# H-GAC Socio-Economic Modeling GIS & Forecast Overview

Dmitry Messen
Bill Bass

April 20, 2011
Houston-Galveston Area Council
www.h-gac.com/forecast

H-GAC Overview

- Regional Council of Government (COG) for 13 county area

- Socio-Economic Modeling
  - Population, employment forecasting
  - Land use forecasting
  - Environmental analysis

- Larger Than...
  - District of Columbia (70)
  - Rhode Island (1,141)
  - Delaware (2,066)
  - Puerto Rico (3,662)
  - Connecticut (5,219)
  - Hawaii (6,590)
  - New Jersey (7,834)
  - Massachusetts (8,560)
  - New Hampshire (9,902)
  - Vermont (10,313)
  - Maryland (10,674)
  - And over 100 countries including: Belgium, Albania, Singapore, Luxembourg, Qatar and Kuwait

13,923 Square Miles
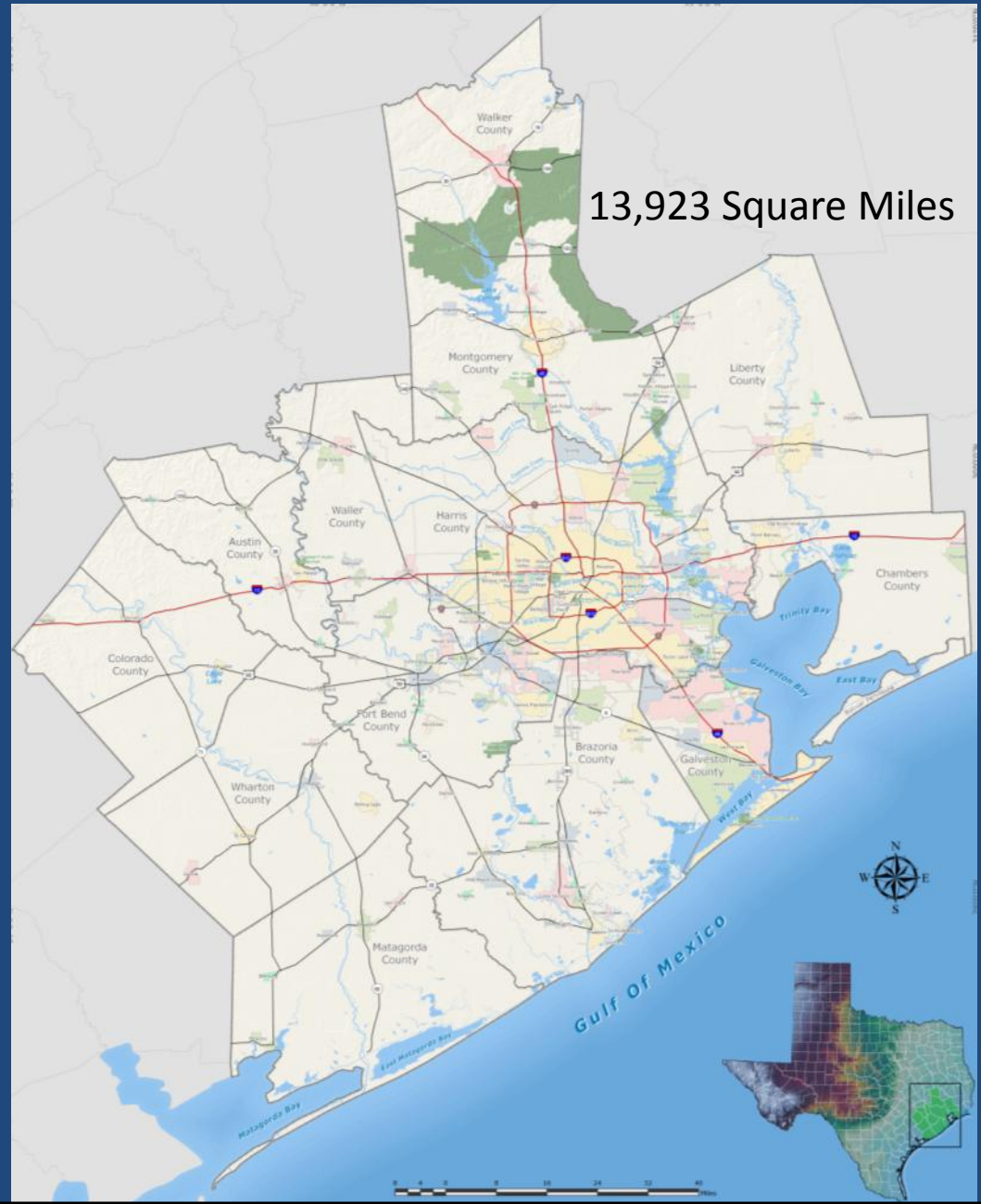
Software Platforms Used

Data Development → **Analysis** → **Communicating Results**
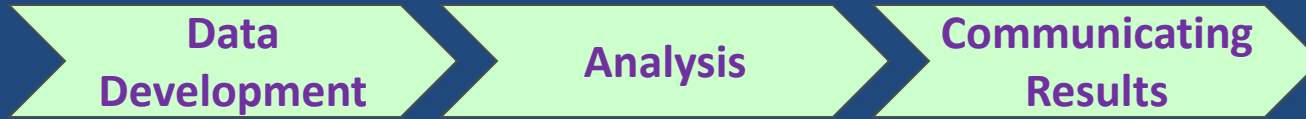
Platform	Data Development	Data Warehousing (Internal)	Spatial Analysis/ Mapping	Forecasting/ Modeling	Web GIS Applications
ArcGIS Desktop	✓		✓		
SAS	✓		✓	✓	
Python	✓		✓		✓
ArcSDE		✓	✓	✓	✓
Adobe Flex					✓
ArcServer					✓

Land Use Modeling Process

Parcel Boundaries	**Preliminary Land Use**	**Land Use Overrides**	**Current Land Use**	**Regional Forecast**	**Future Land Use**
Appraisal Data					

Imagery

RLUIS (Regional Land Use Information System)

Additional Land Use Information

Parks	Cultural	Infra-structure	Development Events	Buildings

RLUIS Feedback

Regional, Local, 3rd Party Sources

Development Events

Track Announcement Status

Announcements → Plats → Parcels

'1,500 home development in Fort Bend County'

Identify parcels involved

Updated County Appraisal Data

Geo Database

Land Use Modeling

Announcements and Plats help fill in the gaps,

until appraisal data is current.

Public Participation GIS (PPGIS)

- NCGIS 1996 (National Center for Geographic Information and Analysis)

- Bring academic practices of GIS to local level to promote production of knowledge

- Empowerment and inclusion of marginalized populations through geographic technology and participation

- Variety of tools and maps produced to gather feedback

- Information gathered was subject to review and QA process
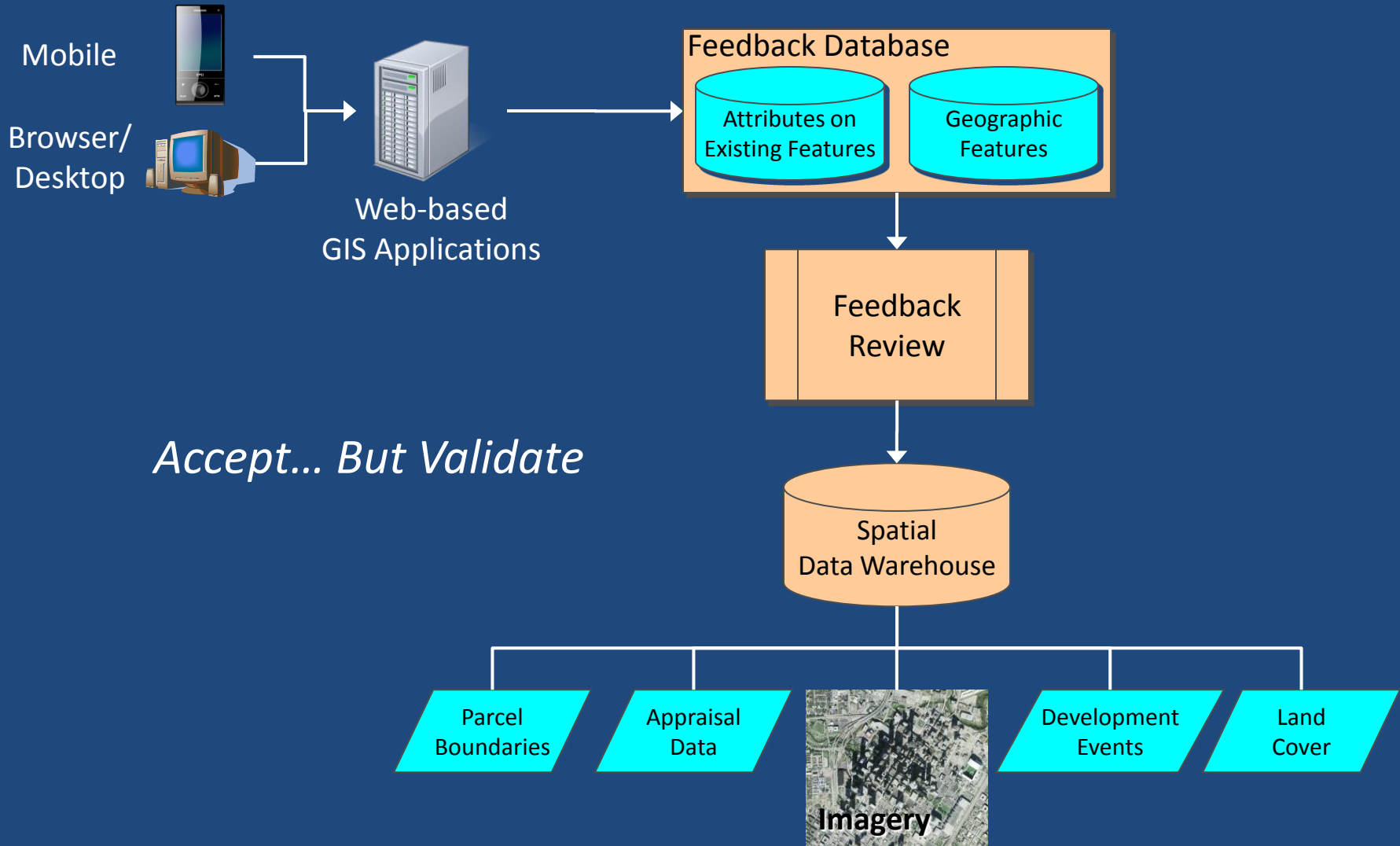
- Pre web-based GIS application era

Crowd Sourcing

- Term was first coined by Jeff Howe in 2006 in Wired Magazine

- The argument was that due to technological advances, and the availability of cheap electronics, the gap between professional and amateurs has been diminished.

- Leveraging the public to perform a task previously done in-house to outsourced

- Not necessarily a GIS centric function

- Exist concerns with regards to quality, accuracy, and validity of data gathered
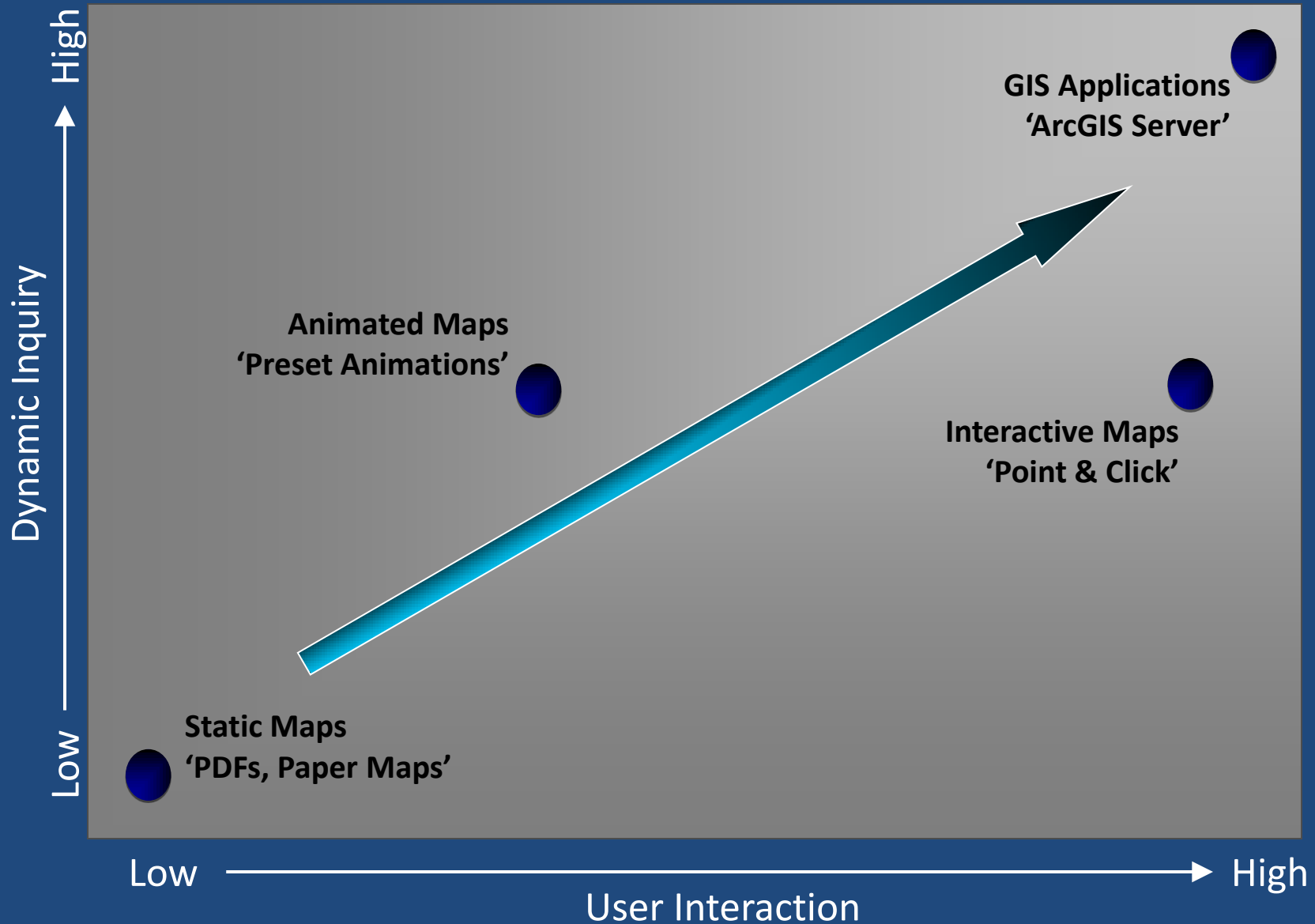
Volunteered Geographic Information (VGI)

- Harnessing of tools to create, assemble, and disseminate geographic data provided voluntarily by individuals (Goodchild, 2007)

- Advances in web-based GIS enabled VGI
    - OpenStreetMap
    - GoogleMyMaps
    - Gulf Oil Spill maps (numerous)

- Typically viewed as an extension of PPGIS

- VGI is Crowd Sourced data, so there are similar concerns with regards to quality, accuracy, and validity of data gathered

- Concerns need to be addressed as part of process

Our Approach to VGI

Mobile

Browser/
Desktop

Web-based
GIS Applications

Feedback Database

Attributes on Existing Features

Geographic Features

Feedback Review

Spatial
Data Warehouse

Accept... But Validate

Parcel
Boundaries

Appraisal
Data

Imagery

Development
Events

Land
Cover

From Static Maps to Applications

High

Dynamic Inquiry

GIS Applications
'ArcGIS Server'

Animated Maps
'Preset Animations'

Interactive Maps
'Point & Click'

Low

Static Maps
'PDFs, Paper Maps'

Low ⟶ **High**

User Interaction

Mapping Applications
Regional Land Use Information System

Click to Launch
RLUIS

http://www.h-gac.com/go/rluis

Click to Watch a
Video Tutorial

- Regional decision support system

- Communication of current & forecasted information

- Public participation feedback loop

- Available for use by both desktop and web-based clients

- Geoprocessing tools and summary statistics
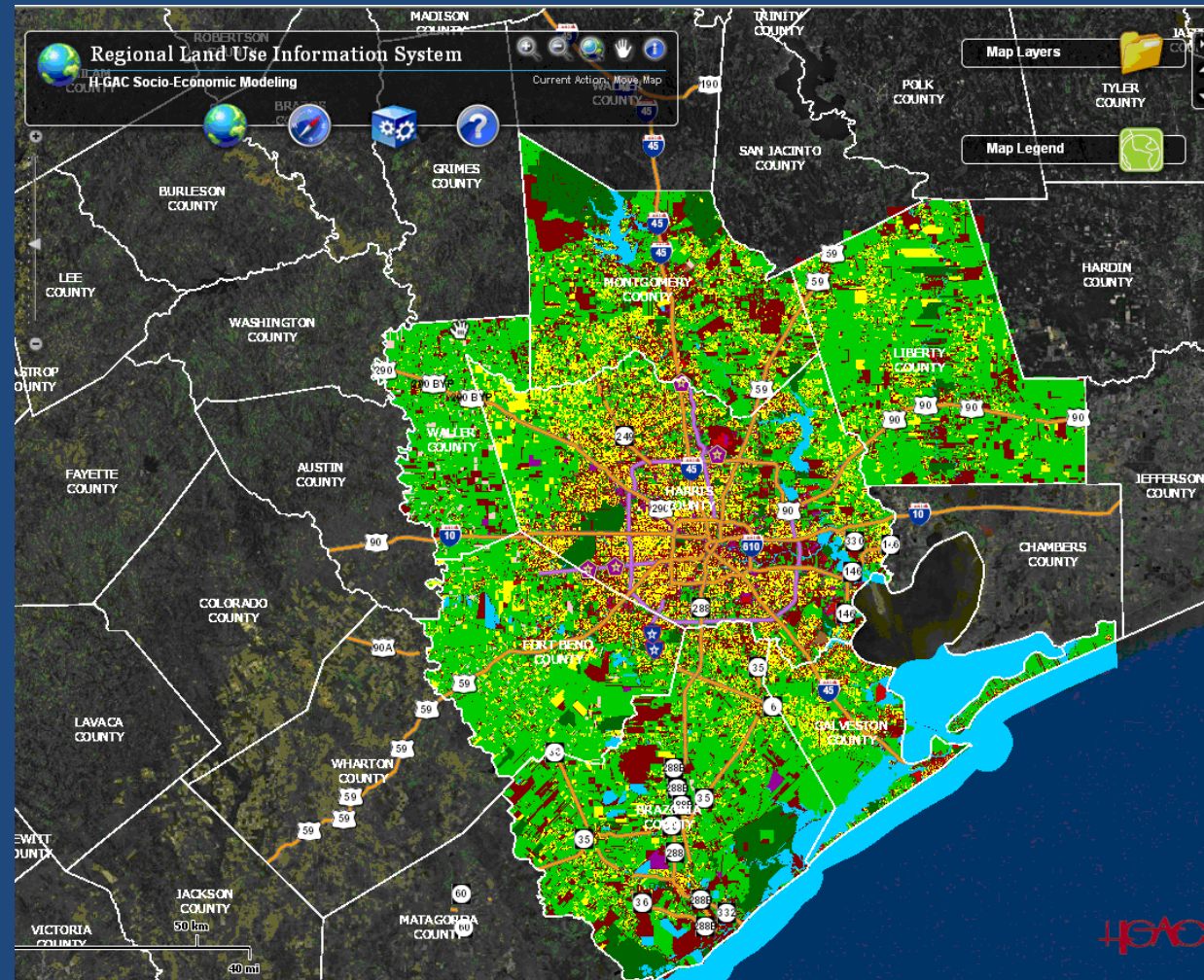
Mapping Applications
Eco-Logical GIS

Click to Launch the
Eco-Logical GIS

http://www.h-gac.com/go/ecologicalgis

Click to Watch a
Video Tutorial

- Regional decision support system

- Integration of long-range transportation & environmental planning

- Identify & aid in conservation of high value environmental resources

- Available for use by both desktop and web-based clients

- Public participation feedback loop

- Geoprocessing tools and summary statistics
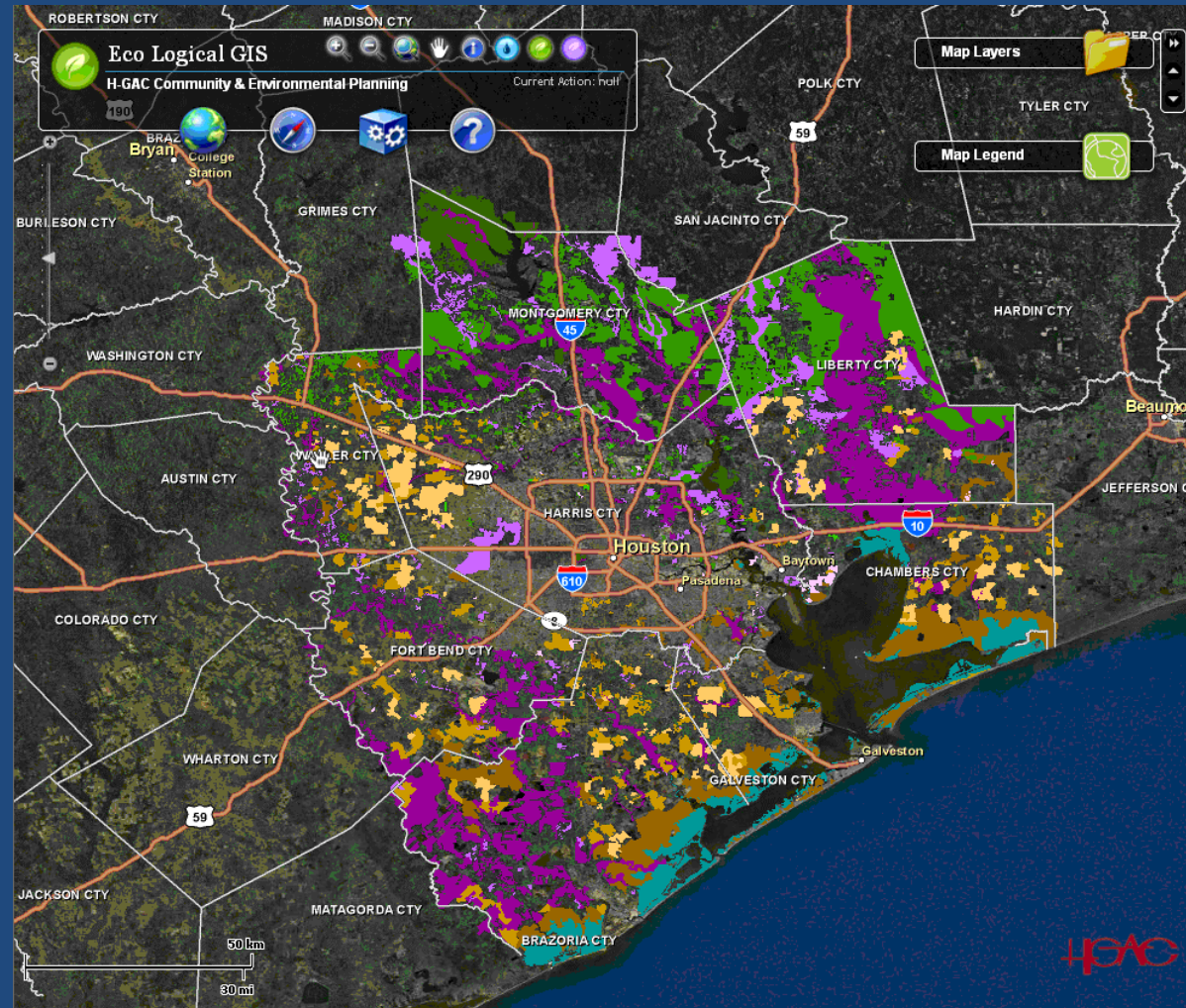
Next Steps in Web GIS Applications
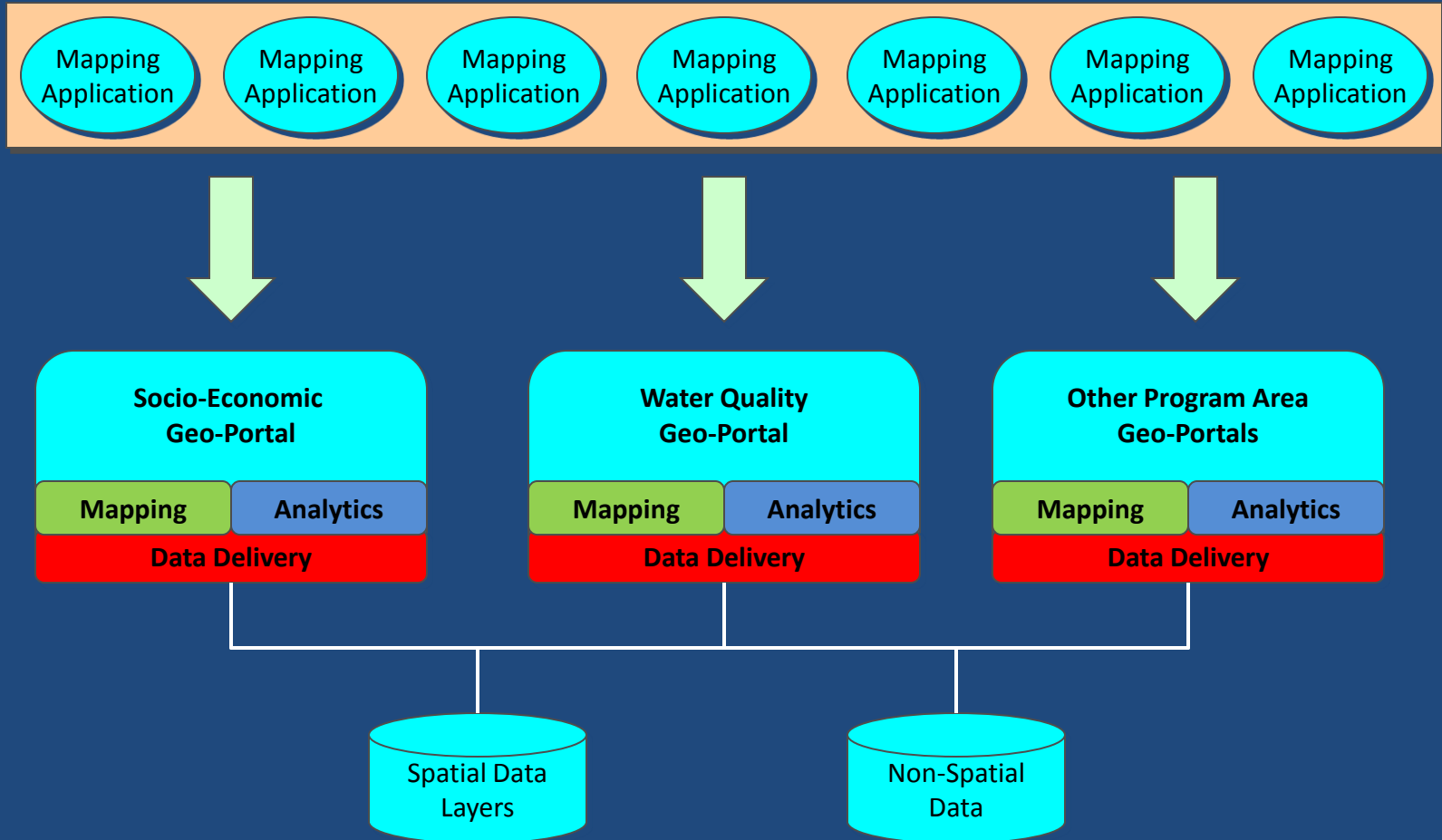
Forecast Process Overview

- Phase I (MACRO): Predict annual change (through 2040) in population, households, and jobs in the REGION as a whole; predict demand for buildings

- Phase II (MICRO): Package buildings into projects; predict which projects will occupy which parcels

Regional Population (Baseline Scenario)
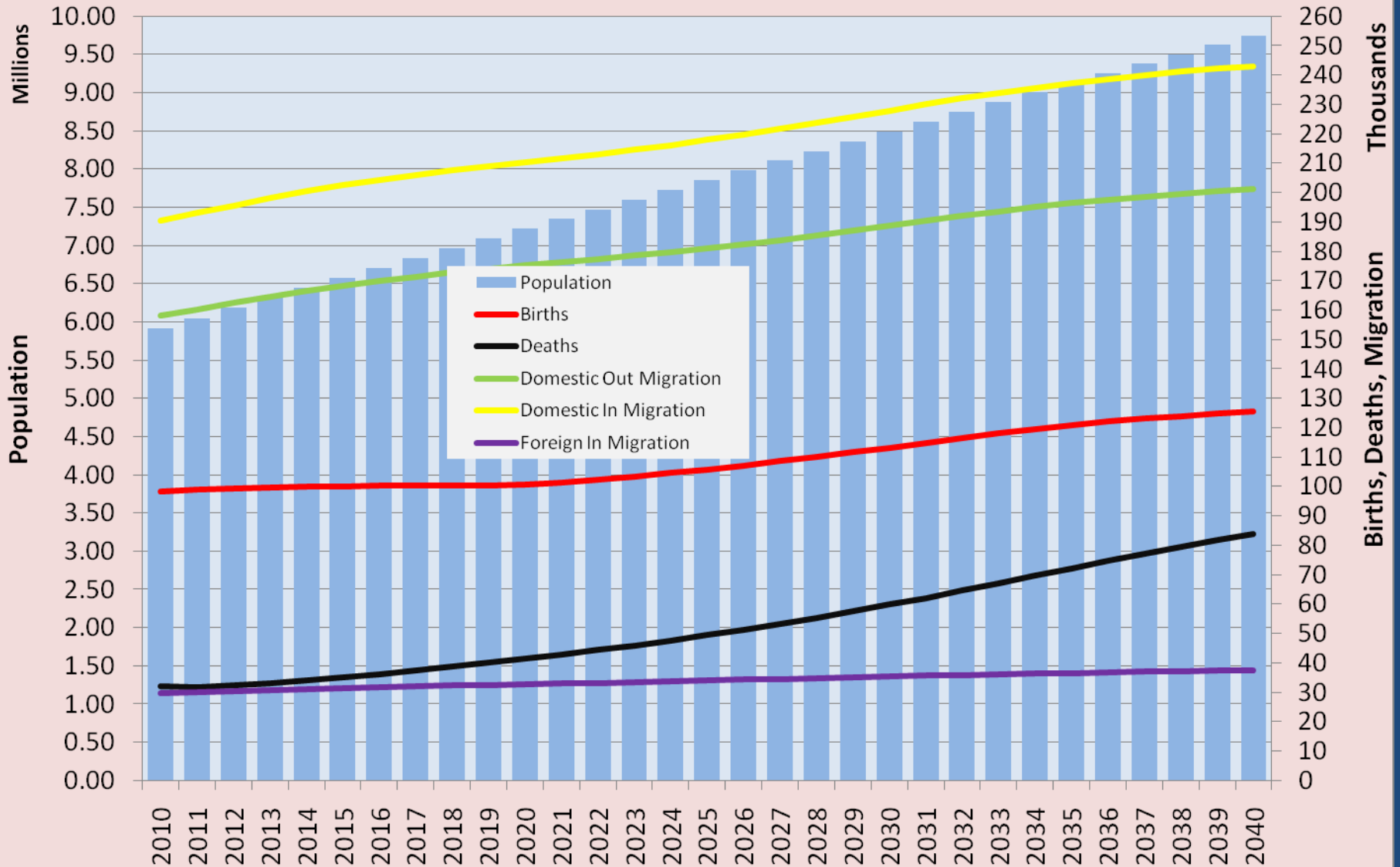
Regional Population (Zero Migration Scenario)
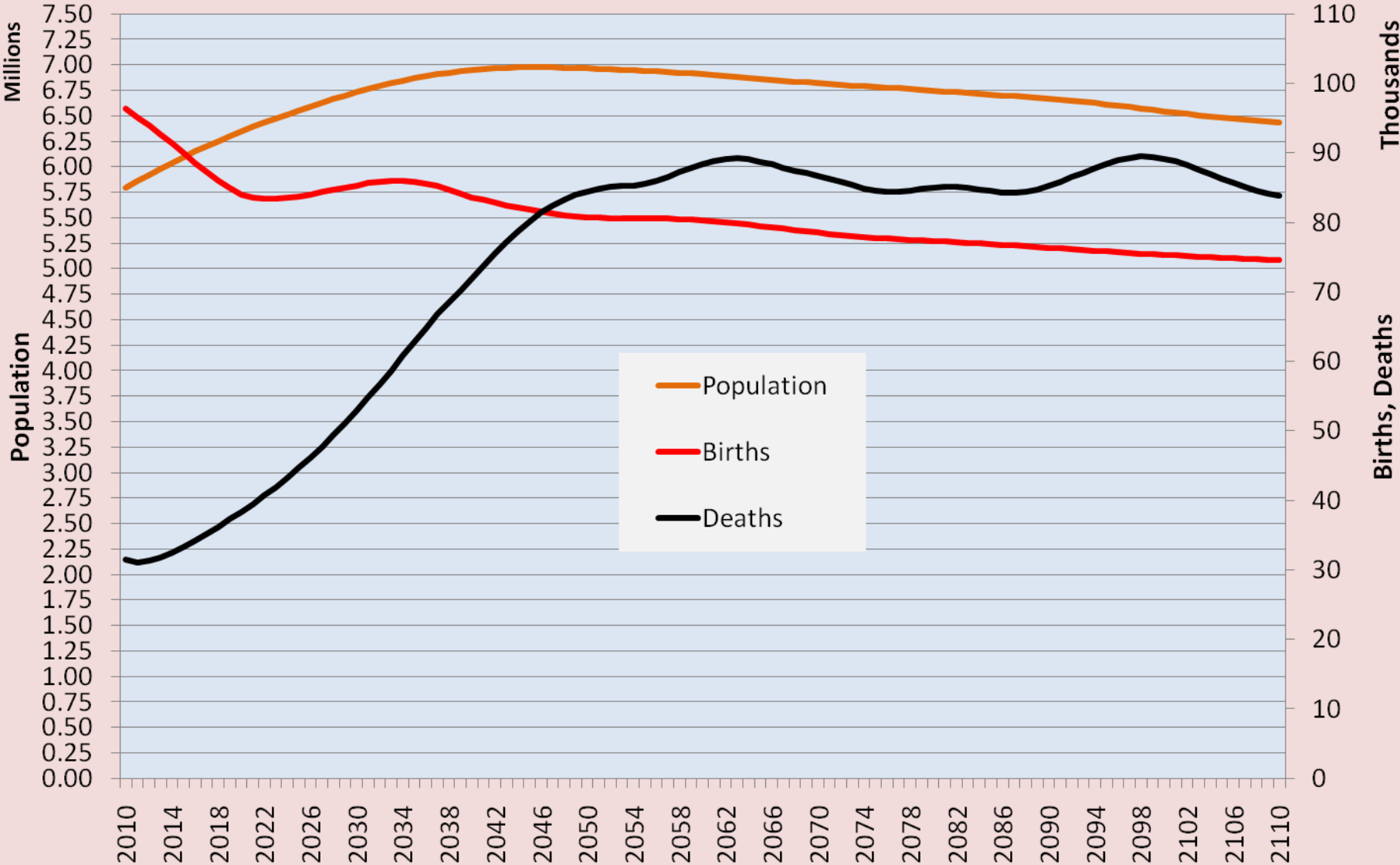
Macro Forecast

- Model Development is completed
- Population-driven
  - Population → Labor Force → Workforce → Jobs → Jobs by sector (2-digit NAICS)
- Migration rates: the most "uncertain" input
- Scenario approach
  - Different migration rates
  - Proxy for economic conditions

Land Use: Base and Forecast

- Parcels and Buildings are elementary units
- 3 "Components"
  - *What's on the ground now*
    - Sources: appraisal, imagery, real estate databases, research
  - *Planned/Announced*
    - Sources: plats, business press
  - *Future projects* (SF subdivisions, MF complexes, Office, Retail, Industrial/Warehouse Buildings)
    - Source: model predictions

Land Use: Base and Forecast

- Base year 2008
- Will bring up to 2010 this year
  - 2010 appraisal
  - 2009 and 2010 plats and announcements
- Model is operational, *test* (Version 1.0) results available in RLUIS application
- Public Review/Input
  - Errors in the base year land use or planned/announced project
  - Utterly unreasonable predictions (why?)

Tentative Schedule

- Work in progress

- Subsequent versions to be released in spring/summer

- Late summer: new (2010) base to match 2010 Census data

- Fall: inclusion of future transportation networks (to be developed as part of the RTP process)

Community & Environmental Planning GIS Resources

Community & Environmental Planning
http://www.h-gac.com/community

Socio-Economic Modeling
http://www.h-gac.com/forecast

C&E GIS Data and Applications
http://www.h-gac.com/go/cegis

Thank You.

Bill Bass
William.Bass@h-gac.com

GIS Data & Applications
CEGIS@h-gac.com

Dmitry Messen
Dmitry.Messen@h-gac.com

Forecast/Census/Demographics
Forecast@h-gac.com