CENTER FOR HOUSTON'S FUTURE

Houston's Call to Action

3/22/2018

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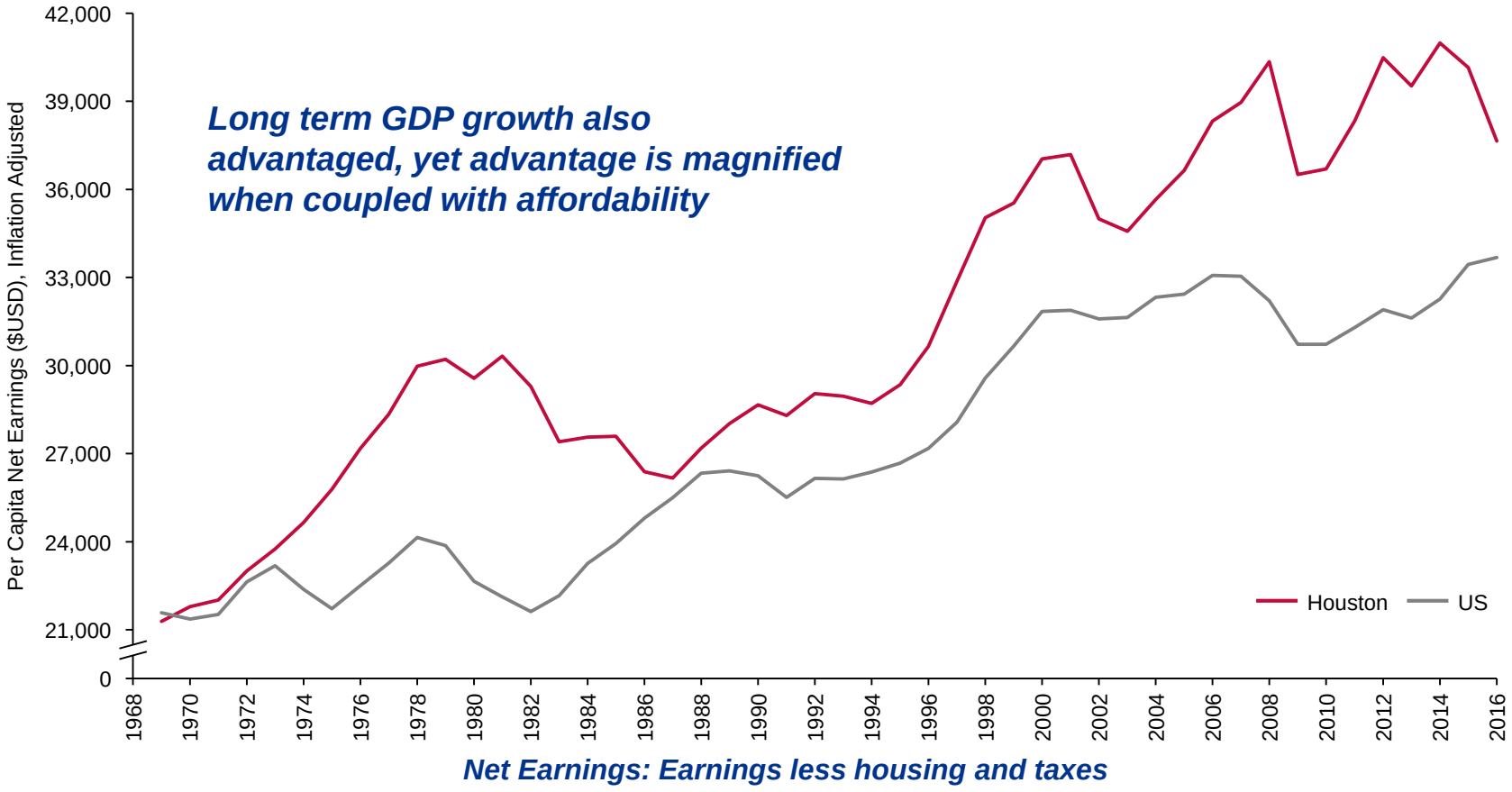
Center for Houston's Future

A Call to Action

- **Houston MSA's long trend of economic outperformance has been disrupted, suggesting the existing 'growth model' be reexamined and potentially changed**
- When faced with similar crossroads – natural disaster, industry shifts, or other disruptions – peer cities have demonstrated an ability to transform and thrive
- Houston MSA's current challenges suggest an opportunity for leadership to adopt similar strategies

Houston MSA has held a long standing economic advantage (especially in terms of discretionary income growth), though recently we've slipped

Houston MSA and US per capita net earnings



Note(s): Per Capita Net Earnings adjusted using US Bureau of Labor Statistics Inflation Calculator
Source(s): US Bureau of Economic Analysis

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Houston MSA's relative economic success has been proven to link back to three key catalysts

Houston MSA Growth Catalysts

US Economic Growth
(35%)

Upstream Oil & Gas Industry Growth
(35%)

- Primary generator of high multiplier jobs

Infrastructure & Pro-growth Enablers
(30%)

- Low housing cost, pro growth
- Immigration across socio economic groups

Dr. Gilmer & the Institute for Regional Forecasting Model

- Provides Houston an independent center of economic and forecasting expertise, conducting bi-annual symposia on Houston's economy since 1984
- Led by Dr. Gilmer, previous VP/senior economist at the Federal Reserve Bank of Dallas
- Work on Texas' economy has been recognized in the Wall Street Journal, The Economist, and Forbes

Model architecture

- Isolates US economy vs. Houston specific economic drivers
- Model back-tested over 1996 – 2016 period to ensure validity

Note: In addition to the above factors, foreign trade has been key to Houston's long-term growth. Furthermore, the recent petrochemical boom has helped bolster Houston's economy over the past several years
Source(s): Dr. Bill Gilmer from the U of H Institute for Regional Forecasting

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Post 2014, Houston MSA's economic advantages have been disrupted

	Then	Now
Infrastructure 	*Pro-growth policies and investments enabled rapid development*	*Limits of Houston MSA's pro-growth model are being reached (e.g., congestion, watershed destruction)*
Upstream Oil & Gas 	*While cyclical, O&G industry predominantly headed 'up and right'*	*Increasing probability of 'Lower for longer' or Lower Forever'*
Inclusive Economy 	*Growing economy attracted immigrants – education often 'imported', rest of system adequate*	*Less educated population out of balance with escalating job requirements*

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Oklahoma City is an example: took actions around infrastructure, business renewal, and talent after losing a major United Airlines depot

Case study framework

Call to Arms

What Leadership did

Oklahoma City

Call to Arms: United chose not to move a major depot to OKC, citing 'poor quality of life'

Infrastructure enhancement:

- Voter approved, Metropolitan Area Projects (MAP) revitalization
- Repurposed old warehouses for residential space

Business rejuvenation:

- Stabilized existing industries (purchased aero plant for Air Force program; incented shale drillers to stay in OK)
- Collaborated with Brookings on an innovation district driving health, energy, and aerospace

Talent influx:

- Downtown renewal and Innovation District attracted talent

What led OKC and other case study cities to success?

An integrated plan tying infrastructure investment to retaining and attracting specific businesses and talent

Other cities in KPMG's 'Magnet City' case studies include: Denver, San Francisco, and Pittsburgh

Source(s): KPMG Magnet Cities, CityLab, SF Gate, San Francisco Center for Economic Development, New York Times, KPMG Smart Cities, Denver Post, National Renewable Energy Lab, TechStars

Other cities have followed a similar integrated path of infrastructure, talent and business rejuvenation to revitalize after a significant disruption

Case study framework

Call to Arms

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Why it worked

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Talent influx:
- Downtown and Innovation District attract talent

San Francisco

Call to Arms: Earthquake in 1989 devastated infrastructure and caused $5b in damage

Infrastructure enhancement:
- Redesigned for the future (e.g., highlighted waterfront, increased residential space)
- Leveraged old industrial sites to expand (e.g., Mission Bay Renewal)

Business rejuvenation:
- Used tax incentives to target hi tech start ups, and 'surplus' from nearby Silicon Valley
- Leveraged existing VC focus on tech companies

Talent influx:
- Attracted talent through urban renewal and hi tech job opportunities

Denver

Call to Arms: 1980's oil glut edged Denver into a recession

Infrastructure enhancement:
- Dedicated task force (Greater Denver Corp) and Metro Vision plan
- Designed suburban business area with urban amenities (Denver Tech Center)

Business rejuvenation:
- Preserved old energy (e.g., shale drillers, new BP HQ)
- Moved into new energy (e.g., Solar Energy Lab repurposed as renewable R&D center)
- Tech Center now focused on energy tech VC and startups

Talent influx:
- Targeted energy & tech talent through accelerator programs
- Nurtured VC growth through tax incentives

Integrated plan tying infrastructure investment to attracting specific businesses and talent

Source(s): CityLab, SF Gate, San Francisco Center for Economic Development, New York Times, KPMG Smart Cities, Denver Post, National Renewable Energy Lab, TechStars

The successful turnaround of Oklahoma City and other cities that experienced similar disruption suggests several key takeaways

Leadership 'call to arms'

- Cities all recognized the need, and the opportunity, for change
  - Oklahoma City: United depot loss
  - San Francisco: 1989 earthquake devastating infrastructure
  - Denver: 1980's recession due to oil & gas dependency

Infrastructure rejuvenation

- Existing assets
- Future business needs
- Workforce vision

- Implemented specific infrastructure projects (e.g., San Francisco 'Mission Bay Renewal', Denver 'Greater Denver Corporation')
- Repurposed existing and designed new infrastructure with a mind towards the future (e.g., old industrial site rejuvenation)

Business rejuvenation

- Existing assets
- Existing capabilities

- Rejuvenated existing assets in line with business goals (e.g., Denver solar energy facility turned into a Renewable Energy lab)
- Implemented specific business initiatives aligned with strengths (e.g., Denver Tech Center attracted telecom and cable companies, major tech and other corporations later followed)

Talent attraction and retention

- Role of infrastructure
- Business opportunity

- Offered economic incentives and accelerator programs (e.g., SF attracting Silicon Valley talent, Denver tech accelerator programs)
- Ensured infrastructure and rejuvenation plans were attractive to talent (e.g., urban renewal in SF and Denver attracted new and helped retain current talent)

Source(s): KPMG Magnet Cities, CityLab, SF Gate, San Francisco Center for Economic Development, New York Times, KPMG Smart Cities, Denver Post, National Renewable Energy Lab, TechStars

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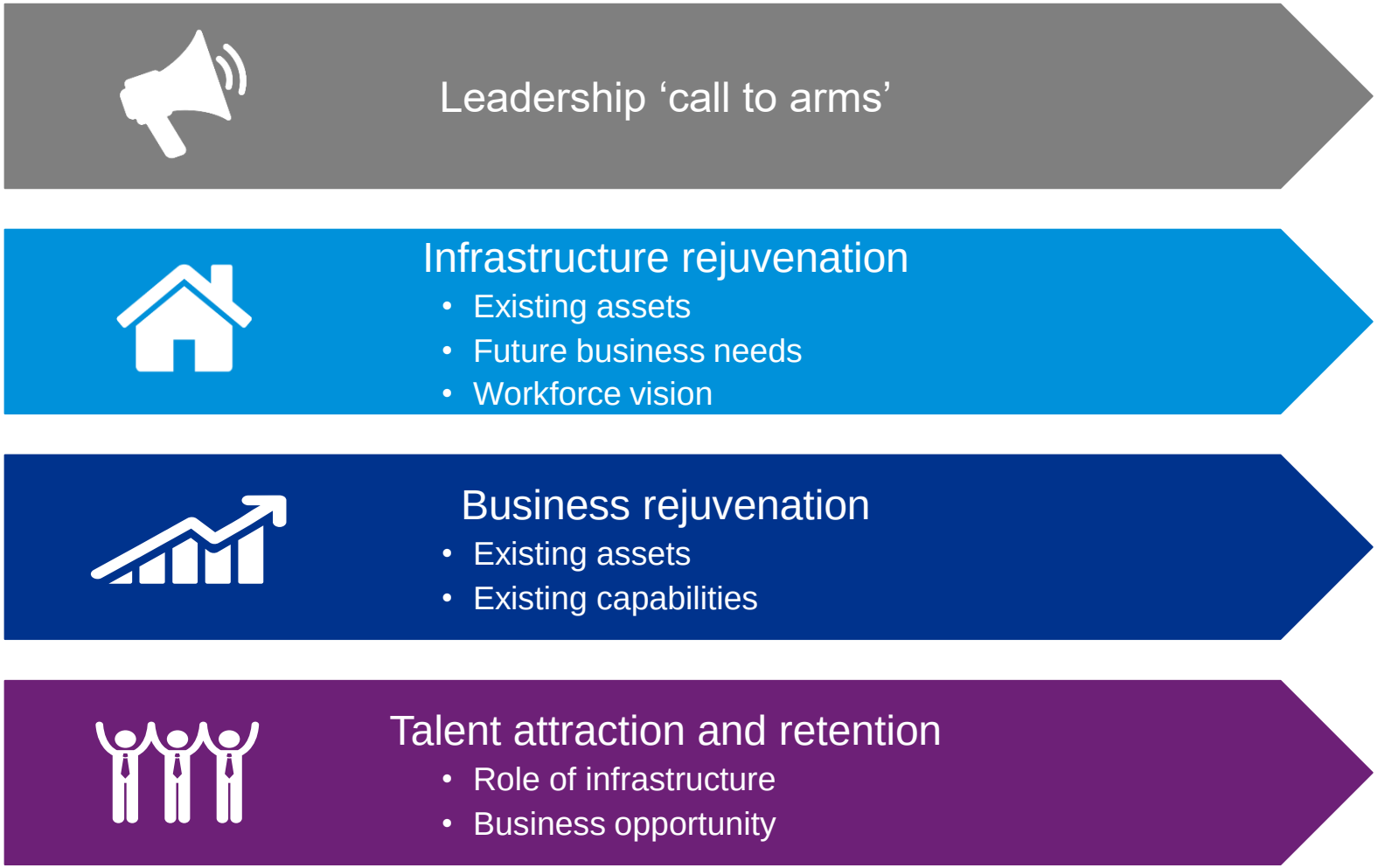
- When faced with similar crossroads – natural disaster, industry shifts, or other disruptions – peer cities have demonstrated an ability to transform and thrive
- **Houston MSA's current challenges suggest an opportunity for leadership to adopt similar strategies**

Where does Houston stand against these key levers?

Magnet City Model



Houston MSA leadership has initiated the call to arms…

Houston Leadership: This is a wake up call

As disappointing and heartbreaking as [not making the Amazon cut] is, **it serves as a wake up call** that we must move at a much quicker pace

-Sylvester Turner, Houston Mayor

Houston did not make [Amazon's] short list…we are obviously disappointed and believe **this is a wake up call for Houston**

-Bob Harvey, GHP CEO

Source(s): Houston Chronicle, Greater Houston Partnership

…and the public appears ready to respond

Houston public receptive

No excuses: we need to fully understand why Houston didn't make the [Amazon] cut. And **we need visionary leadership** to make sure this doesn't happen again

-Houston Chronicle

Houston's oil industry is crucial, but **we need to be able to diversify** and be a part of America's future

-Houston Chronicle

Houston's **infrastructure** – water lines, roads and bridges, and stormwater systems – **is crumbling, and the problem needs a [large scale] solution**

-Houston Business Journal

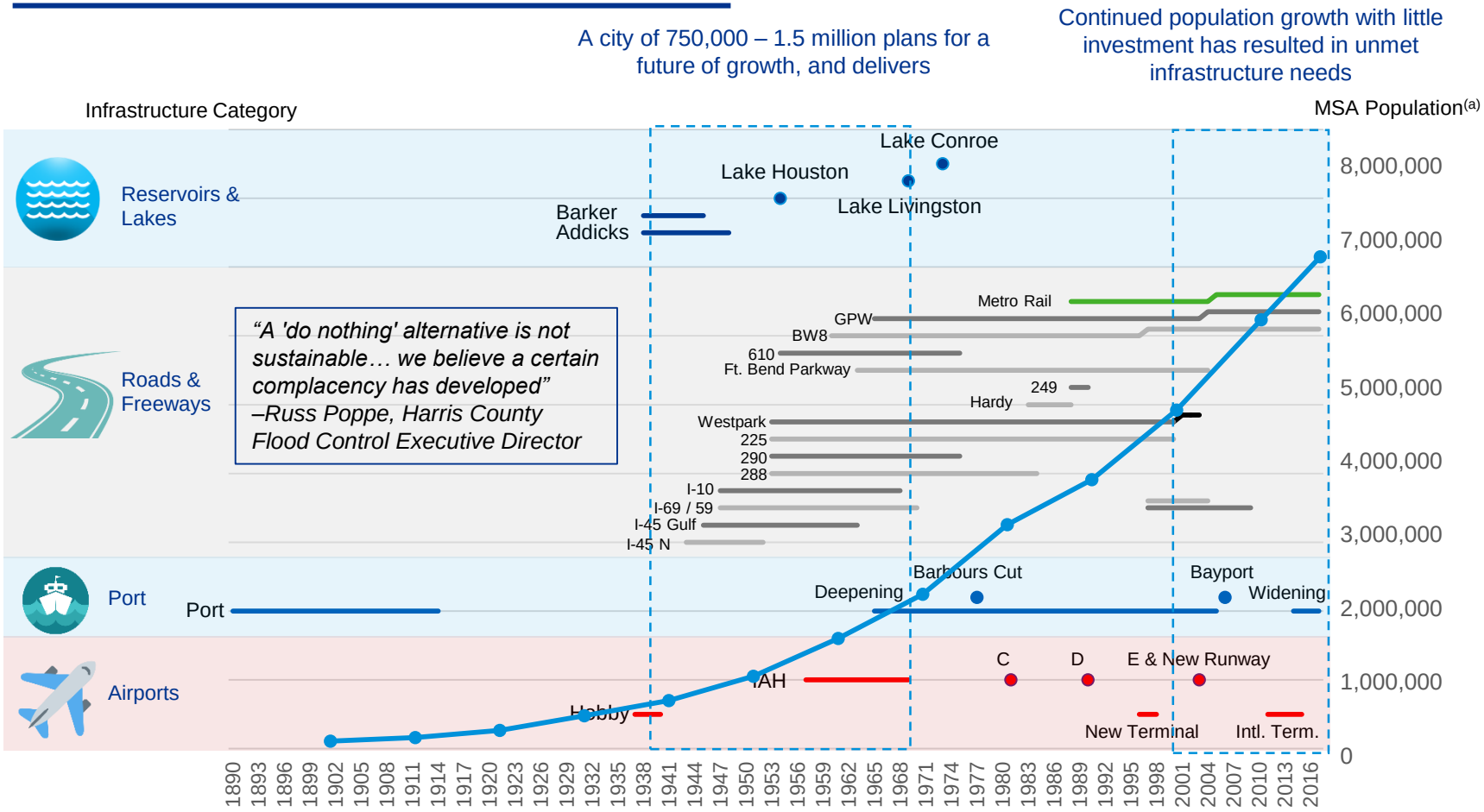
How do you attract the talent of the 21st century? **Houston has to turn itself into a destination of choice.** Quality of life is now essential to [Houston's] economic prosperity

-Houston Public Media

Source(s): Houston Chronicle, Houston Public Media, Houston Business Journal

The gap in Houston infrastructure – largely in place decades ago – is clear

Houston infrastructure timeline vs. MSA Population growth



Note: (a) Population by county summed to determine total population – included counties currently in Houston MSA (Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, Waller)
Source(s): City of Houston, U.S. Census Bureau, Port of Houston website, *Houston Freeways* Stotbloom, Harris County Flood Control District

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Several infrastructure initiatives are in place, yet key questions remain

Current Houston MSA infrastructure initiatives

Downtown Plan

Modernizing and revitalizing Houston's downtown district by 2036

- Innovation district
- Building residential units
- Connectivity improvements (e.g., electric vehicles)
- Walkability and greenspace

MetroNext

Improving Houston's transportation system to support population growth

- Improved accessibility
- System expansion (e.g., rail, park and ride)
- Increased connectivity

The Cannon

Co-working ecosystem for Houston's entrepreneurs, small businesses, and freelancers

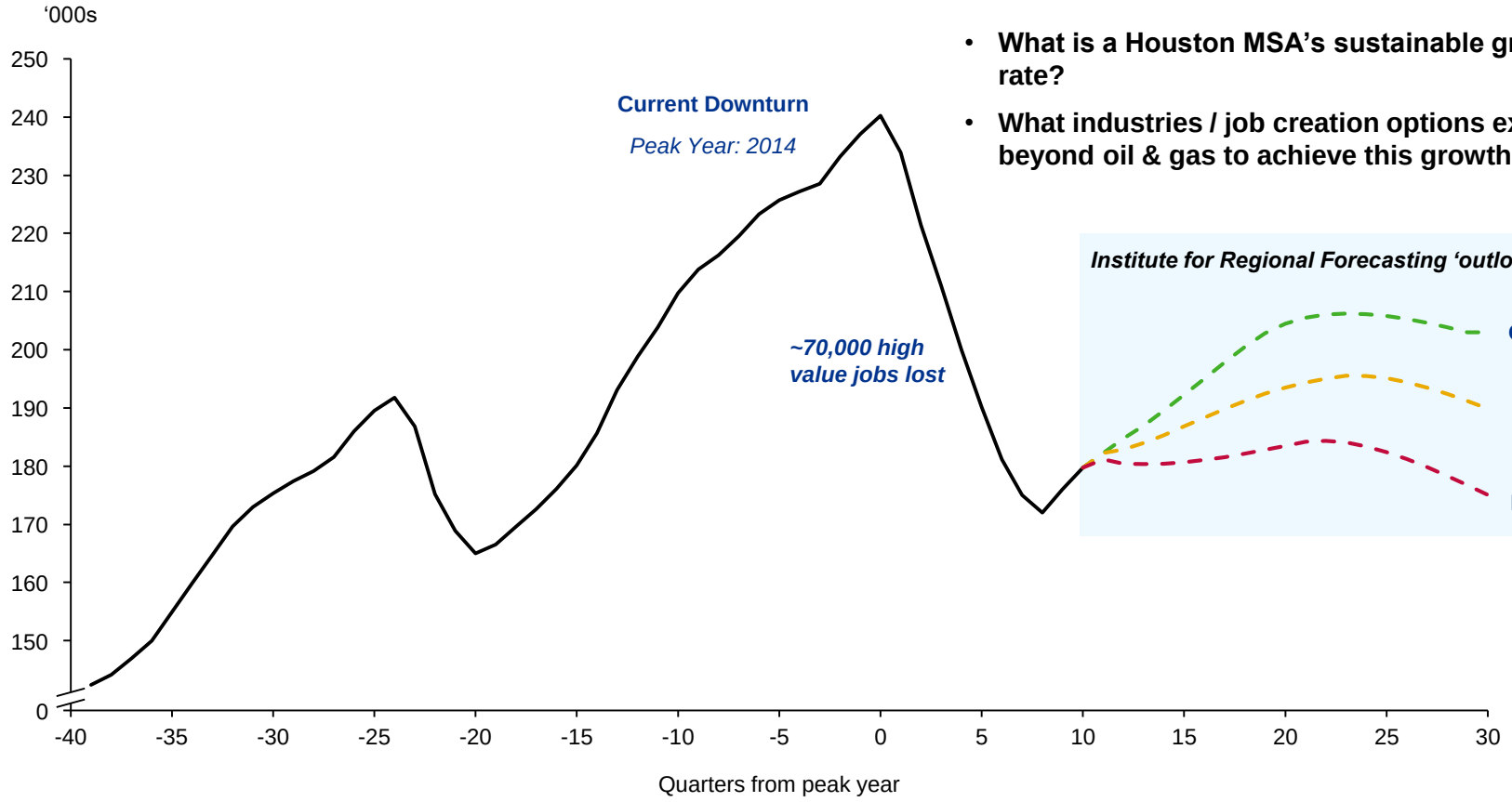
- New Founder's District (24+ acre campus)
- Discounted professional services

- Do we have an adequate plan (and funding) in place to **upgrade weather infrastructure** and address related development policies**?**
- What is the right balance between addressing **near term vs. longer term** infrastructure needs? Should an **integrated program** be explored?
- Are we developing infrastructure **in alignment with our business rejuvenation and talent agendas**?

Source(s): Houston Plan Downtown, MetroNext, The Cannon

Though differences in views exist, relying primarily on an O&G upcycle to drive high quality job growth appears increasingly problematic

Houston MSA oil and gas related jobs versus peak quarter



- **What is a Houston MSA's sustainable growth rate?**
- **What industries / job creation options exist beyond oil & gas to achieve this growth rate?**

Note(s): Jobs consist of oil production, oil services, machinery, and fabricated metals – change from SIC to NAICS coding results in classification change
Source(s): US Bureau of Labor Statistics; The Institute for Regional Forecasting

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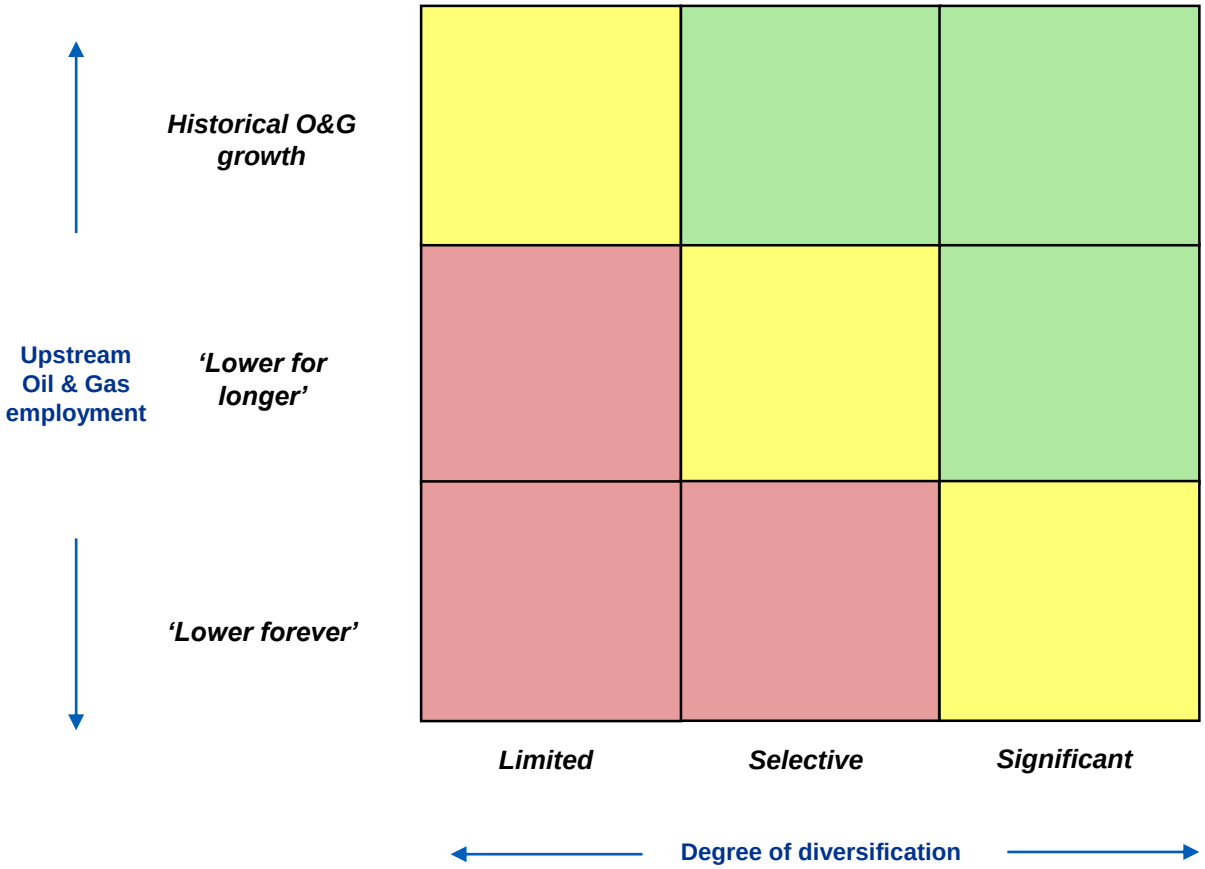
Modeling was conducted to answer the key question: to what extent does Houston need to diversify to maintain an outperforming economy?



Modeling Approach

- Used IMPLAN economic development model
- Selected key sectors for job diversification through a multi-screening process
- Set target of outperforming peer city average annual growth rate **(2.1%)**[(a)]
- Modeled extent of diversification beyond oil and gas required

Note: (a) Average employment CAGR from 1990 – 2016 of key peer cities outperforming US employment growth: Austin, Atlanta, Dallas, Denver, Oklahoma City, Phoenix
Source(s): Bureau of Economic Analysis, Bureau of Labor Statistics

Sectors for diversification were selected based on connectedness to Houston, economic value add, and growth potential

Selective Diversification

Existing presence

Healthcare manufacturing
5 year CAGR: **7.1%**
2017 jobs: 2,631

Healthcare R&D[(a)]
3 year CAGR: **1.7%**
2017 jobs: 27,407

Plastics manufacturing
5 year CAGR: **1.3%**
2017 jobs: 6,525

Chemical manufacturing
5 year CAGR: **1.7%**
2017 jobs: 14,428

Significant Diversification

Existing capabilities and/or high applicability

Data Science & Programming
5 year CAGR: **2.9%**
2017 jobs: 30,885

Computer systems & engineering
5 year CAGR: **2.8%**
2017 jobs: 37,813

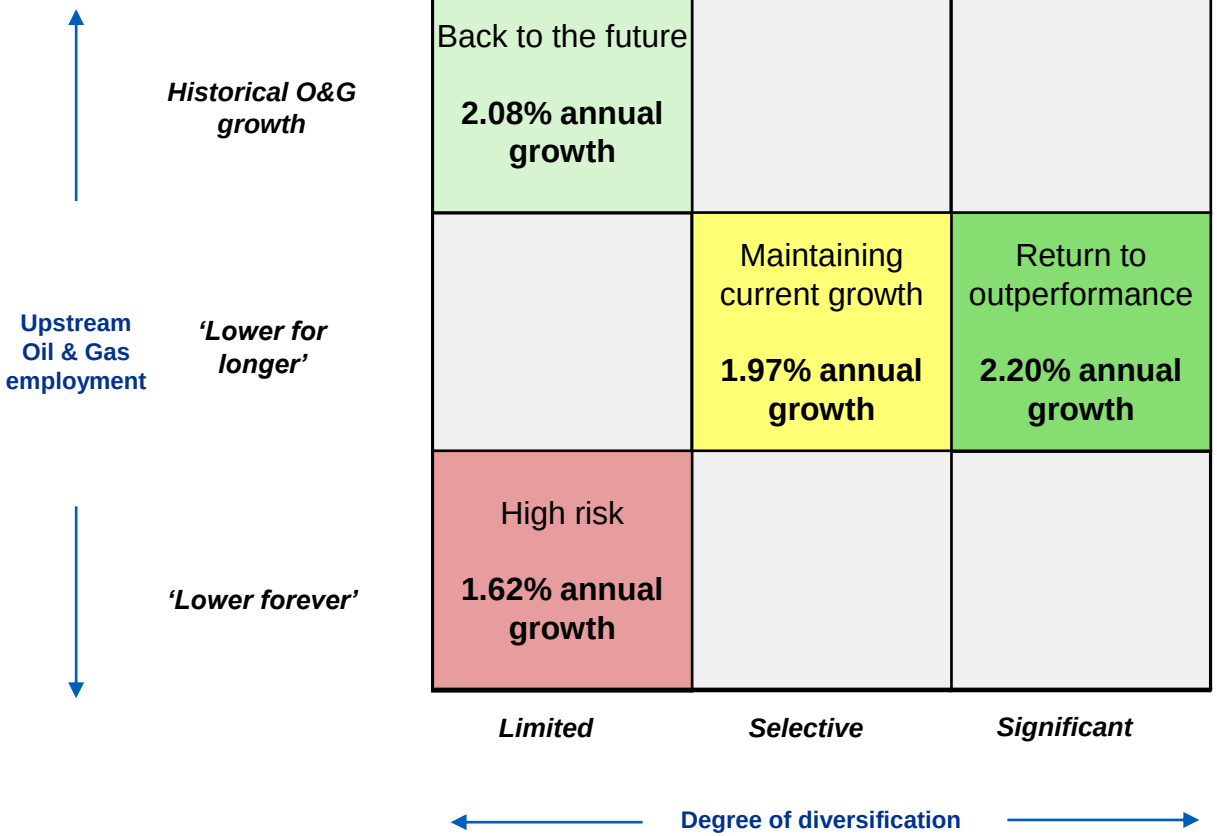
Power transmission[(a)]
5 year CAGR: **2.0%**
2017 jobs: 9,539

Utility scale renewables
5 year CAGR: **3.2%**
2017 jobs: 706

Note: (a) CAGR from 2013 – 2016 due to availability of data
Source(s): US Bureau of Labor Statistics, IMPLAN

The scenario modeling considers a combination of oil & gas sector employment growth and diversification across selected sectors

Scenario Outline



Peer city annual growth rate: 2.1%

Back to the future: Cyclical oil price rebound reestablishes Houston's economic growth to match rate of peer cities[a]

High risk: Low oil price coupled with lack of diversification maintains current economic deterioration[b]

Maintaining current growth: Selective diversification plus modest oil and gas expansion maintains Houston MSA growth, but does not match peer city levels[c]

Return to outperformance: Thoughtful diversification plus modest oil and gas expansion achieves Houston's outperformance[c]

Note: (a) Employment CAGRs are based on Houston MSA historical data from 1990 – 2014. O&G sector employment CAGR is 2.77%, All other Houston MSA employment CAGR is 2.03%; (b) High risk scenario includes 2.03% CAGR across non O&G employment - no incremental growth across chosen diversification sectors and no growth in the O&G sector is included; (c) Incremental growth across each chosen diversification sector is determined by analyzing how much faster the sector is currently growing over the overall employment CAGR of 2.03%. 'Lower for longer' O&G sector growth is approximately 1.3% (matches 1990 – 2014 CAGR). 'Significant' diversification includes sectors from the 'selective' category.
Source(s): US Bureau of Labor Statistics, IMPLAN

Overall, significant job diversification will be required to maintain outperformance in the event of low to modest oil and gas expansion

Back to the future	A 1980's or 2014 rebound in the oil and gas cycle in theory could return Houston MSA to outperforming growth rates, however there is decreasing likelihood of this occurring
High risk	If an oil and gas rebound does not occur and Houston MSA does not diversify, economic performance will lag the general economy and peer cities
Keeping up	Even in a modest oil and gas sector recovery scenario, Houston MSA will require at least selective diversification in order to sustain the current level of economic growth
Return to outperformance	Lacking high oil and gas cyclical upside, more significant business diversification will be required to return to economic outperformance as witnessed through 2014

Many business rejuvenation efforts are underway, however the question of urgency around diversification remains

Current Houston MSA business rejuvenation initiatives

The Cannon

Co-working ecosystem for Houston's entrepreneurs, small businesses, and freelancers

- New Founder's District (24+ acre campus)
- Discounted professional services

Houston Exponential

Creating a hub to nurture tech-driven startups and attract venture capital

- Innovation district
- Accelerator programs
- Working closely with local government

Station Houston

Connecting Houston's startup economy and innovation ecosystem

- Innovation district
- Connect companies with venture capital and corporations
- Provide startup resources

TMC Innovation

Uniting healthcare innovators with academia, science and medicine

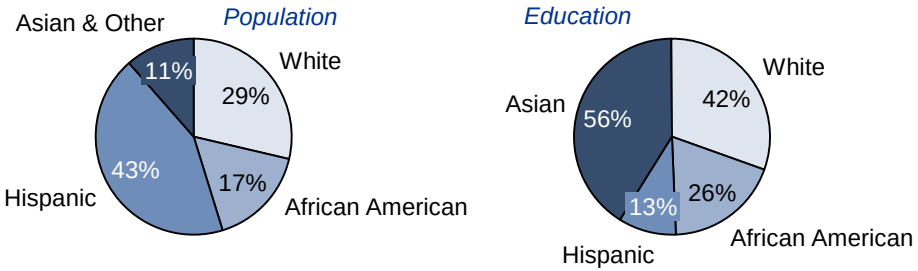
- Streamlining development of medical devices and technology
- Access to TMC resources and experts

- What level of **effort and urgency** is required to **push beyond the traditional oil and gas business**?
- Do the planned business initiatives **synergize effectively with existing assets and capabilities**? Do they **leverage the current skill base**?
- **Can we attract the entrepreneurial talent** relative to targeted innovation initiatives?

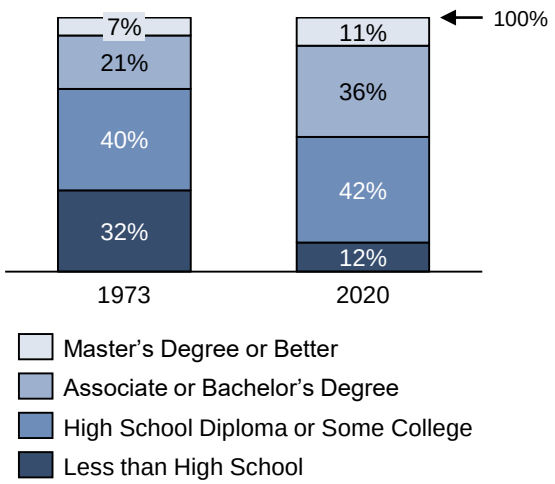
Source(s): The Cannon, Houston Exponential, Station Houston, TMC Innovation, Greater Houston Partnership

‘Left-behind’ talent initiatives are crucial, as Houston’s job market is at risk of a supply and demand imbalance

Houston MSA population forecast (2030) vs. Percent of Houston MSA ethnicity groups with a college degree (2016)



Educational Demand for Jobs (1973 vs. 2020)



Current Houston MSA ‘left-behind’ initiatives

Upskill Houston

Helping develop skills and opportunities for middle-skill job market

- Focus on Houston key businesses (e.g., healthcare, petrochem)
- Industry-led collaboration
- Training & job placement

Early Matters

Raising awareness about the importance of early education

- Improving quality of and access to education
- Reducing dropout rates
- Prioritizing funding based on return on investment

- Is it sufficient to continue to **import Houston’s educational needs?**
- What is the risk of a **growing undereducated** population?
- Do we have sufficient programs in place for **vocational training?**
- Are **entry education levels accessible and viable** across the diversified population?

Source(s): US Census Bureau, Kinder Institute for Urban Research, Georgetown Center on Education and the Workforce Analysis

Additional initiatives around future talent, to support diversification moves, are also underway

Current Houston MSA talent initiatives

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Co-working ecosystem for Houston's entrepreneurs, small businesses, and freelancers

- New Founder's District (24+ acre campus)
- Discounted professional services

Innovation District

Downtown district dedicated to startup growth

- Part of Downtown Plan and Houston Exponential
- Catalyzing formation of innovative startups to grow central city innovation economy

U of H Data Science Center

Expanding Houston's educational focus on data science

- Cybersecurity, healthcare, energy, and infrastructure focus
- Focus on building data science talent base

Rice Liu Innovation Lab

Supporting Rice students in entrepreneurial endeavors

- Expanded entrepreneurial courses
- 'Start-up' learning programs
- Led by Rice's entrepreneurial initiative

- Are local universities (Rice, U of H) **producing the right talent** needed for the future?
- Do the current infrastructure plans (e.g., Innovation District) create a **'city of the future' that will attract innovation talent**?

Source(s): The Cannon, Houston Plan Downtown, Houston Chronicle, U of H, Rice University

Where does Houston stand against these key levers?

Magnet City Model

Leadership 'call to arms'	• Clearly exists
Infrastructure rejuvenated • Existing assets • Future business needs • Workforce vision	• Crumbling infrastructure needs repair • ***Beyond repair, what is needed to enhance target businesses and attract desired talent (new mobility paradigm)?*** • ***How will we fund new infrastructure?***
Business rejuvenation • Existing assets • Existing capabilities	• Significant public / private efforts in building innovation eco-systems underway • ***What is the link to the assets we have and what we already do well?***
Talent attraction and retention • Role of infrastructure • Business opportunity	• How do we retain current talent? • ***How do we handle the growing 'left-behind' issue?*** • ***What is the nature of the new talent we seek to attract, and how can we attract this talent?***

Potential Center Initiatives – Initial Thoughts

The Center's Role

- Decide to what degree the Center should be focused on **addressing current imperatives** (e.g., weather infrastructure, 'left-behind' education) versus **shaping and orchestrating a future vision**
- **Communicate the imperative to integrate** infrastructure, talent and business rejuvenation plans

Infrastructure rejuvenation

- Determine if participation in Rockefeller resilient cities initiative is additive to **addressing Houston 'ante to play' infrastructure issues**, or if other actions are required
- **Identify opportunities to influence infrastructure plans** (e.g., Downtown Plan, MetroNext) towards business and talent imperatives

Business rejuvenation

- Assess if **participation in the current Houston Exponential focus area study** would be feasible and beneficial
- Finalize scope and launch **'Future of Energy in Houston'** study

Talent attraction and retention

- Determine if **'left-behind' education challenges are being sufficiently addressed** (e.g., UpSkill Houston, Early Matters, Center Immigration Study) or if additional action is required
- **Partner with local universities** to share perspectives on opportunities to **play a differentiated role in Houston's development**