



HOUSTON

SUSTAINABLE DEVELOPMENT INDICATORS:

A Comprehensive Development Review for
Citizens, Analysts and Decision Makers

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by

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Conclusion

Houston is the 4th largest city in the country and currently has a national reputation for sprawl, air pollution, and a southern stereotype of 'cowboy culture.' To dispel these notions the City has been engaged in marketing its strengths such as: affordable housing; largest medical center in the world; world-class arts and entertainment venues; home for several sports teams including basketball, soccer, and football. The city has also recently started focusing on marketing livability and sustainability (Radley, 2012; The Economist, 2012). Marketing campaigns are important to generate interest, but more important are the facts necessary to identify areas of improvement for function and aesthetics of the city. The Houston Sustainability Indicators Project (HSI) was designed to generate facts and measure how well Houston is doing in terms of development and to identify areas of improvement as Houston pursues sustainable development. The intrinsic value of a sustainability indicators report, and what separates it from traditional performance reports or adhoc compilations of metrics, is the sustainability themes and topics and the presentation of data in a systematic manner, which reflects the relationships among disparate systems.

The City of Houston is a wealthy city. As such progress towards sustainability is a matter of choices and priorities. The city has a \$2.4 billion investment portfolio and assets exceed liabilities by \$3.5 billion (City of Houston, 2011). It follows that the degree of unsustainable practices in Houston is directly related to the lack of will to pursue sustainability by residents, business and local leaders. This, in turn, is the result of a lack of information about how the city is developing. This study has found that most of the several indicators analyzed are not included in any public reports.

This sustainability indicators report is meant to be used as the basis for an agenda of livability, greening or sustainable development in Houston. With annual updates, improvements in these indicators would



represent clear progress towards sustainability in Houston. Reductions in indicators present challenges for future generations.

The following summary is a listing of the sustainability indicators by priority. The indicators are listed by the percentage of population impacted. Environmental indicators are listed prominently since indicators like air pollution affect everyone.

Summary Importance and Impact of Sustainability Indicators		
Indicator	Metrics Description	Importance and Impact
 <p>14. Energy Consumption</p>	<p>Average residential energy consumption per household has increased between 2000 and 2010 from 13,496 kwh to 14,221 kwh. This accounts for 11 million Mwh needed to power Houston homes in 2010. The city administration of Houston uses only 10% of this number and HISD uses 4%.</p>	<p>100% population affected. Energy is one of the most important challenges for the Houston region. Due to our torrid summer temperatures we depend on cooling technologies. To get around our city we depend on cars. We also need energy to drive our economy. Deriving energy from coal or petroleum is not as sustainable as integrating natural gas or renewable energy resources. Integration of natural gas into our energy supply is needed. Gas produces 25% less carbon dioxide than petroleum and 50% less carbon dioxide than coal (The Economist, 2012).</p>
 <p>16. Vehicle Miles Travelled</p>	<p>Annual VMT is projected to increase in Houston.</p>	<p>100% of population affected. VMT increases per capita demonstrate that there is a sprawl issue in the city. More driving causes more congestion; more pollution; and reduces economic efficiency due to traffic delays.</p>
 <p>18. Ambient concentrations of air pollutants</p>	<p>Houston has attained criteria pollutants under federal standards except for Ozone. The Houston region is in non-attainment for the federal standard for Ozone.</p>	<p>100% of population affected. Ozone levels in Houston continue to be above federally mandated standards. This is a major health issue and liability for all Houstonians.</p>

 <p>19. Greenhouse Gas Emissions</p>	<p>Private vehicles CO₂ emissions are increasing and now constitute the largest source for CO₂ emissions in the county.</p>	<p>100% of population affected. GHG emissions from private vehicles are an increasing burden. Efficient public transit, such as rail, would greatly reduce dependence on private cars.</p>
 <p>21. Water Use</p>	<p>Per capita municipal water use in Houston increased from 159 gallons per day in 2000 to 165 gallons per day in 2010. Unless this trend is reversed, water consumption will increase disproportionately with population growth, a trend that is not sustainable.</p>	<p>100% of population affected. Water is essential to life and since there are diverse uses for water, our water supply should reflect that fact. Water suitable for ingestion should not be used to water lawns or wash cars. A city with over 2 million people should have a separate system to provide water for purposes other than drinking. This reduces the overall cost to tax payers since water treatment requires a great deal of energy.</p>
 <p>23. Flooding</p>	<p>One quarter of the City of Houston is at risk of flooding.</p>	<p>17% of the population affected. Almost 400,000 people live in an area that is at risk of flooding in Houston. The estimated value of Housing units in this area is \$18 billion. The City of Houston needs to accelerate buyout for flood prone properties.</p>
 <p>20. Water Pollution</p>	<p>Houston water quality monitoring expanded considerably between 2004 and 2011. Additionally, the City of Houston published annual updates of water quality to all residents.</p>	<p>100% of population affected. The City of Houston is currently in compliance with all known federal standards for drinking water quality. However there are no federal standards for emerging contaminants from pharmaceuticals, pesticides, waterborne pathogens or biological toxins.</p>
 <p>4. Indicator – Income Inequality</p>	<p>Income inequality must be addressed in Houston since the median top 20% earned \$140,000; median earnings were \$43,000; and the bottom 20% earned a median income of \$10,000.</p>	<p>80% of households earn under twice the median household income in 2010. There is general awareness that incomes for the majority of workers are not rising commensurate with economic gains. It is not clear what public policy interventions exist for this problem, which affects 80% of the working population.</p>

 <p>25. Jobs / Housing Balance</p>	<p>A higher percentage of jobs are located within business centers, which is good for agglomeration. However only 21% of housing units are located within a quarter mile of business centers. This means that 78% of persons are commuting alone in private autos.</p>	<p>78% of population affected. There is a need for more multifamily units located closer to job centers. Developers in Houston have a less regulated market and as a result high building rates. What is needed are design and construction guidelines for building in proximity to job centers. Houston cannot gain sustainability simply by providing cheap housing. What is also needed is well designed developments, which create a sense of place. This is one of the major tenets of a livability agenda.</p>
 <p>17. Travel Choice</p>	<p>A higher percentage of people in Houston were travelling alone using private cars in 2010 than in 2000. In 2000 28% of persons used alternative travel sources. The number dropped to 25% in 2010.</p>	<p>75% of population affected. In many cities buses, which use the same road space as cars, are not perceived as a more efficient form of alternative transportation. We need to continue the development of rail in the city. All large major cities have easily accessible rail as an alternative transportation option. In order to assume its position as a major livable city in the United States, Houston will have to more actively develop its rail network.</p>
 <p>8. Accessibility of Public Spaces</p>	<p>44% of the population lives within a quarter mile of a public park. This number needs to increase to ensure accessibility to quality of life in Houston.</p>	<p>56% of the population affected. More open space must be added to our parks inventory. This is also a major component of a livability agenda.</p>
 <p>3. Voter Participation</p>	<p>Only 7% of the population voted in the local election of 2011.</p>	<p>93% of population affected. The population is not properly engaged and has not prioritized the value of electing city representatives. The management of a city is the business of all citizens. When the general population does not participate, this gives leeway to organized business and lobbying groups, to create a city that meets their needs. A city which meets the needs of business and not its citizens may not be a very livable city. It is in everyone's interest to increase voter participation in the city.</p>

 <p>7. Affordability</p>	<p>30% of Houstonians spent more than 30% of their income on housing in 2010. Since housing in Houston is cheaper than in other parts of the country, this problem may be a result of unemployment or underemployment.</p>	<p>57% of Households earn below median affordable household income. Houston is currently marketed as one of the most affordable cities in the country because of the low cost of housing. Incomes must be commensurate with the cost of housing or cheap housing will still be unaffordable.</p>
 <p>9. Food Deserts</p>	<p>36% of the population lives within a Food Desert. That is, they live more than 1 mile from a grocery store or supermarket that sells fresh fruit and vegetables.</p>	<p>36% of the population affected. Currently 58% of adults and 39% of children are overweight or obese in the Houston region (Center for Clinical and Translational Sciences, 2012). Not having convenient access to a supermarket that sells fresh fruits and vegetables, means having meals, which may not be as healthy. Location decisions have also determined that some areas such as Houston’s Third Ward should not have a major supermarket. Public intervention can help alleviate this issue.</p>
 <p>6. Health Coverage</p>	<p>30% of persons have no health insurance in Houston in 2010. Houston has the largest medical center in the world, and boasts many jobs in this sector. However, access to health insurance in Houston is a problem.</p>	<p>30% of population affected. Since health insurance is presently tied to employment in this country, this explains one third of the uninsured in 2010. The other two-thirds are perhaps underemployed persons, whose employers do not offer health insurance; or privately wealthy individuals who choose to pay privately for healthcare services. This is a federal issue, but local governments can help ensure the availability of skills training.</p>
 <p>12. Income</p>	<p>Since per capita income in 2010 (\$44,001), was slightly below 2007 levels (\$44,872), it is estimated that the 2008 economic recession set us back approximately 3 years.</p>	<p>29% was the per capita income increase in the Houston MSA in 2010. Population increased by 26% during that same period and the median household income increased by 21%. Total income is increasing faster than population growth. In historical comparison, the per capita income increased by 70% between 1990 and 2000. Between 2000 and 2010 the economy slowed by half from the previous decade.</p>

 <p>2. Education Attainment</p>	<p>There exists an attainment gap between the White student cohort and other student groups. In general all graduation rates have improved. The HISD district graduation rate was 74.3% in 2010.</p>	<p>25.7% of the population affected. High school drop outs are not properly prepared for the workforce. They constitute a large percentage of the unemployed and low wage populace. More opportunities are needed for the development of skills training in Houston as an alternative to professional tracks. According to research sponsored by the Greater Houston Partnership, Houston should focus on the development of blue collar jobs to facilitate industrial and manufacturing job growth in this region (Kotkin, 2007).</p>
 <p>5. Poverty Rate</p>	<p>The percentage of persons below poverty was 23% (474,346) in 2010. This metric is increasing, which is not a sustainable trend.</p>	<p>23% of population affected. Poverty can affect a person due to unforeseen events. Cyclical poverty must be addressed or it continues through generations. This type of poverty may be caused by poor schools, poorly maintained neighborhoods and poor access to services. These problems can be alleviated by improved public services.</p>
 <p>10. Employment Status</p>	<p>The unemployment rate for Houston was 10% in 2010. For the white cohort it was 6.2% and for African Americans it was 16.5%. This means disproportionate hiring or employment stability practiced in Houston.</p>	<p>10% of the population affected. The unemployment rate may be the sign of a slow economy or improperly trained workforce. Public intervention may occur by the attraction of more businesses to the city or increased skills training for the population. Since high schools in Houston do not have curricula to facilitate blue collar careers, most potential employees in this area have to matriculate through the community college system or learn on the job. This scenario creates a disadvantage for high-school drop-outs who are prevented from enrollment in community colleges due to lack of high-school diploma.</p>
 <p>11. Primary Jobs and Green Jobs</p>	<p>Medical jobs in Houston are increasing while industrial jobs are decreasing as an absolute percentage of all jobs. Together, industrial and manufacturing jobs make up 23% of all jobs and are considered primary jobs for Houston. Less than 7% of</p>	<p>5% Industrial Job loss. A reduction in industrial job growth is very difficult for the local economy, since these jobs bring new capital into the local economy. Due to the size of the local economy we may be able to replace jobs lost from the industrial sector with jobs in the service sector. However, there has been job growth in</p>

	all jobs in Houston are green jobs.	the medical sector. Houston must continue development of jobs in the medical sector.
 15. Access to Transit	As of 2010, 78.5% of people in Houston live within a quarter of a mile to a bus stop.	22% of population affected. We have relatively good access to bus transit in Houston. This indicator is not sensitive to the frequency of bus trips. Good access, good frequency, and short trip times constitute a good transit system.
 1. Population Growth	Population in Houston is currently growing at an average annual rate of approximately 1.42%.	1.42% of population affected. This is the equivalent of 30,000 persons per year, which Houston can easily absorb with regards to housing availability. Applying the 2.64 persons average household size for 2010, this yields 11,453 new households needed for 2011 and 122,131 housing units needed by 2020. There were 110,003 vacant housing units in the city of Houston according to the 2010 census (U.S. Census Bureau, 2011). This means that between 2011 and 2020 approximately 12,128 new housing units are needed.
 13. Waste Generation	The total disposal tonnage for all counties in the Houston region dropped between 2000 and 2010. Additionally the disposal rate per person dropped from 9 to 7 lbs/person/day between those same years. It is not clear whether this was caused by reduction, recycling or reuse practices.	100% of population affected. Good progress has been made in the Houston region with reductions in waste disposal. The underlying problem is that public agencies depend on voluntary reporting mechanism from private haulers. Additionally private haulers do not have to report the type of waste they haul or the source of origin. This makes it difficult for public agencies to monitor source reductions.
 22. Water Availability	The City of Houston owns access rights to a little less than half of the available water in the region. That was 1,264,231 acre-feet in 2010. The Houston municipal water demand for 2010 was 389,082 acre-feet.	100% of population affected. There are adequate water supplies for the City of Houston. The reporting mechanism often times confuses the needs of the city with the needs of its customers that are outside of City boundaries.



24. Land Cover Change

The highest increase in land cover between 2001 and 2006 was for medium intensity development. This was an increase from 150 square miles to 160 square miles. Medium intensity development accounts for the highest land coverage type in Houston and most commonly include single family housing units.

100% of population affected. Within the City of Houston one issue is the protection of land as park and other open space.





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Glossary

Accessibility: The degree to which a product, device, service, or environment is available to as many people as possible.

Acre-foot: a unit of volume commonly used in the United States in reference to large-scale water resources. Equal to 325,851 gallons.

Affordable Care Act: A United States federal statute signed into law by President Barack Obama on March 23, 2010.

Agglomeration: An extended city or town area comprising the built-up area of a central place and any suburbs linked by continuous urban area.

Ambient concentration: Amount of the particulate or gas pollutant per volume unit of air.

Attainment gap: The observed and persistent disparity on a number of educational measures between the performance of groups of students, especially groups defined by gender, race/ethnicity, and socioeconomic status.

CO2 emissions: The release of carbon dioxide gas into the atmosphere.

Contiguous estuaries: Mixed fresh and salt water bodies that are connected or adjacent to each other.

Employment status: Refers to the three recognized work schedules of full-time, part-time and temporary.

Flood plain: A floodplain or flood plain is a flat or nearly flat land adjacent a stream or river that stretches from the banks of its channel to the base of the enclosing valley walls and



experiences flooding during periods of high discharge.

Food Desert: Any area more than 1 mile from a grocery store that sells fresh fruits and vegetables.

Fragile lands: Land that is sensitive to degradation when disturbed; such as with highly erodible soils, soils where salts can and do accumulate, and soils at high elevations.

GHG: A greenhouse gas (sometimes abbreviated GHG) is a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range.

Globalization: Globalization is the process of international integration arising from the interchange of world views, products, ideas, and other aspects of culture.

GPCD: Unit for the water usage of an area, in gallons per capita per day.

Green jobs: Work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute(s) substantially to preserving or restoring environmental quality.

HGB: Acronym for the Houston-Galveston-Brazoria region.

Housing affordability: Relates to the ability of individual households to meet their monthly rent or mortgage payments within a reasonable threshold of their income.

kwh: Kilowatt-hour; a unit of energy commonly used for electricity purposes.

Land cover: Land cover is the physical material at the surface of the earth. Includes grass, asphalt, trees, bare ground, water, etc.

Medium intensity development: Includes areas with a mixture of constructed materials and vegetation.

Metropolitan Statistical Area (MSA): A geographical region with a relatively high population density at its core and close economic ties throughout the area.

Houston MSA: The Houston MSA is composed of 10 counties: Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, San Jacinto, Waller.

Municipal Solid Waste (MSW): A waste type consisting of everyday items that are discarded by the public.

Mwh: Megawatt-hour; one thousand kilowatt-hours; a unit of energy commonly used for electricity purposes.



National Ambient Air Quality Standards (NAAQS): Standards established by the United States Environmental Protection Agency under authority of the Clean Air Act that apply for outdoor air throughout the country.

Natural resources: Resources occurring naturally within environments that exist relatively undisturbed by mankind.

Personal Income: Refers to an individual's total earnings involving wages, investment enterprises, and other ventures.

PM 2.5, 10: Particulate matter of 2.5 or 10 micrometers; tiny pieces of solid or liquid matter associated with the Earth's atmosphere.

Poverty line: the minimum level of income deemed adequate in a given country.

ppb: Parts per billion; a unit of concentration of chemical compounds in the atmosphere.

ppm: Parts per million; a unit of concentration of chemical compounds in the atmosphere.

Primary jobs: A primary job is a job which brings in new capital (money) to an area.

Street intersection density: The number of street intersections per unit area in a metropolitan area.

Subsidence from groundwater extraction: The sinking of land resulting from groundwater extraction.

Vehicle Miles Traveled (VMT): A measure of the extent of motor vehicle operation within a specific geographic area over a given period of time.

Water availability: Describes the amount of water available for irrigation or consumption per person, per year in a region.

Wetland: Land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem.

µg: Microgram; unit of weight often used for small concentrations of contaminants.



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Appendix A – Experts and Advocacy Groups

Advisory Board – Rice University



John Anderson, PhD
Geologist
Research in Geosciences for 40 years



Jim Blackburn, JD
Environmental Lawyer
Environmental Law for 30 years



Stephen Klineberg, PhD
Sociologist
Houston Area Survey for 29 Years



Lyn Ragsdale, PhD
Political Scientist
Political Science for 30 Years



Ron Soligo, PhD
Economist
Energy Economics for 48 years

Experts and Advocacy Groups- City of Houston

Social Development Experts

Michael Emerson, PhD	Rice University
Peter Brown	Former City Council
Robert Bullard, PhD	Texas Southern University
David Crossley	Houston Tomorrow
Marlene Gafrick	City of Houston Planning Director
Rocaille Roberts, PhD	Healthy Living Matters
Diane Schenke	Greater East End Management District
Laura Solitare, PhD	Texas Southern University

Economic Development Experts

Theresa DeBose	Centerpoint Energy
Gavin Dillingham, PhD	Houston Advanced Research
George Granias	METRO, Chief Executive
Carol Lewis, PhD	Texas Southern University
Qisheng Pan, PhD	Texas Southern University
Laura Spanjian	Houston Sustainability Director
Fred Welch	Greater Houston Partnership, VP

Environmental Development Experts

Phil Bedient, Ph.D.	Rice University
Jun Chang	City of Houston Public Works Deputy Director
Thomas Colbert	University of Houston
Aston Hinds, Ph.D.	Port of Houston Environmental Director
Jim Lester, Ph.D.	Houston Advanced Research
Brandt Mannchen	Sierra Club
Martin Melosi, Ph.D.	University of Houston
Jeff Taebel	Houston Galveston Area Council
Matt Tejada, Ph.D.	Air Alliance Houston





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