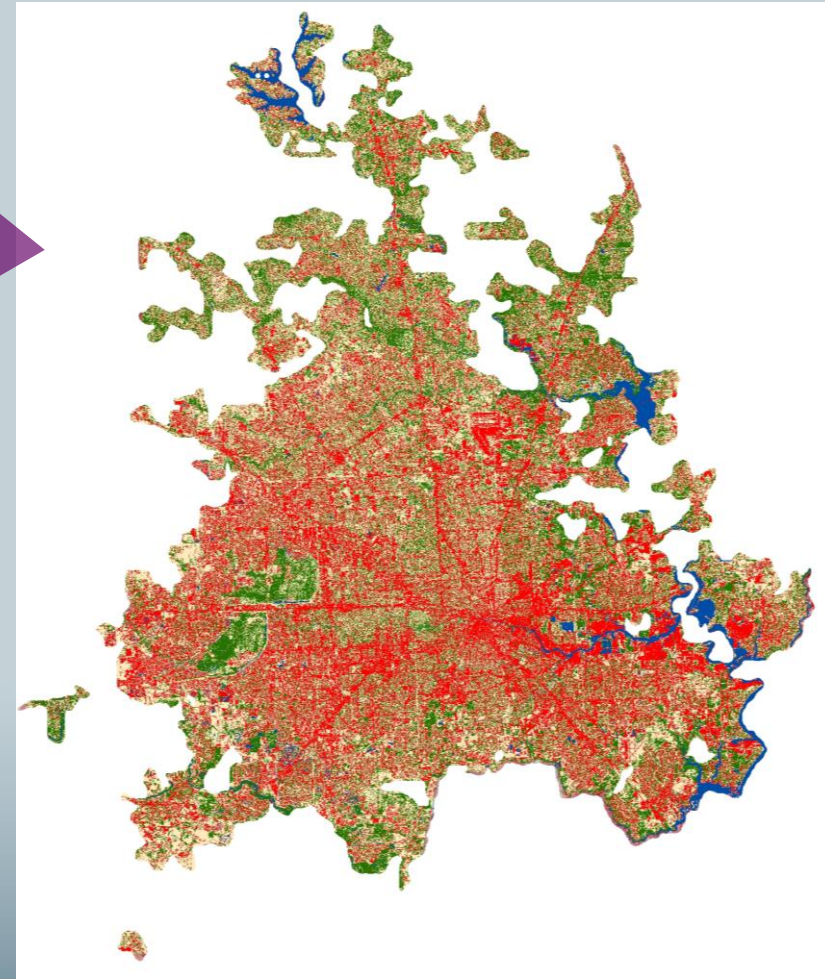
- HGAC provides high-resolution aerial imagery for the Houston-Galveston region, supporting environmental analysis and regional planning.
- Applications of Aerial Imagery
 - ☒ Land Cover & Urban Growth Mapping: Tracks changes in urbanization, wetlands, and forest cover for conservation and sustainable development.
 - ☒ Hydrological & Flood Modeling: Enhances watershed management and flood risk assessments by improving terrain and land use analysis.
 - ☒ Disaster Response & Recovery: Provides critical post-event imagery for storm impact assessments and emergency planning.

Aerial imagery is a key tool for accurate environmental modeling and informed decision-making!

Extraction of Urban Forestry, Plantable, and Developed Lands



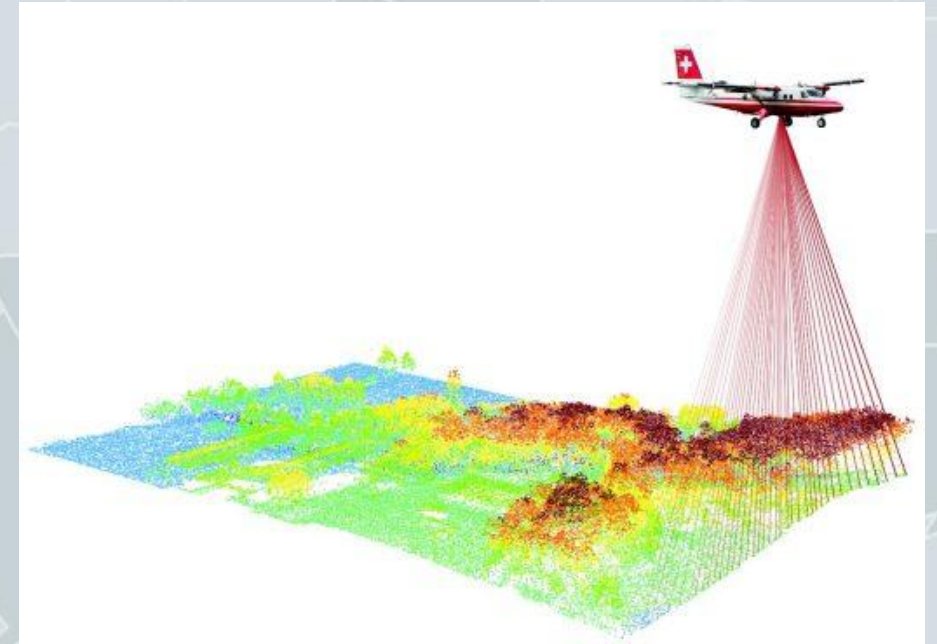
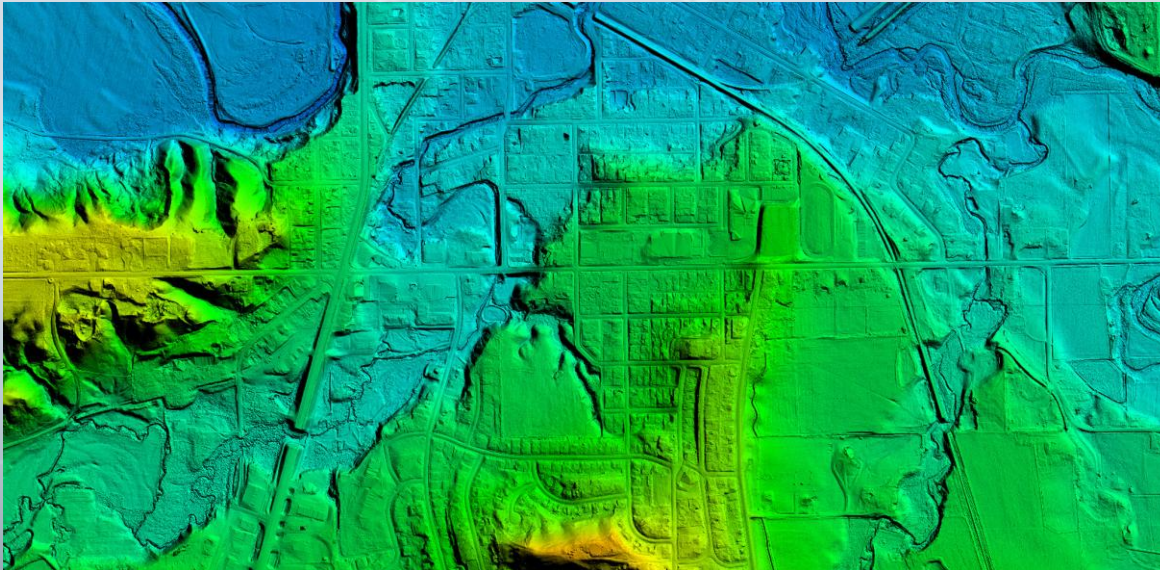
**NDVI
and
Reclassify into
4 Classes**



- Open Water
- Developed Lands
- Plantable Lands
- Canopy Cover

H-GAC Regional LiDAR Data

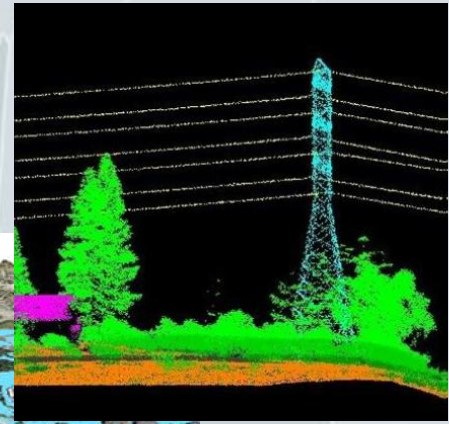
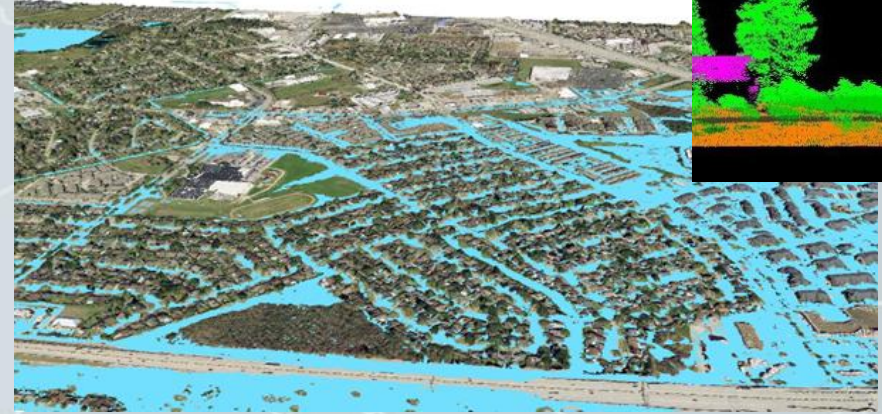
- Light Detection and Ranging
- Airborne, mobile, or stationary
- High-frequency laser scanning



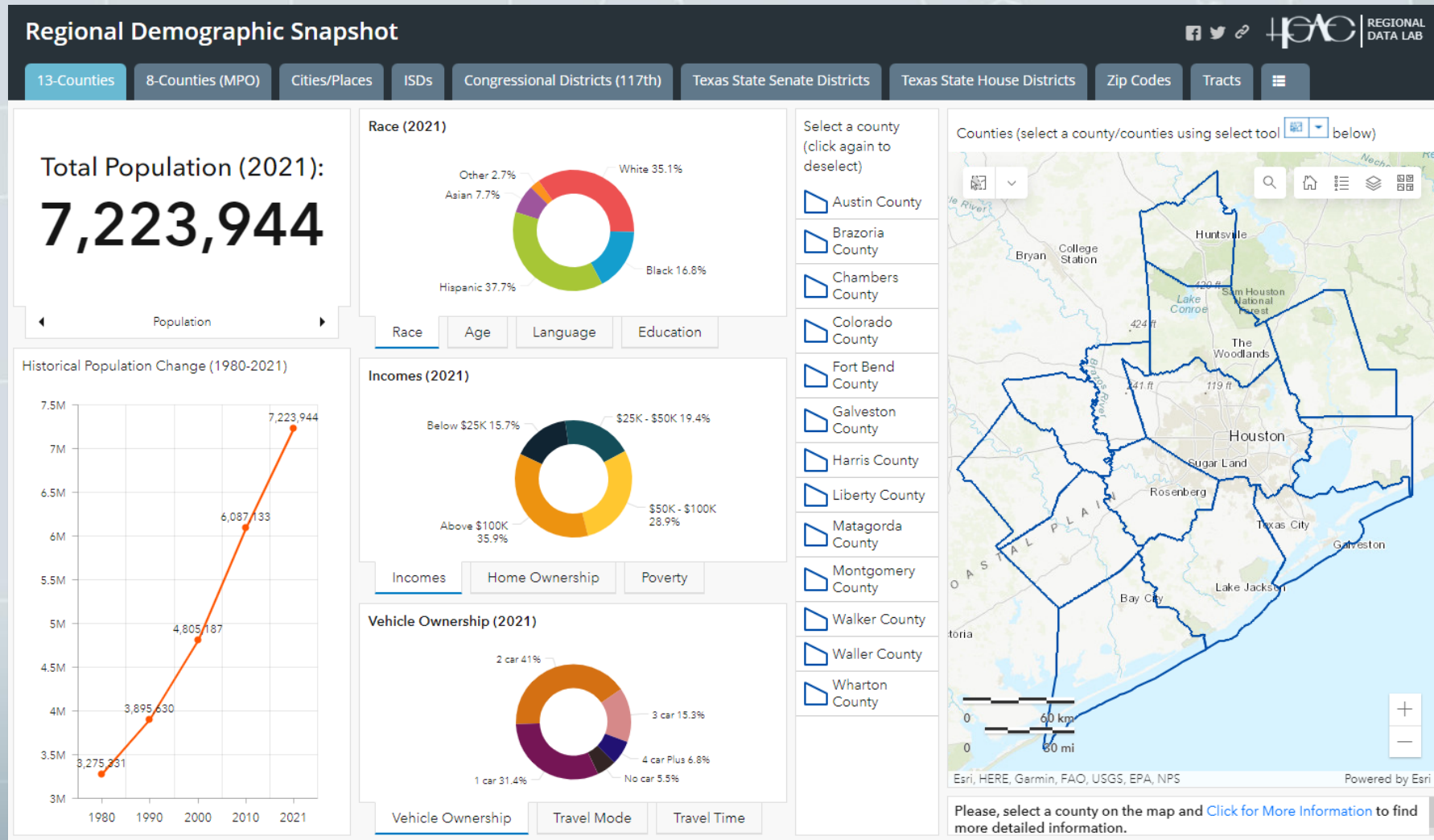
- High-resolution topographic data
 - Digital Elevation Models (DEMs)
 - Digital Surface Models (DSMs)
- 1ft/2ft/5ft Contours

LiDAR Uses and Applications

- **Hazard Assessments**
 - Inundation Risk Mapping
 - Flood Mitigation & Resiliency
 - Drainage Analyses & Runoff Modeling
- **Feature Delineation & Mapping**
 - Vegetation, canopy, and land cover
 - Man-made structures, building footprints
 - Water bodies / wetlands / shorelines
- **Planning, Infrastructure & Energy**
 - Utilities
 - 3-D buildings / roadway models
 - Slope & aspect > Sunlight exposure modeling
- **Agriculture & Forestry**
 - Crop yield, fire risk
- **Geology & Mining**
 - Cut & fill volumes

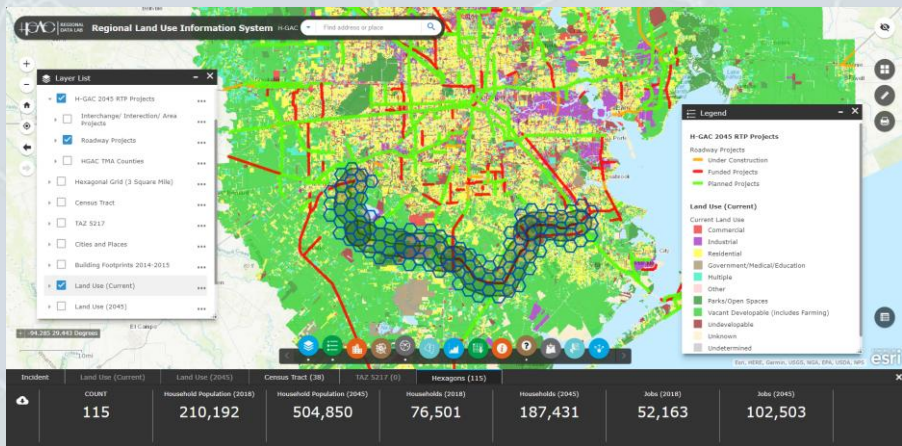


Data Visualization

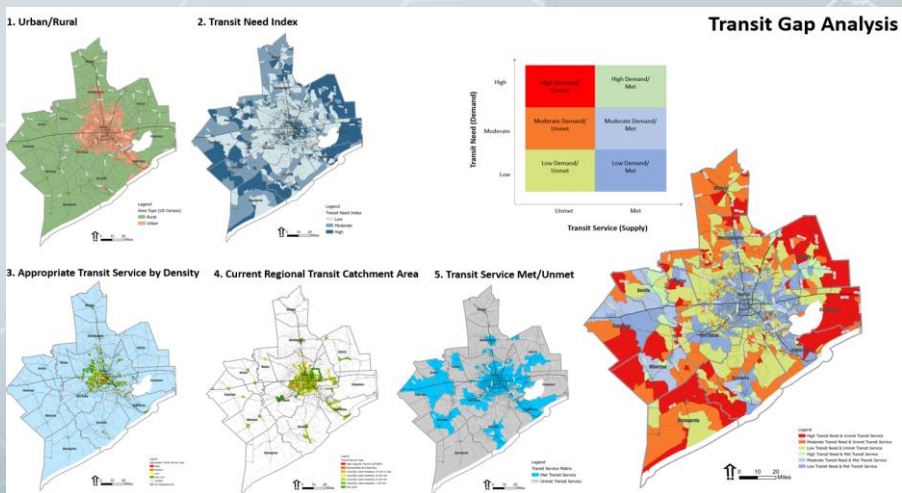


- Advanced Information Extraction & Display
- Interactive Web-mapping Tools, Story Maps, and Dashboards

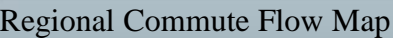
Interactive Tools & Dashboards



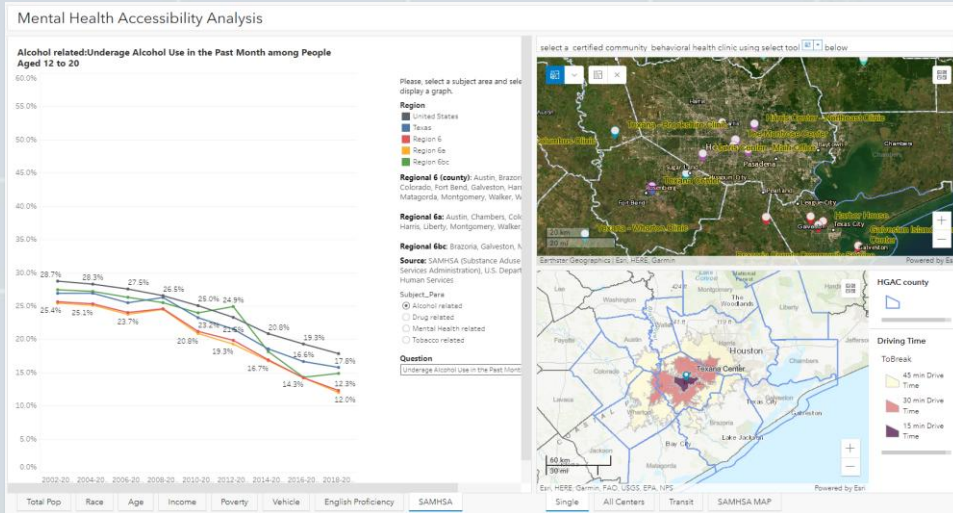
Regional Growth Forecast



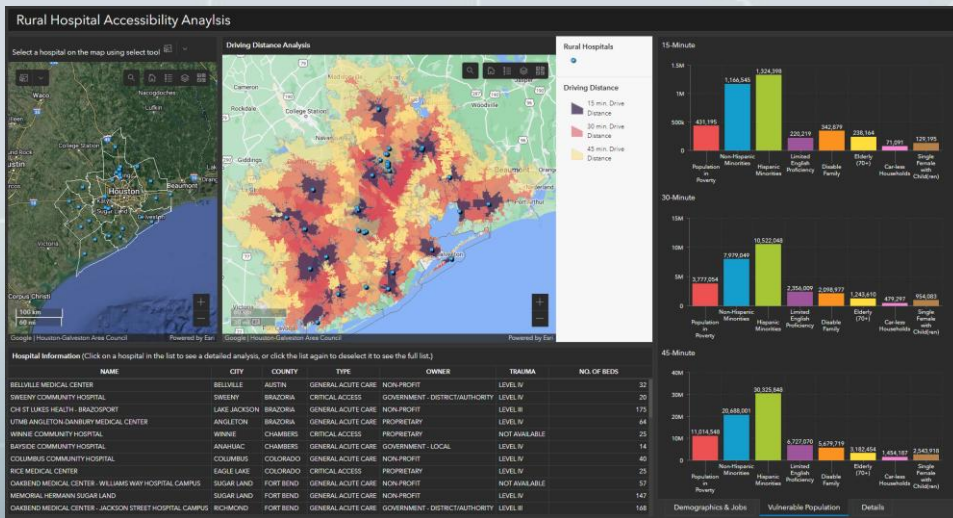
Transit Gap Analysis



Data Visualization

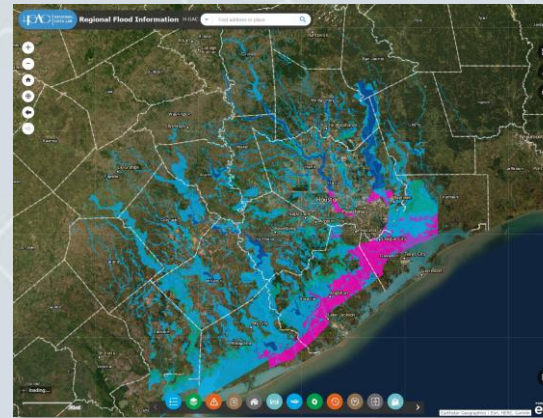


Behavioral Health Accessibility

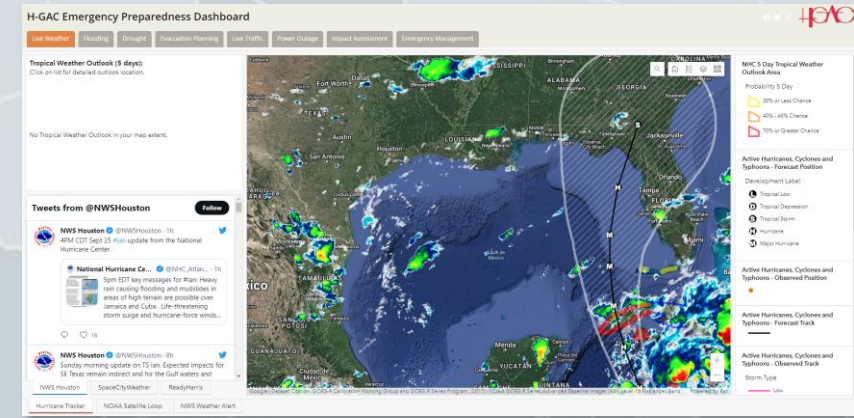


Rural Hospital Accessibility

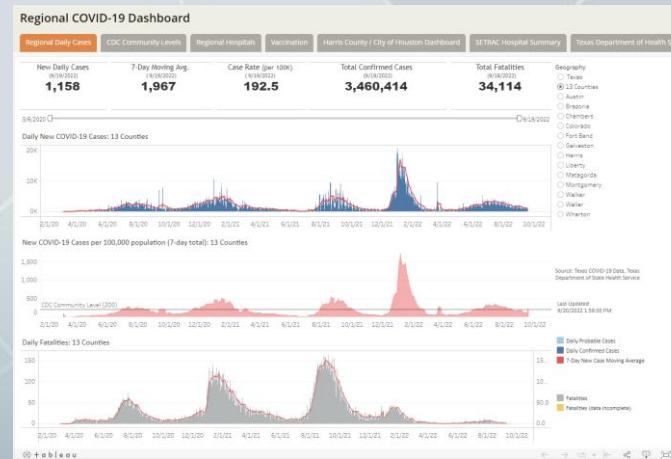
Interactive Tools & Dashboards



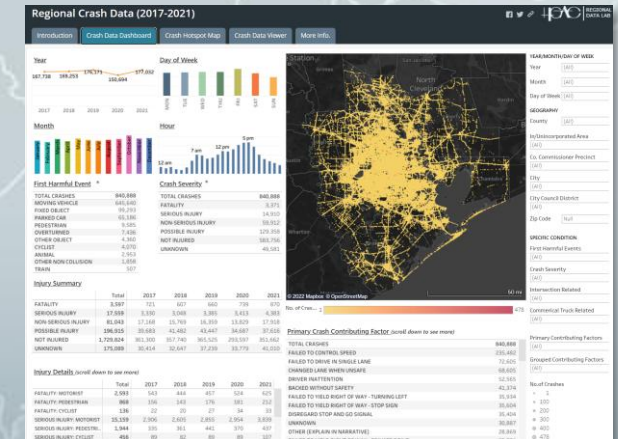
Regional Flood Information



Emergency Preparedness Dashboard (internal)



Regional COVID-19 Dashboard (internal)



Regional Crash Data (2017-2021)

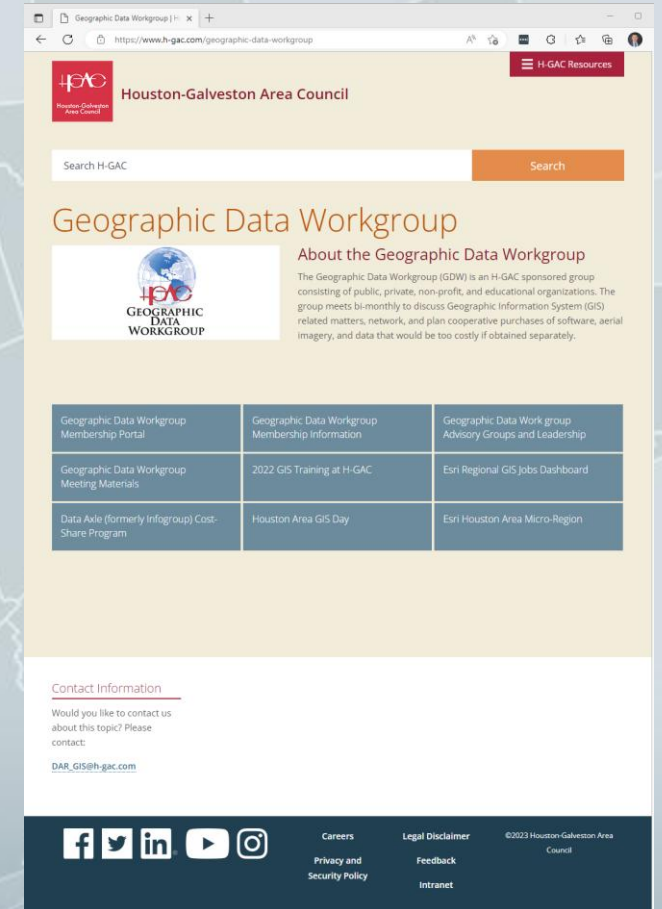
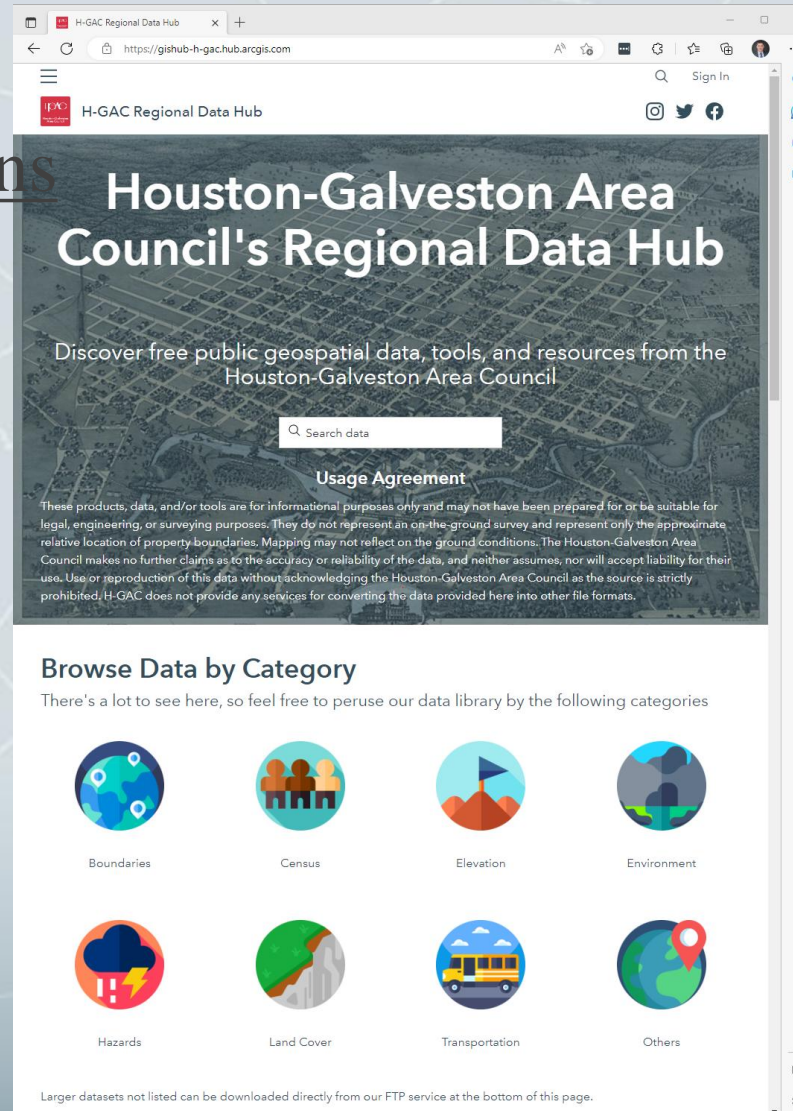
Data & Information Sharing

- www.h-gac.com/interactive-web-applications

- External GIS Gateway (Data Hub)

- Geographic Data Workgroup

- Remote sensing programs (imagery & lidar)



Thank you...!

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