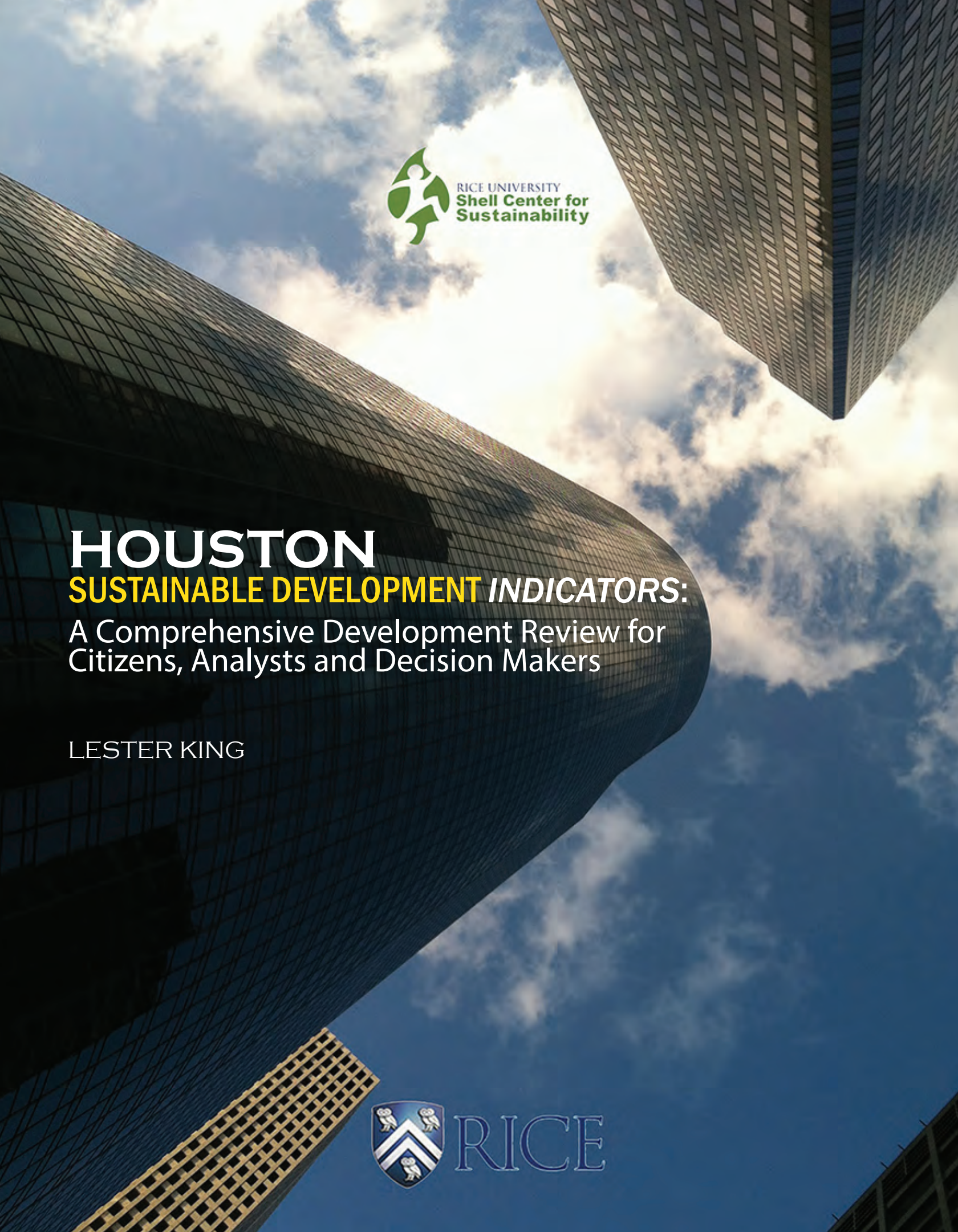

HOUSTON
SUSTAINABLE DEVELOPMENT *INDICATORS*:
A Comprehensive Development Review for Citizens, Analysts and Decision Makers

LESTER KING

RICE


RICE UNIVERSITY
Shell Center for
Sustainability


RICE
Unconventional Wisdom

Houston Sustainable Development Indicators:

A Comprehensive Development Review for Citizens, Analysts and Decision Makers

by

Lester King, PhD, AICP, LEED

Appendix B – Indicator Data Sheets

Social Demography – Population Growth

Population Growth Rate

1. **INDICATOR**
   a. **Name:** Population Growth Rate
   b. **Metrics:**
      - City of Houston Population Growth
      - Harris County Population Count
      - City of Houston Average Annual Growth
      - Harris County Average Annual Growth
      - City of Houston Race and Ethnicity
      - Harris County Race and Ethnicity
      - Population Density

2. **POLICY RELEVANCE**
   a. **Purpose:** The population growth rate measures how the population is changing.
   b. **Relevance to Sustainable/ Unsustainable Development (theme/ subtheme): "**Agenda 21 identifies population growth as one of the crucial elements affecting long-term sustainability. Rapid population growth can put a strain on an area's capacity for handling economic, social, and environmental issues; particularly when this occurs in conjunction with unsustainable levels of consumption and production." (UN 2007).

      Of particular importance to this study is the spatial allocation of growth in the Houston region. This indicator offers greater understanding of the suburban vs urban extent of growth and development.

   c. **International Conventions and Agreements:** None.
   d. **National, State or Local Conventions and Agreements:** None
   e. **International Targets/ Recommended Standards:** none
   f. **National, State or Local Recommended Standards:** None
   g. **Linkages to other indicators:** This indicator is related to indicators expressed in per capita terms; and other social and demographic indicators.

3. **METHODOLIGICAL DESCRIPTION**
   a. **City of Houston Population Growth**
      i. Data Sources:
         - US Census Bureau - Decennial Census for 1990, 2000, 2010 (U.S. Census Bureau, 2011).
      ii. Calculation for Intercensal years using Das Gupta (U.S. Census Bureau, n.d.); and PostCensal population estimates (U.S. Census Bureau, 2011).
      iii. Projection to future years using linear projection of historical trend.
   b. **Harris County Population Count**
      i. Data Sources:

- US Census Bureau – Decennial Census for 1990, 2000, 2010 (U.S. Census Bureau, 2011).
- US Census Bureau – Population Estimates for Intercensal years (U.S. Census Bureau, 2011).

ii. Projection for future years using linear projection of historical trend.

c. City of Houston Average Annual Growth

i. Data Sources:

- US Census Bureau – Decennial Census for 1980, 1990, 2000, 2010 (U.S. Census Bureau, 2011).

ii. The rate of population growth, *r*, between two time points, t_1 and t_2, is calculated as an exponential rate of growth, conventionally expressed in percentage units per year:

$$r = 100 \ln (P_2 / P_1)/(t_2 - t_1)$$

Where P_1 and P_2 are the number of persons at times t_1 and t_2, respectively, and the time interval (t_2-t_1) is expressed in years.

d. Harris County Average Annual Growth

i. Data Sources:

- US Census Bureau – Decennial Census for 1980, 1990, 2000, 2010 (U.S. Census Bureau, 2011).

ii. The rate of population growth, r, between two time points, t1 and t2, is calculated as an exponential rate of growth, conventionally expressed in percentage units per year:

$$r = 100 \ln (P_2 / P_1)/(t_2 - t_1)$$

Where P_1 and P_2 are the number of persons at times t_1 and t_2, respectively, and the time interval (t_2-t_1) is expressed in years.

e. City of Houston Race and Ethnicity

i. Data Sources:

- US Census Bureau – Decennial Census for 1980, 1990, 2000, 2010 (U.S. Census Bureau, 2011).

f. Harris County Race and Ethnicity

i. Data Sources:

- US Census Bureau – Decennial Census for 1980, 1990, 2000, 2010 (U.S. Census Bureau, 2011).

g. Population Density

i. Data Sources:

- US Census Bureau – Decennial Census for 1990, 2000, 2010 (U.S. Census Bureau, 2011).
- US Census Bureau – TigerLine Shapefiles for 1992 (used for 1990 calculations), 2000 and 2010 city limits (U. S. Census Bureau, 2011).

- Density Calculation by Author (pop/square mile). Used population projection above. For land area projection, applied same percentage rate of growth in square miles between 2000 and 2010 since Houston annexation is now primarily limited purpose annexation since 1999 as opposed to more aggressive annexation prior to 1999.

4. RELATED AGENCIES AND REPORTS

i. Most public agencies compile reports on population growth.

ii. Average annual growth calculations and intercensal population calculations are not calculated by any public agency for the City of Houston at this time. This creates errors such as those found in the population counts on page 227 of the City of Houston Comprehensive Annual Financial Report for 2011 (City of Houston, 2011).

iii. Population growth projections are also not calculated specifically for the City of Houston. The Houston planning department utilizes growth forecasts from the Houston Galveston Area Council (City of Houston, 2011). However, those forecasts are not sensitive to City level inferences in the Houston region. As a result city level extracts from the regional forecasts are invalid.

Social Demography – Education

Education Attainment

1. **INDICATOR**
   a. **Name:** Education Attainment
   b. **Metrics:**
      - Percentage of Students Graduating High School
2. **POLICY RELEVANCE**
   a. Purpose: The indicator measures the percentage of students who successfully graduate from high school and are prepared to make a more substantive contribution to society and the economy.
   b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** The percentage of students who graduate from high school is directly related to the quality of the workforce and indirectly related to several social indicators such as crime, mortality, health, and poverty.

   c. International Conventions and Agreements: None.
   d. National, State or Local Conventions and Agreements: NCLB
   e. International Targets/Recommended Standards: none
   f. National, State or Local Recommended Standards: AYP, HISD – Superintendent's Appraisal Report
   g. Linkages to other indicators: This indicator is related to population and job data.
3. **METHODOLIGICAL DESCRIPTION**
   1. Percentage of Students Graduating High School
      a. Data Sources:
         - FY 1991 - 1992 AEIS Report Houston ISD (Texas Education Agency, 1992).
         - FY 1992 - 1993 AEIS Report Houston ISD (Texas Education Agency, 1993)
         - Glossary for the Academic Excellence Indicator System, 1992-93 Report (Texas Education Agency, 1993b).
         - FY 1997, 1998 - 1999 District AEIS Report Houston ISD (Texas Education Agency, 1999).
         - FY 1999 - 2000 District AEIS Report Houston ISD (Texas Education Agency, 2000).
         - FY 2000 - 2002 District AEIS Report Houston ISD (Texas Education Agency, 2002).
         - FY 2002 - 2003 District AEIS Report Houston ISD (Texas Education Agency, 2003).
         - FY 2004 - 2005 District AEIS Report Houston ISD (Texas Education Agency, 2005).
         - FY 2006 - 2007 District AEIS Report Houston ISD (Texas Education Agency, 2007).

- FY 2008 - 2009 District AEIS Report Houston ISD (Texas Education Agency, 2009).
- FY 2010 - 2011 District AEIS Report Houston ISD (Texas Education Agency, 2011).
- Glossary for the Academic Excellence Indicator System (Texas Education Agency, 2011b).

ii. This indicator shows the status of a group of students after four years in high school (4-year Completion Rate). The cohort is initially tracked from 9th Grade. The percent graduated is defined as: Number of students from the cohort who received a high school diploma by August 31st of the target year / Number of students who started the 9th Grade cohort together. The cohort in the denominator includes graduates, continuers, GED recipients, and dropouts. It does not include leavers. FY 1990, 1993 - 1996 the state of Texas did not report graduation rates in the Academic Excellence Indicator System (AEIS) reports. FY 1991-1992 the graduation rate only included 12th graders who graduated divided by students enrolled in the 12th grade at the beginning of the previous Fall. Therefore this is not a 4 year graduation rate.

b. **Limitations of the indicators:** The four year completion graduation rate is not available prior to 1997. In 1991-1992 a 12th grade graduation rate is reported. This figure may be appropriate to compare race and ethnicity performance but not to compare to subsequent years without making reservations for the difference in calculation.

4. RELATED AGENCIES AND REPORTS

a. Texas Education Agency
http://ritter.tea.state.tx.us/perfreport/aeis/

b. Houston Independent School District
http://tinyurl.com/7pvp7nc

Notes:

Social Demography – Community Involvement

Voter Participation

1. INDICATOR

a. **Name:** Voter Participation

b. **Metrics:**

- Voter Participation in Houston

2. **POLICY RELEVANCE**

a. Purpose: The indicator measures the degree of public participation in the election of government representatives.

b. Relevance to Sustainable/Unsustainable Development (theme/subtheme): One of the simplest measures of community participation is voting activity. In a developed democratic country very few hurdles exist to impede public participation in voting. The propensity to not participate is based on more private reasons. A high degree of non-participation may be a sign of the lack of importance attributed to the election of representatives to city government.

c. International Conventions and Agreements: None.

d. National, State or Local Conventions and Agreements: None

e. International Targets/Recommended Standards: None

f. National, State or Local Recommended Standards: None

g. Linkages to other indicators: This indicator is related to population.

3. METHODOLIGICAL DESCRIPTION

1. Error! Reference source not found.

a. Data Sources:

- Harris County Clerk – Data Request (Harris County Clerk, 2011)
- US Census – Decennial Census 1990, 2000, 2010, Total population 18 and over.
- Calculation by author for population 18 and over in 1997, 2001, 2011 – Using Intercensal estimates, based on decennial censuses.
- To compute 18 and over populations, used same ratio to total population as the nearest past decennial census count.

ii. The voting participation rate is the number of persons who voted / voting age population in the city. The number of persons who voted / registered voters was also included for comparison.

iii. Electronic records are not available prior to 1996.

iv. 1997 – Local election

v. 2001 - Local election

vi. 2011 - Local election

4. RELATED AGENCIES AND REPORTS

Harris County Clerk manages elections and voting rolls. Election results are posted on the Harris County Clerk, Election Division website.

Poverty – Inequality

Income Inequality

1. **INDICATOR**
   a. **Name:** Income Inequality
   b. **Metrics:**
      a. Median Income Comparison
      b. Ratio of Share in Income

   c. **Placement in the HIS:** Poverty/Income Inequality
2. **POLICY RELEVANCE**
   a. **Purpose:** The indicator shows the extent of inequality in income distribution.
   b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** Inequality in incomes hinders human development and long-term economic growth (UN 2007). Large gaps in income distribution may result in unequal burden sharing with higher income responsible for increases in taxes for programs while the lower incomes may be responsible for dependency on government programs.

   c. **International Conventions and Agreements:** None.
   d. **National, State or Local Conventions and Agreements:** None
   e. **International Targets/Recommended Standards:** None
   f. **National, State or Local Recommended Standards:** None
   g. **Linkages to other indicators:** This indicator is related to economic development.
3. **METHODOLIGICAL DESCRIPTION**
   a. Median Income Comparison
      i. Data Sources
         - US Census Bureau – Decennial Census for 1990, 2000, 2010 (U.S. Census Bureau, 2011).
         - Calculation by author for median household income values of top 20%, median and bottom 20% for each decennial year.

   b. Ratio of Share in Income
      ii. Data Sources
         - US Census Bureau – Decennial Census for 1990, 2000, 2010 (U.S. Census Bureau, 2011).
         - Calculation by author for median household income values of top 20%, median and bottom 20% for each decennial year.
         - Ratio share is dimensionless value of top 20% median / bottom 20% median.
4. **RELATED AGENCIES AND REPORTS**

   No public agencies in the Houston area presently publish reports on income comparison between top and bottom 20% or Ratio Share of income between top and bottom 20%.

Poverty – Poverty Level

Poverty Rate

1. **INDICATOR**
   a. **Name:** Poverty Rate
   b. **Metrics:**
      - Population Living Below Poverty
2. **POLICY RELEVANCE**
   a. **Purpose:** This indicator is the most important for defining the characteristic of underdevelopment. It is one of the core measures of living standards.
   b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** Poverty reduction is one of the key goals for most community sustainable development strategies. Measurement and monitoring of the current level as well as the trend in poverty rates provides useful information for policy makers to plan and implement growth strategies for the poor and ultimately contributes to the betterment of human lives. Poverty statistics are important for analyzing the relationship of income or consumption poverty or other dimensions of human development such as education, health, labor skills and other measures of living standards (UN 2007).
   c. **International Conventions and Agreements:** None.
   d. **National, State or Local Conventions and Agreements:** None
   e. **International Targets/Recommended Standards:** None
   f. **National, State or Local Recommended Standards:** None
   g. **Linkages to other indicators:** This indicator is related to education attainment, health status, mortality, and economic development.
3. **METHODOLIGICAL DESCRIPTION**
   a. Population Living Below Poverty
      i. Data Sources:
         - US Census Bureau – Decennial Census (U.S. Census Bureau, 2011).
      ii. Projected calculation by author using linear projection of historical trend.

4. **RELATED AGENCIES AND REPORTS**

   The Houston Department of Health and Human Services reports the percentage of persons below poverty. The estimated percentage needs to be updated since it relies on postcensal estimates for 2008 population of the City of Houston (City of Houston, 2011).

Poverty – Healthcare Delivery

Health Coverage

1. **INDICATOR**
    i. Name: Health Coverage
    ii. Metrics:
        - City and County Health Insurance Estimates
2. **POLICY RELEVANCE**
    a. **Purpose:** The indicator identifies uninsured populations.
    b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** In developed countries access to healthcare should be a reliable public good even though it is not a basic right for people. However, health care delivery varies across cities and countries and as a result not everyone has reliable access to healthcare. Not only should governments identify typical uninsured populations but they should identify barriers to access. The well being of the total population will often depend on our ability to monitor the health of the greatest number of individuals.
    c. **International Conventions and Agreements:** None.
    d. **National, State or Local Conventions and Agreements:** None
    e. **International Targets/Recommended Standards:** None
    f. **National, State or Local Recommended Standards:** None
    g. **Linkages to other indicators:** This indicator is related to population, jobs and employment.
3. **METHODOLIGICAL DESCRIPTION**
    a. **City and County Health Insurance Estimates**
        i. Data Sources:
            - US Census Bureau – Small Area Health Insurance Estimates 200 data (U.S. Census Bureau, 2011).
            - US Census Bureau – Decennial Census (U.S. Census Bureau, 2011).
4. **RELATED AGENCIES AND REPORTS**

    No public report exists to monitor the uninsured population in Houston.

Livability – Cost of Living

Affordability

1. **INDICATOR**
   a. **Name:** Affordability
   b. **Metrics:**
      - Gasoline Prices
      - Housing Affordability
      - Housing Affordability by Cost Quintiles
      - Median Home Price vs Gasoline Price

2. **POLICY RELEVANCE**
   a. **Purpose:** The indicator measures affordability.
   b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** Housing costs which are unaffordable may be a sign of diminishing incomes, or of an unsustainable housing market. Housing prices which escalate faster than real incomes invariably cause a housing crash. Housing prices, which are too low, also affect the economy adversely, since this leads to an oversupply.

      The cost of gasoline is related to transportation, economic, and social indicators such as housing affordability. Since gasoline is a non-renewable resource, whose production and supply causes environmental and health issues, increases in price signal benefits to some. For others, it is just another integral raw material needed for the economy to function. Keeping the price low ensures economic efficiency.

   c. **International Conventions and Agreements: None**
   d. **International Conventions and Agreements:** None.
   e. **National, State or Local Conventions and Agreements:** None
   f. **International Targets/Recommended Standards:** None
   g. **National, State or Local Recommended Standards:** None
   h. **Linkages to other indicators:** This indicator is related to population.
3. **METHODOLIGICAL DESCRIPTION**
   a. **Gasoline Prices**
      i. Data Sources:
         - US Department of Labor – Cost of Gasoline (Bureau of Labor Statistics, 2012)
      ii. Calculation by author for projected years based on linear historical trend.
   b. **Housing Affordability**
      i. **Data Sources:**
         - US Census Bureau – Decennial Census 1990, 2000, 2010 (U.S. Census Bureau, 2011).
      ii. Calculation by author to determine housing units greater than 30% income.
   c. **Housing Affordability by Cost Quintiles**
      i. Data Sources:

- US Census Bureau – Decennial Census 1990, 2000, 2010 (U.S. Census Bureau, 2011).

ii. Calculation by author to determine housing costs as a percentage of income.

d. Median Home Price vs Gasoline Price

i. Data Sources:
- Texas Real Estate Center – MLS Housing Activity (Texas A&M University, 2012)
- US Department of Labor – Cost of Gasoline (Bureau of Labor Statistics, 2012)

ii. Calculation by author: increased cost of gasoline by a factor equal to the price of gasoline in 1990 to meet median price of homes in 1990. Apply factor to all years in analysis.

4. RELATED AGENCIES AND REPORTS

There does not appear to be any public reports on the number of persons that spend greater than 30% of their income on housing costs. There are no public reports that track gasoline costs in Houston although that data is easily accessible from the Bureau of Labor Statistics.

Livability – Quality of Life

Accessibility of Public Spaces

1. **INDICATOR**
    a. **Name:** Accessibility of Public Spaces
    b. **Metrics:**
        - City of Houston Access to Parks 2000
        - City of Houston Access to Parks 2000 – 2010

2. **POLICY RELEVANCE**
    a. **Purpose:** The indicator measures accessibility to public spaces as a measure of quality of life.
    b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** Access to public spaces is important for community engagement and outdoor activities. Physical health of persons is directly related to the amount of outdoor activity they are involved in. The community is enhanced by the provision of more public spaces.
    c. **International Conventions and Agreements:** None
    d. **International Conventions and Agreements:** None.
    e. **National, State or Local Conventions and Agreements:** None
    f. **International Targets/Recommended Standards:** None
    g. **National, State or Local Recommended Standards:** None
    h. **Linkages to other indicators:** This indicator is related to population.

3. **METHODOLIGICAL DESCRIPTION**
    a. **City of Houston Access to Parks 2000**
        i. Data Sources:
            1. City of Houston – Parks locations GIS shapefiles 2000
            2. US Department of Transportation – Population by Transportation Analysis Zones 2000 (U.S. Department of Transportation, 2011)
        ii. Calculation by author of quarter mile buffer around park locations.
        iii. Calculation of reductions of population assignments to TAZs since both the CTPP numbers were larger than actual census count. Author performed a uniform reduction in population numbers based on ratio of population in each TAZ to total population.
        iv. Calculation of numbers and percentage of persons within a quarter mile from parks based on TAZ assignments of population in the city.
    b. **City of Houston Access to Parks 2000 – 2010**
        i. Data Sources:
            1. City of Houston – Parks locations GIS shapefiles 2000, 2010
                a. 2010 parks file from Parks and Recreation Department contained Harris county parks; City owned parks; Public works and engineering (PWE) shared use parks, PWE bikeways; Spark School Parks.
            2. Census population by blocks 2010
        ii. Calculation by author of quarter mile buffer around park locations.
        iii. Calculation of numbers and percentage of persons within a quarter mile from parks based on block assignments of population in the City.

4. RELATED AGENCIES AND REPORTS

No public report exists on access to parks in Houston.

Livability – Health & Nutrition

Food Deserts

1. **INDICATOR**
    a. **Name:** Food Deserts
    b. **Metrics:**
        - Houston Food Desert 1990
        - Houston Food Desert 2000
        - Houston Food Desert 2010
        - Houston Grocery Stores 1990 – 2010

2. **POLICY RELEVANCE**
    a. **Purpose:** The indicator measures accessibility to supermarkets and grocery stores in Houston.
    b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** Grocery stores and supermarkets are the main source to find fresh fruit and vegetables in Houston (There has also been a recent increase in the number of temporary farmers markets around the city). If people do not have good access to these stores to shop they will not be able to obtain fresh fruit and vegetables. This is a major health concern.
    c. **International Conventions and Agreements:** None
    d. **International Conventions and Agreements:** None.
    e. **National, State or Local Conventions and Agreements:** None
    f. **International Targets/Recommended Standards:** None
    g. **National, State or Local Recommended Standards:** None
    h. **Linkages to other indicators:** This indicator is related to population.

3. **METHODOLIGICAL DESCRIPTION**
    a. Houston Food Desert 1990
        i. Data Sources:
            - InfoUSA – locations of supermarkets and grocery stores 1990.
            - US Census Bureau – Decennial Census Median Housing Price 1990 (U.S. Census Bureau, 2011)
            - US Department of Transportation – CTPP population 1990.
        ii. Calculation by author of one mile buffer around supermarket locations.
        iii. Calculation of reductions of population assignments to TAZs since both the CTPP and HGAC numbers were larger than actual census count. Author performed a uniform reduction in population numbers based on ratio of population in each TAZ to total population.
        iv. Calculation of numbers and percentage of persons within a one mile buffer from supermarkets based on TAZ assignments of population in the city.
    b. Houston Food Desert 2000
        i. Data Sources:
            - InfoUSA – locations of supermarkets and grocery stores 2000.
            - US Census Bureau – Decennial Census Median Housing Price 2000(U.S. Census Bureau, 2011)
            - US Department of Transportation – CTPP population 2000.

ii. Calculation by author of one mile buffer around supermarket locations.
iii. Calculation of reductions of population assignments to TAZs since both the CTPP and HGAC numbers were larger than actual census count. Author performed a uniform reduction in population numbers based on ratio of population in each TAZ to total population.
iv. Calculation of numbers and percentage of persons within a one mile buffer from supermarkets based on TAZ assignments of population in the city.

c. Houston Food Desert 2010
   i. Data Sources:
      - InfoUSA – locations of supermarkets and grocery stores 2010.
      - US Census Bureau – Decennial Census Median Housing Price 2010 (U.S. Census Bureau, 2011)
      - HGAC – population 2010.
   ii. Calculation by author of one mile buffer around supermarket locations.
   iii. Calculation of reductions of population assignments to TAZs since both the CTPP and HGAC numbers were larger than actual census count. Author performed a uniform reduction in population numbers based on ratio of population in each TAZ to total population.
   iv. Calculation of numbers and percentage of persons within a one mile buffer from supermarkets based on TAZ assignments of population in the city.

d. Houston Grocery Stores 1990 – 2010
   i. Data Sources:
      - InfoUSA – locations of supermarkets and grocery stores 1990, 2000, 2010.
      - US Census Bureau – Decennial Census Median Housing Price 1990, 2000, 2010 (U.S. Census Bureau, 2011)
      - US Department of Transportation – CTPP population 1990, 2000.
      - HGAC – population 2010.
   ii. Calculation by author of one mile buffer around supermarket locations.
   iii. Calculation of reductions of population assignments to TAZs since both the CTPP and HGAC numbers were larger than actual census count. Author performed a uniform reduction in population numbers based on ratio of population in each TAZ to total population.
   iv. Calculation of numbers and percentage of persons within a one mile buffer from supermarkets based on TAZ assignments of population in the city.

4. RELATED AGENCIES AND REPORTS

No public agency in Houston reports on locations of food deserts. A private study has been conducted analyzing food deserts and sales activity of existing supermarkets in Houston (Manon, Giang, & Treering, 2010)

Economic Development – Employment

Employment Status

1. **INDICATOR**
    a. **Name:** Employment Status
    b. **Metrics:**
        - Unemployment Rate
2. **POLICY RELEVANCE**
    a. Purpose: The unemployment rate provides information on the ability of the economy to create employment. Broken down by race and ethnicity unemployment rate can provide greater information on racial differences in labor market activity.
    b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme): "**Employment is useful and relevant to measuring sustainable development." (United Nations Department of Economic and Social Affairs, 2007).
    An assessment of the unemployment rate by race and ethnicity gives greater insight into social vulnerabilities in the economy.

    c. **International Conventions and Agreements:**
    The measures employment and working age population are defined for statistical purposes in the International Labour Office (ILO): Resolution concerning statistics of the economically active population, employment, unemployment, and underemployment, adopted by the Thirteenth International Conference of Labour Statisticians, Geneva, 1982 (United Nations Department of Economic and Social Affairs, 2007).
    d. National, State or Local Conventions and Agreements: none
    e. **International Targets/Recommended Standards:**
    The ILO Convention concerning Employment Policy, 1964 (No. 122) states that "With a view to stimulating economic growth and development, raising levels of living, meeting manpower requirements and overcoming unemployment and underemployment, each Member shall declare and pursue, as a major goal, an active policy designed to promote full, productive and freely chosen employment". The revised MDG monitoring framework, presented in 2007 to the General Assembly, includes the new target "Achieve full and productive employment and decent work for all, including women and young people" under MDG 7 (Eradicate extreme poverty and hunger) (United Nations Department of Economic and Social Affairs, 2007).
    f. National, State or Local Recommended Standards: none
    g. Linkages to other indicators: Linkages to other social indicators.
3. **METHODOLIGICAL DESCRIPTION**
    a. Unemployment Rate
        i. Data Sources:
            - **US Census Bureau – Decennial Census 1990, 2000, 2010** (U.S. Census Bureau, 2011)
4. **RELATED AGENCIES AND REPORTS**
    The unemployment rate is an indicator used by public agencies. However, unemployment rate by race and ethnicity does not exist in public reports for Houston.

Economic Development – Macroeconomic Performance

Primary Jobs and Green Jobs

1. **INDICATOR**
   - **c. Name:** Primary Jobs and Green Jobs
   - **d. Metrics:**
     a. Figure 26: Houston Jobs 1990-2040
     b. Figure 27: Green Jobs in Texas
2. **POLICY RELEVANCE**
   - **a. Purpose:** The percentage of primary jobs measures the core strength of the economy.
   - b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** The percentage of primary jobs in the economy tells us about the sustainability of the core strength of the economy. Primary jobs attract new capital from outside the local economy and as such offset local dollars flowing out of the local economy.
   - **c. International Conventions and Agreements:** None.
   - **d. National, State or Local Conventions and Agreements:** None
   - **e. International Targets/Recommended Standards:** none
   - **f. National, State or Local Recommended Standards:** None
   - **g. Linkages to other indicators:** This indicator is related to population and job data.
3. **METHODOLIGICAL DESCRIPTION**
   - **a.** Figure 26: Houston Jobs 1990-2040
     i. Data Sources:
     - CTPP 1990, 2000, 2006-2008
     - The CTPP 2006-2008 data was used to represent 2010 data. From the CTPP data extraction total jobs and manufacturing jobs were used. The Health jobs were taken from the HGAC jobs forecast for 2010.
     - CTPP jobs data was taken from the 'By place of work' data extraction.

     ii. Primary jobs were defined as manufacturing plus medical jobs in Houston.
   - b. Figure 27: Green Jobs in Texas
     i. Data Sources:
     - US Department of Labor – Green Jobs (U.S. Department of Labor, 2012)
4. **RELATED AGENCIES AND REPORTS**
   - **a.** Reports on jobs data are produced for the regional level but not for the City of Houston**.**

Economic Development – Earnings

Income

1. **INDICATOR - Income**
   a. **Name:** Income
   b. **Metrics:**
      - US Personal Income by MSA
      - Personal Income Houston vs Comparative Metros
      - Per Capita Income Houston MSA

2. **POLICY RELEVANCE**
   a. **Purpose:** This indicator measures the degree to which the local economy is engaged in green job development.
   b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** The green economy was one of the focus areas of the just concluded Rio+20 conference. An essential component of a green economy is obviously the number of green jobs. The Bureau of Labor statistics recently started tracking the numbers of green jobs in the economy of the United States. This is a major step which ensures that we begin monitoring how well we are doing with the creation of green jobs in the country.

   c. **International Conventions and Agreements:** None.
   d. **National, State or Local Conventions and Agreements:** None
   e. **International Targets/Recommended Standards:** none
   f. **National, State or Local Recommended Standards:** None
   g. **Linkages to other indicators:** This indicator is related to population data.

3. **METHODOLIGICAL DESCRIPTION**
   a. US Personal Income by MSA
      i. Data Sources:
         - US Department of Commerce – Personal Income by large MSA (U.S. Department of Commerce, 2011)
   b. Personal Income Houston vs Comparative Metros
      i. Data Sources:
         - US Department of Commerce – Personal Income by large MSA (U.S. Department of Commerce, 2011)
   c. Per Capita Income Houston MSA
      i. Data Sources:
         - US Department of Commerce – Personal Income by large MSA (U.S. Department of Commerce, 2011)
      ii. Calculation by author for projected years using linear projections of historical data.

4. **RELATED AGENCIES AND REPORTS**

No public reports exist that track green jobs in the City of Houston**.**

Consumption and Production – Waste Generation & Management

Waste Generation

1. **INDICATOR**
   a. **Name:** Waste Generation
   b. **Metrics:**
      a. Houston Region MSW Disposal (tons)
      b. Houston Region MSW Disposal Rate (lbs/person/day)

2. **POLICY RELEVANCE**
   a. **Purpose:** Provides the total amount of municipal solid waste landfilled.
   b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** Generation and landfill of waste is a reflection of inefficient processes in our city. Many landfill sites are not reused for other purposes after closing. Some have issues with regard to environmental pollution caused by leaking and noxious odors. The management of waste is regarded as an economic pillar of sustainability. Businesses can reduce product costs by reducing waste during manufacturing.

   c. **International Conventions and Agreements:** None.
   d. **National, State or Local Conventions and Agreements:** None
   e. **International Targets/Recommended Standards:** None
   f. **National, State or Local Recommended Standards:** None
   g. **Linkages to other indicators:** This indicator is related to socio-economic indicators such as population growth and GDP.

3. **METHODOLIGICAL DESCRIPTION**
   a. Houston Region MSW Disposal (tons)
      a. **Data Sources:**
         - TCEQ 2010 Waste statistics by county (Texas Commission on Environmental Quality, 2011).
         - TNRCC 2000 Waste statistics by county (Texas Natural Resources Conservation Commission, 2000).
         - TNRCC 1990 Waste statistics by county (Texas Commission on Environmental Quality, 2012).
         - HGAC 2003, Regional Solid Waste Management Plan (Houston Galveston Area Council, 2003).
   b. Houston Region MSW Disposal Rate (lbs/person/day)
      a. **Data Sources:**
         - TCEQ 2010 Waste statistics by county (Texas Commission on Environmental Quality, 2011).
         - TNRCC 2000 Waste statistics by county (Texas Natural Resources Conservation Commission, 2000).
         - TNRCC 1990 Waste statistics by county (Texas Commission on Environmental Quality, 2012).

- HGAC 2003, Regional Solid Waste Management Plan (Houston Galveston Area Council, 2003).

4. RELATED AGENCIES AND REPORTS

The state of Texas prepares an annual report of solid waste deposited in permitted landfill sites by county. No report exists, which outlines how much waste is generated by the City of Houston for the various industrial or residential generators.

Consumption and Production – Energy Use

Energy Consumption

1. INDICATOR

a. **Name:** Energy Consumption

b. **Metrics:**

- Centerpoint Energy Residential Energy Use History
- Houston vs National Ave Residential Energy Use
- Houston Residential Energy Demand vs City Administration and HISD

2. POLICY RELEVANCE

a. **Purpose:** To determine the total energy used in the local economy in Houston.

b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):**
Although energy is key to sustaining life, its production, use, and byproducts have resulted in major negative effects on the environment. Decoupling fossil fuel based energy sources from development is one of the strategies of sustainable development. Another challenge for sustainability is to increase access to energy sources for developing countries. (United Nations Department of Economic and Social Affairs, 2007).

c. **International Conventions and Agreements:** None.

d. **National, State or Local Conventions and Agreements:** None

e. **International Targets/Recommended Standards:** None

f. **National, State or Local Recommended Standards:** None

g. **Linkages to other indicators:** This indicator is related to population growth, air pollution, and climate change.

3. METHODOLIGICAL DESCRIPTION

b. Centerpoint Energy Residential Energy Use History

i. **Data Sources:**

- Residential Energy Use History (Sumners, 2010)

c. Houston vs National Ave Residential Energy Use

i. **Data Sources:**

- Per Residential energy regional energy use (CenterPoint Energy, 2012).
- US Census – Households in Houston (U.S. Census Bureau, 2011).
- National average residential energy use (U. S. Energy Information Administration, 2012).

ii. Calculate total residential energy use in Houston by multiplying the regional average by the number of households.

d. Houston Residential Energy Demand vs City Administration and HISD

i. **Data Sources:**

- Per Residential energy regional energy use (CenterPoint Energy, 2012).
- US Census – Households in Houston (U.S. Census Bureau, 2011).
- Total HISD Energy (The SCORE Program, 2011)
- Total city Administration Energy (Environmental Protection Agency, 2010)

iii. Calculate Houston total energy use for 2000 and 2010 by multiplying the average residential energy use in those years by the number of occupied households in respective years from census.
iv. City of Houston total energy use is estimated from the reported Green Power use in 2010 to the EPA (Environmental Protection Agency, 2010).

5. RELATED AGENCIES AND REPORTS

No public report exists for total industrial and residential energy use in the City of Houston.

Transportation – Access

Access to Public Transportation

1. **INDICATOR**
   a. **Name:** Access to transit
   b. **Metrics:**
      a. Percentage of population and housing units close to transit stops
2. **POLICY RELEVANCE**
   a. **Purpose:** Provides information on the relative ease of access to bus transit service.
   b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme): "**Cars are less energy-efficient and produce more emissions per passenger-mile than either buses or trains. Therefore, the use of cars for passenger transportation has greater environmental and social impacts, such as pollution, global warming as well as a higher accident rate, than mass transit. Policies are needed which reduce the use of cars as a mode of passenger transport and support a shift towards the use of less environmentally damaging modes, such as public transport." (United Nations Department of Economic and Social Affairs, 2007)

   c. **International Conventions and Agreements:** None.
   d. **National, State or Local Conventions and Agreements:** None
   e. **International Targets/ Recommended Standards:** None
   f. **National, State or Local Recommended Standards:** None
   g. **Linkages to other indicators:** This indicator is related to the concentration of air pollution in urban areas.
3. **METHODOLIGICAL DESCRIPTION**
   a. **Error! Reference source not found.**
      i. **Data Sources:**
         - Houston Metro Bus Stop locations GIS Shapefiles.
         - US Census Bureau 2010 population and housing units by blocks.

      ii. Calculation for quarter mile buffer around bus stop shapefiles.
      iii. Analysis does not select the total block population that intersects with the quarter mile buffer. The calculation identifies the percentage of the block within the quarter mile buffer and reduces the total population in that block by the percentage of the block within the quarter mile radius.
4. **RELATED AGENCIES AND REPORTS**

   No public agency produces a report of the percentage of persons within walking distance to transit.

Transportation – Demand

Vehicle Miles Traveled

1. **INDICATOR**
    b. **Name:** Vehicle Miles Traveled
    c. Metrics:
        i. Annual VMT PerCapita
2. **POLICY RELEVANCE**
    a. Purpose: To provide information on the intensity of vehicle use in the area.
    b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme): "**Cars are less energy-efficient and produce more emissions per passenger-mile than either buses or trains. Therefore, the use of cars for passenger transportation has greater environmental and social impacts, such as pollution, global warming as well as a higher accident rate, than mass transit. Policies are needed which reduce the use of cars as a mode of passenger transport and support a shift towards the use of less environmentally damaging modes, such as public transport." (United Nations Department of Economic and Social Affairs, 2007)

    c. International Conventions and Agreements: None.
    d. National, State or Local Conventions and Agreements: None
    e. International Targets/ Recommended Standards: None
    f. National, State or Local Recommended Standards: None
    g. Linkages to other indicators: This indicator is related to the concentration of air pollution in urban areas.
3. **METHODOLIGICAL DESCRIPTION**
    i. Annual VMT PerCapita
    ii. Data Sources:
        - Vehicle Miles Travelled data (Texas Transportation Institute, 2011)
    iii. Calculation:
        - This metric utilizes the Houston Urban Area (UA) boundary.
        - Using TTI data – Daily VMT for Freeway and Arterial were added and multiplied by 365 to compute the Annual VMT. This number was divided by the population in the Urban area to compute the Annual VMT PerCapita in the report.
        - This indicator does not include additional miles for public transit.
4. **RELATED AGENCIES AND REPORTS**

Houston Galveston Area Council publishes VMT data in various reports.

Transportation – Mode

Travel Choice

1. **INDICATOR**
   a. **Name:** Travel Choice
   b. **Metrics:**
      - Alternative Means of Travel
2. **POLICY RELEVANCE**
   a. Purpose: Provides information on the relative importance of different modes of passenger transport.
   b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme): "**Cars are less energy-efficient and produce more emissions per passenger- (mile) than either buses or trains. Therefore, the use of cars for passenger transportation has greater environmental and social impacts, such as pollution, global warming as well as a higher accident rate, than mass transit. Policies are needed which reduce the use of cars as a mode of passenger transport and support a shift towards the use of less environmentally damaging modes, such as public transport" (United Nations Department of Economic and Social Affairs, 2007)

   c. International Conventions and Agreements: None.
   d. National, State or Local Conventions and Agreements: None
   e. International Targets/Recommended Standards: None.
   f. National, State or Local Recommended Standards: None
   g. Linkages to other indicators: This indicator is related to the indicators 'Cost of gasoline/ gal', 'Access to transit', 'Daily VMT per capita', 'Annual Hours of Delay per Auto Consumer', 'Ambient concentration of air pollutants in urban areas', 'Street Intersection Density'.
3. **METHODOLIGICAL DESCRIPTION**
   a. Alternative Means of Travel
      i. Data Sources:
         - **US Census Bureau – Decennial Census** (U.S. Census Bureau, 2011)
4. **RELATED AGENCIES AND REPORTS**

   No public report exists which reports the modal split of travel choice in the City of Houston.

Atmosphere – Air Quality

Ambient Concentration of Air Pollutants

1. **INDICATOR**
   a. **Name:** Ambient concentration of air pollutants
   b. **Metrics:**
      a. Carbon Monoxide Levels in HGB
      b. Nitrogen Dioxide Levels in HGB
      c. Ozone Levels in HGB
      d. PM 10 Levels in HGB
      e. PM 2.5 Levels in HGB
      f. Lead Levels in HGB
      g. Sulphur Dioxide Levels in HGB

2. **POLICY RELEVANCE**
   a. **Purpose:** The indicator provides a measure of the state of the environment in terms of air quality and is an indirect measure of population exposure to air pollution of health concern in urban areas.
   b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme): "**High population density and concentration of industry exert great pressures on ambient air quality levels. Air pollution from households, industry, power stations and transportation, occurring collectively in and around urban areas is a major problem. Improving air quality is a significant aspect of promoting sustainable human settlements, since the greatest potential to have adverse effects from ambient air pollution occurs in urban areas." (United Nations Department of Economic and Social Affairs, 2007).
   This indicator may be used to monitor trends in air pollution as a basis for prioritizing policy actions; to map levels of air pollution in order to identify hotspots or areas in need of special attention; to help assess the number of people exposed to excess levels of air pollution; to monitor levels of compliance with air quality standards; to assess the effects of air quality policies; and to help investigate associations between air pollution and health effects.

   c. **International Conventions and Agreements:** None.
   d. **National, State or Local Conventions and Agreements:** Clean Air Act
   e. **International Targets/Recommended Standards:** World Health Organization (WHO) air quality guidelines exist for all the pollutants that are a part of this indicator.
   f. **National, State or Local Recommended Standards:** Environmental Protection Agency (EPA) air quality standards for all the pollutants of this indicator.
   g. **Linkages to other indicators:** This indicator is related to indicators on population growth rate, annual energy consumption per capita, and total healthcare costs as a percentage of Gross National Product (GNP).
3. **METHODOLIGICAL DESCRIPTION**
   a. Carbon Monoxide Levels in HGB
      i. Data Sources:
         1. Criteria Pollutants Trends (U.S. Environmental Protection Agency, 2010)

b. Nitrogen Dioxide Levels in HGB
    i. Data Sources:
        1. Criteria Pollutants Trends (U.S. Environmental Protection Agency, 2010)

c. Ozone Levels in HGB
    i. Data Sources:
        1. Criteria Pollutants Trends (U.S. Environmental Protection Agency, 2010)

d. PM 10 Levels in HGB
    i. Data Sources:
        1. Criteria Pollutants Trends (U.S. Environmental Protection Agency, 2010)

e. PM 2.5 Levels in HGB
    i. Data Sources:
        1. Criteria Pollutants Trends (U.S. Environmental Protection Agency, 2010)

f. Lead Levels in HGB
    i. Data Sources:
        1. Criteria Pollutants Trends (U.S. Environmental Protection Agency, 2010)

g. Sulphur Dioxide Levels in HGB
    i. Data Sources:
        1. Criteria Pollutants Trends (U.S. Environmental Protection Agency, 2010)

4. RELATED AGENCIES AND REPORTS

No public document exists with air quality trends in Houston by pollutant.

Atmosphere – Climate Change

Greenhouse Gas Emissions

1. INDICATOR

a. Name: Greenhouse Gas Emissions

b. Metrics:

- Houston MSA CO2 Emissions 2000
- Houston MSA CO2 Emissions 2008
- Harris County CO2 Emissions '00-'08

2. POLICY RELEVANCE

a. Purpose: The indicator measures greenhouse gas emissions by carbon dioxide (CO2).

b. Relevance to Sustainable/Unsustainable Development (theme/subtheme): Primarily due to the combustion of fossil fuels and deforestation, the amount of carbon dioxide in the atmosphere is increasing at an annual rate of 0.4%. A doubling of the CO2 concentration in the atmosphere since the 19th century is believed to cause an increase in the global mean temperature of 1.5 to 4.5°C. Reduction in the amount of CO_2 released in the atmosphere is important for sustainability (United Nations Department of Economic and Social Affairs, 2007).

c. International Conventions and Agreements: The United Nations Framework Convention on Climate Change was activated in March 1994. As of 11 April 2007 this convention has been ratified by 191 countries. The Kyoto Protocol to the Convention was adopted in December 1997 and was activated on 16 February 2005. As of 6 June 2007, the Kyoto Protocol has been ratified by 174 countries (United Nations Department of Economic and Social Affairs, 2007).

d. National, State or Local Conventions and Agreements: None

e. International Targets/Recommended Standards: The United Nations Framework Convention on Climate Change (UNFCCC) was activated in March 1994. As of 11 April 2007 this convention has been ratified by 191 countries. The EPA prepares the official U.S. Inventory of Greenhouse Gas Emissions and Sinks to comply with decision 3/CP.5 of the UNFCCC Conference of Parties. The Kyoto Protocol to the Convention was adopted in December 1997 and was activated on 16 February 2005. As of 6 June 2007, the Kyoto Protocol has been ratified by 174 countries (United Nations Department of Economic and Social Affairs, 2007).

f. National, State or Local Recommended Standards: None

g. Linkages to other indicators: This indicator is related to population, transportation, and air quality data.

3. METHODOLIGICAL DESCRIPTION

a. Houston MSA CO2 Emissions 2000
   i. Data Sources:
      - Houston MSA CO2 emissions by sector 2000 (Gurney, Mendoza, Fischer, Miller, Geethakumar, & de la Rue du, 2009).

b. Houston MSA CO2 Emissions 2008
   i. Data Sources:
      - Houston MSA CO2 emissions by sector 2008 (Gurney, Mendoza, Fischer, Miller, Geethakumar, & de la Rue du, 2009).

c. Harris County CO2 Emissions '00-'08
   i. Data Sources:

- Harris County CO2 emission by sector 2000-2008 (Gurney, Mendoza, Fischer, Miller, Geethakumar, & de la Rue du, 2009).

d. **Error! Reference source not found.**
   i. Data Sources:
      1. Harris County CO2 emission by sector 2008 (Gurney, Mendoza, Fischer, Miller, Geethakumar, & de la Rue du, 2009).

e. Gurney et.al. (2009) used the following data sources
   i. National Emissions Inventory (NEI); Emission Tracking System/Continuous Emissions Monitoring systems (ETS/ CEM); National Mobile Inventory Model (NMIM) County Database (NCD); Aero2k aircraft emissions inventory.

Data Source	National Emissions Inventory				ETS/ CEM	NMIM NCD	Aero 2k
Data Type	**Non-road**	**Non-point**	**Point**	**Airport**	**Power Prod.**	**On road**	**Aircraft**
Pollutant Utilized	Activity/ population	CO	CO	CO	CO2	VMT/ population	CO2
Incoming Resolution: Space/Time	County; Monthly	County; Annual	Lat/Lon; Annual	Lat/Lon; Annual/ summer	Lat/Lon; Hourly	County; Monthly	1^{o}X 1^{o}; Monthly
Condition Data		Census; EIA sector/state/ fuel/month sales	EIA sector/ state/fuel/ month sales			GIS Road Atlas; Mobile 6.2	
Final Resolution: Space/Time	County; Monthly	Census tract; Month	Lat/Lon; Month	Lat/Lon; Annual	Lat/Lon; Hourly	Road segment; Hourly	1^{o}X 1^{o}; Monthly
Sector	Mobile	Comm. Res. Ind. Electric	Comm. Res. Ind. Electric	Mobile	Electric	Mobile	Mobile

CO_2 Emissions

   ii.

5. RELATED AGENCIES AND REPORTS

No public document exists which reports CO_2 emissions in Houston by sector.

Freshwater – Water Quality

Water Pollution

1. **INDICATOR**
    1. **Name:** Water Pollution
    2. **Metrics:**
        a. COH Drinking Water Quality 2000-2010
2. **POLICY RELEVANCE**
    a. **Purpose:** Provides information on local water quality
    b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** In moving towards sustainability and setting policies that recognize the need to protect this scarce resource, water use per capita should be decreasing, despite increases in population. This decreasing trend would show whether we were efficiently using water.

    c. **International Conventions and Agreements:** None.
    d. **National, State or Local Conventions and Agreements:** None
    e. **International Targets/Recommended Standards:** None
    f. **National, State or Local Recommended Standards:** Clean Water Act
    g. **Linkages to other indicators:** This indicator is related to population growth.
3. **METHODOLIGICAL DESCRIPTION**
    a. COH Drinking Water Quality 2000-2010
        i. Data Sources:
            - Water Quality Report 2000 (City of Houston, 2001).
            - Water Quality Report 2010 (City of Houston, 2011)
    b. Error! Reference source not found.
        i. Data Sources:
            - HGAC GIS shapefiles of monitors.
4. **RELATED AGENCIES AND REPORTS**
    The City of Houston publishes an annual Water Quality Report.

Freshwater – Water Demand

Water Use

1. INDICATOR

a. Name: Water Use

b. Metrics:

- Water Use per Capita
- Harris County Water Demand
- Harris County and Houston Municipal Water Demand

1. POLICY RELEVANCE

a. Purpose: To provide information on local water demand

b. Relevance to Sustainable/Unsustainable Development (theme/subtheme): The indicator shows the intensity of water demand and can be used to determine the nature of adjusted supply and demand management policies (United Nations Department of Economic and Social Affairs, 2007). In moving towards sustainability and setting policies to recognize the need to protect this scarce resource, water use per capita should decrease, despite increases in population. This decreasing trend would point towards increased business efficiency.

c. International Conventions and Agreements: None.

d. National, State or Local Conventions and Agreements: None

e. International Targets/Recommended Standards: None

f. National, State or Local Recommended Standards: None

g. Linkages to other indicators: This indicator is related to population growth.

2. METHODOLIGICAL DESCRIPTION

a. Water Use per Capita

i. Data Sources:

- Harris County 1990 water use (Texas Water Development Board, 1997).
- Harris County 2000 water use (Region H Water Planning Group, 2006).
- Harris County 2010 – 2060 water use (Region H Water Planning Group, 2010).
- Houston 2010 – 2060 water use (Region H Water Planning Group, 2010).
- Houston 1990 – 2000 water use (Texas Water Development Board, 2012).
- Harris and Houston population 1990 – 2010 – US Census Bureau Decennial Census (U.S. Census Bureau, 2011).
- Harris and Houston population 2020 – 2060 – Calculation by author
- Gallons per capita per day (GPCD) Harris and Houston 1990 – 2060 – Calculation by author.

ii. The per capita water demand measured in gallons per day. The Texas Water Development Board's published figures include the following:
- includes water use of residential, commercial and institutional users, as well as process-related water loss and any system water loss,
- does not include water sales to large manufacturing, mining, or steam-electric power plants,

- does not include a city's water sales to retail customers who live outside of the city limits,
- does include the water use of commercial and institutional entities, and residential customers who are within the city limits but are supplied water by another source, including a private groundwater well, another water utility, or a surface water right.

b. Harris County Water Demand

i. Data Sources:

- Harris County 1990 water use (Texas Water Development Board, 1997).
- Harris County 2000 water use (Region H Water Planning Group, 2006).
- Harris County 2010 – 2060 water use (Region H Water Planning Group, 2010).

c. Harris County and Houston Municipal Water Demand

i. Data Sources:

- Harris County 1990 water use (Texas Water Development Board, 1997).
- Harris County 2000 water use (Region H Water Planning Group, 2006).
- Harris County 2010 – 2060 water use (Region H Water Planning Group, 2010).
- Houston 2010 – 2060 water use (Region H Water Planning Group, 2010).
- Houston 1990 – 2000 water use (Texas Water Development Board, 2012).

3. RELATED AGENCIES AND REPORTS

The Regional Water Plan is published every five years by the Texas Water Development Board.

Freshwater – Water Resources

Water Availability

1. INDICATOR

a. **Name:** Water Availability

b. **Metrics:**

- Houston Region Water Supply
- Houston Region Water Demand vs Supply

2. POLICY RELEVANCE

a. Purpose: The indicator measures the total supply of available water sources.

b. Relevance to Sustainable/Unsustainable Development (theme/subtheme): Scarce water could have negative effects on sustainability by the constraint of economic and regional development, and could lead to the loss of biodiversity. Changes in this indicator are linked to total renewable water resources (United Nations Department of Economic and Social Affairs, 2007).

c. International Conventions and Agreements: None.

d. National, State or Local Conventions and Agreements: None

e. International Targets/Recommended Standards: None

f. National, State or Local Recommended Standards: None

g. Linkages to other indicators: This indicator is related to population growth.

3. METHODOLIGICAL DESCRIPTION

a. Houston Region Water Supply

i. Data Source:

- Available Supply 2000 (Region H Water Planning Group, 2006).
- Available Supply 2010 – 2060 (Region H Water Planning Group, 2010).

b. Houston Region Water Demand vs Supply

i. Data Source

- Available Supply 2000 (Region H Water Planning Group, 2006).
- Available Supply 2010 – 2060 (Region H Water Planning Group, 2010).
- Available Demand 2000 (Region H Water Planning Group, 2006).
- Available Demand 2010 – 2060 (Region H Water Planning Group, 2010).

4. RELATED AGENCIES AND REPORTS

The Regional Water Plan is published every five years by the Texas Water Development Board. The most current report is the 2011 Region H Water Plan.

Land – Flooding

Floodplain Expansion

1. **INDICATOR**
    a. **Name:** Floodplain Expansion
    b. **Metrics:**
        i. Houston floodplain expansion
2. **POLICY RELEVANCE**
    a. **Purpose:** The indicator measures the expansion of the floodplain to assess the risk from flooding in Houston.
    b. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** Disasters caused by vulnerability to natural hazards have a strong impact on the development process. This is a key measure of social welfare, economic risk, and environmental stability.
    c. **International Conventions and Agreements:** None.
    d. **National, State or Local Conventions and Agreements:** None
    e. **International Targets/Recommended Standards:** None
    f. **National, State or Local Recommended Standards:** None
    g. **Linkages to other indicators:** This indicator is related to population growth.
3. **METHODOLOGICAL DESCRIPTION**
    i. Houston floodplain expansion
        - Data Sources:
        - Harris County Flood Control District

    ii. Methodology
        - 2000 floodplain (1%) used the following codes (A,AE,FW,V). Overlay 2000 floodplain on City of Houston 2000 city map.
        - 2012 floodplain (1%) used the following codes (A,AE,AO,VE). Overlay 2012 floodplain on City of Houston 2010 city map.
        - Created a 25 foot buffer around the 1% floodplain in 2012 to estimate the population and housing units affected.
        - Used shapefile of 2010 blocks to identify population and housing units within 25 feet of floodplain in 2012.
        - The floodplain was buffered by 25 feet since housing units in Houston have a 25 foot setback and property within the floodplain have to secure flood insurance. Therefore even if the housing unit itself is not in the floodplain but portions of the property are in the floodplain, mandatory flood insurance is levied (unless the homeowner requests a site survey to demonstrate risk reduction).
        - Using the 'Use Ratio Policy', created a feature layer in ArcGIS to estimate the population and Houston. (The above procedure ensured that population and housing units were extracted from blocks as a percentage of total area of blocks within the floodplain and 25 foot expansion of the floodplain.
4. **RELATED AGENCIES AND REPORTS**
5. The HCFCD published Flood Insurance Rate Maps (FIRMS) and also has a web based Flood Education Mapping Tool (www.harriscountyfemt.org), where residents in Harris County can enter addresses to determine proximity to floodplains.

Land – Land Cover

Land Cover Change

1. **INDICATOR**
   a. **Name:** Land Cover Change
   b. **Metrics:**
      a. City of Houston Land Cover 1992
      b. City of Houston Land Cover 2001
      c. City of Houston Land Cover 2006
      d. Houston Land Cover 1992 – 2006
      e. Houston Land Cover 1992 - 2006 (Urban Not Shown)
      f. Houston Land Cover 2001 – 2006
      g. Houston Land Cover Change 2001 - 2006 Percent Change

2. **POLICY RELEVANCE**
   c. **Purpose:** Highlight changes in the productive or protective uses of the land resource to facilitate sustainable land use planning.
   d. **Relevance to Sustainable/Unsustainable Development (theme/subtheme):** Collecting and tracking information on land cover change is critical for the protection of land uses or for future allocation of land for the greatest sustainable benefits. Changes in land use are associated with development/ resource conflicts. Development conflicts are based upon whether to develop land for anthropogenic enterprise. Resource conflicts are based upon whether land is intrinsically useful in its natural state.
   e. **International Conventions and Agreements:** None.
   f. **National, State or Local Conventions and Agreements:** None
   g. **International Targets/Recommended Standards:** None.
   h. **National, State or Local Recommended Standards:** None
   i. **Linkages to other indicators:** This indicator is related to population growth, density; and open space classification.

3. **METHODOLIGICAL DESCRIPTION**
   a. City of Houston Land Cover 1992
      i. Data Sources:
         - US Geological Survey – Land Cover 1992 (U.S. Geological Survey, 2011)

   b. City of Houston Land Cover 2001
      i. Data Sources:
         - US Geological Survey – Land Cover 2001 (U.S. Geological Survey, 2011)

   c. City of Houston Land Cover 2006
      i. Data Sources:
         - US Geological Survey – Land Cover 2006 (U.S. Geological Survey, 2011)

   d. Houston Land Cover 1992 – 2006
      i. Data Sources:
         - US Geological Survey – Land Cover 1992-2006 (U.S. Geological Survey, 2011)
      ii. Convert pixels in land cover allocations to spatial areas equivalents.

iii. Consolidate the 2001 and 2006 land cover designations to 1992 equivalents to enable direct comparison to 1992 designations.

e. Houston Land Cover 1992 - 2006 (Urban Not Shown)

i. Data Sources:
- US Geological Survey – Land Cover 1992-2006 (U.S. Geological Survey, 2011)

ii. Convert pixels in land cover allocations to spatial areas equivalents.

iii. Consolidate the 2001 and 2006 land cover designations to 1992 equivalents to enable direct comparison to 1992 designations.

f. Houston Land Cover 2001 – 2006

i. Data Sources:
- US Geological Survey – Land Cover 2001-2006 (U.S. Geological Survey, 2011)

ii. Convert pixels in land cover allocations to spatial areas equivalents.

g. Houston Land Cover Change 2001 - 2006 Percent Change

i. Data Sources:
- US Geological Survey – Land Cover 2001-2006 (U.S. Geological Survey, 2011)

ii. Convert pixels in land cover allocations to spatial areas equivalents.

iii. Consolidate the 2001 and 2006 land cover designations to 1992 equivalents to enable direct comparison to 1992 designations.

iv. Calculate percent changed 1992–2001 and 200 -2006 using 1992 land cover designations.

h. 2001 - 2006 Developed

i. High Intensity - highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.

ii. Medium Intensity - areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.

iii. Low Intensity - areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.

iv. Open Space - areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.

4. RELATED AGENCIES AND REPORTS

No public agency reports on land cover change or land use change in the City of Houston.

Land – Classification

Jobs/Housing Balance

1. INDICATOR

a. Name: Jobs/Housing Balance

b. Metrics:

- Houston Business Centers
- Houston Jobs/ Housing Balance

2. POLICY RELEVANCE

a. Purpose: To reduce VMT and increase livability by increasing accessibility between jobs and housing.

b. Relevance to Sustainable/Unsustainable Development (theme/subtheme): Mixed use developments are defined as those places that have a mix of jobs, housing, and services which meet the daily needs of people. People who live in these places have lower transportations needs and costs. Additionally, these people enjoy a higher quality of life since there are more community interactions and opportunities to participate in events on a communal level.

c. International Conventions and Agreements: None.

d. National, State or Local Conventions and Agreements: None

e. International Targets/Recommended Standards: None.

f. National, State or Local Recommended Standards: None

g. Linkages to other indicators: This indicator is related to indicators such as population growth, jobs, and density.

3. METHODOLIGICAL DESCRIPTION

a. Houston Business Centers

i. Data Sources:

- Houston Business Centers 1990 - (U.S. Department of Transportation, 2011)
- Houston Business Centers 2000 - (U.S. Department of Transportation, 2011)
- Houston Business Centers 2010 – HGAC data request

ii. Business center were identified by the following procedure in GIS:

- Identify TAZs with at least 10 jobs per acre.
- Identify aggregate clusters of TAZs (from above) with at least 10,000 jobs.
- For 2010, using HGAC job numbers, Sugarland, Gulfgate, and Galveston show less than 10,000 jobs but were included in analysis based on local knowledge of the region and recognition of these areas as major job hubs.

b. Houston Jobs/ Housing Balance

i. Data Sources:

- Houston Business Centers 1990 - (U.S. Department of Transportation, 2011)

- Houston Business Centers 2000 - (U.S. Department of Transportation, 2011)
- Houston Business Centers 2010 – HGAC data request

ii. Business center were identified by the following procedure in GIS:
- Identify TAZs with at least 10 jobs per acre.
- Identify aggregate clusters of TAZs (from above) with at least 10,000 jobs.
- For 2010, using HGAC job numbers, Sugarland, Gulfgate, and Galveston show less than 10,000 jobs but were included in analysis based on local knowledge of the region and recognition of these areas as major job hubs.

iii. Create a quarter mile buffer around business centers in GIS and identify the number of people living within that boundary for each job center.

iv. Calculate the percentage of persons living within quarter mile of job centers.

v. Calculate the percentage of jobs within job centers.

4. RELATED AGENCIES AND REPORTS

No public agency reports on jobs/housing balance in Houston.


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