Exploring Demographics in Metropolitan Sustainability: San Antonio, Texas

Bill Barker, AICP

2012 Applied Demography Conference
San Antonio, Texas
January 10, 2012

Outline

- How is "sustainability" defined and measured?
- What is the impact of population dynamics on sustainability?
- Can insights from demographics help increase sustainability in the San Antonio region?

Sustainability

- Brundtland definition:
  - "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Dr. Gro Harlem Brundtland, Former Prime Minister of Norway

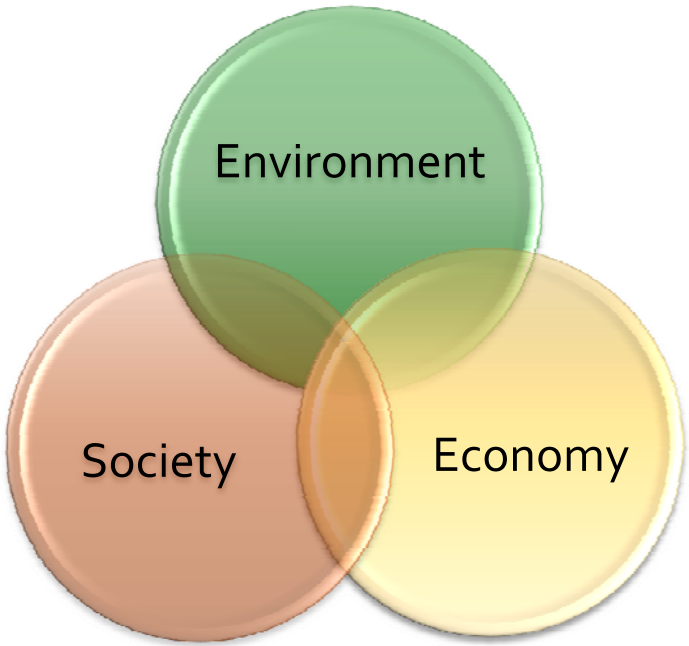
- Intergenerational "golden rule"
  - "Sustainability applies the Golden Rule across generations."

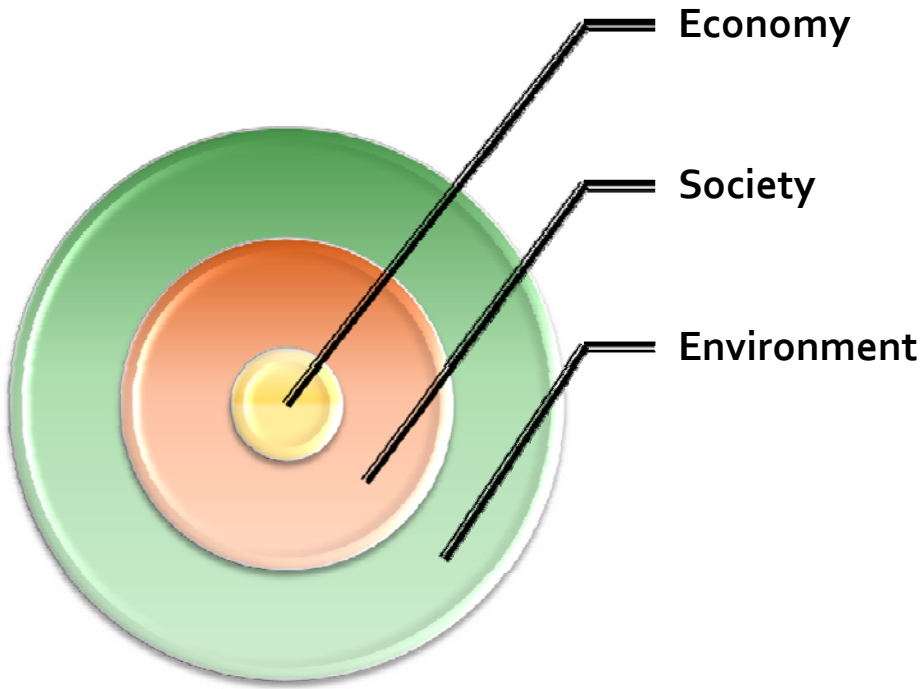
Agricultural Economist Dr. John Ikerd

- Executive Order of the President
  - "…to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations."

President Barack Obama

Weak and Strong Sustainability





Weak Sustainability **Strong Sustainability**

For example, see Michael Getzner, "Weak and strong sustainability indicators and regional environmental resources", *Environmental Management and Health,* 1999

Definition and measurement challenge

"Four decades into talks and negotiations over 'sustainable development' as a planetary aim, and there still remain two key challenges in moving sustainable development from concept to action. One, the broad range of interpretations of the term and two, somewhat connected to the first, is the lack of reliable tools of measurement that can provide an indication if we are moving in the right direction in achieving sustainability. "

Source: Saunders, Caroline M.; Kaye-Blake, William; and Campbell, Rachel, "Capital Based Sustainability Indicators as a Possible Way for Measuring Agricultural Sustainability", March 29, 2010

Focus on a Few Basics

- Water
- Energy
- Environmental degradation
- Equity

Interaction of Environmental Impact, Population, Affluence and Technology

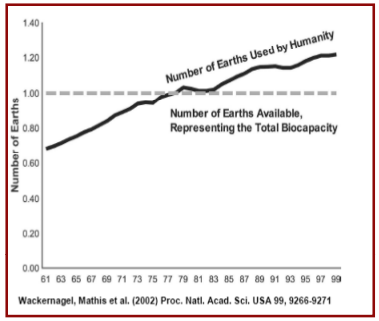
- Impacts on the environment

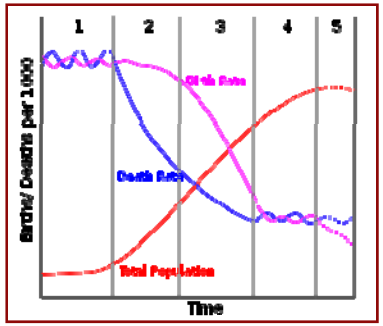
  I = P x A x T

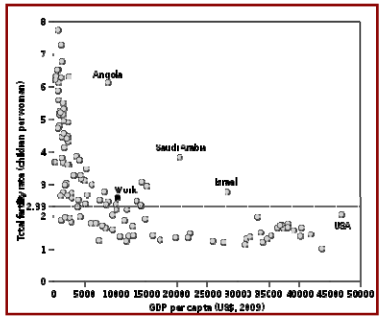
  Where:
  - I = environmental impact
  - P = population size
  - A = affluence (or consumption)
  - T = technology
- Impacts on the population

  P = fn (A,T,E)

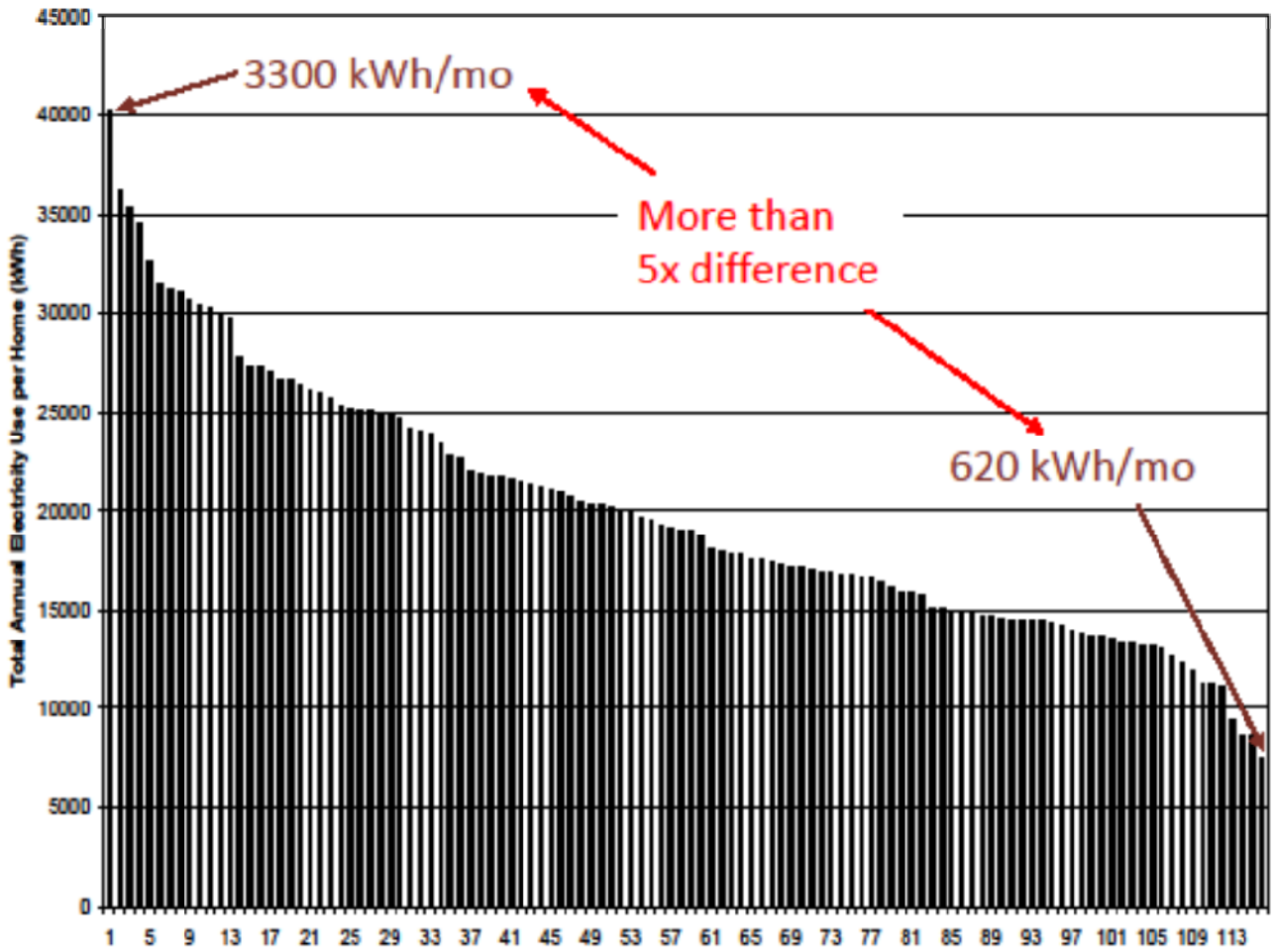
  Where: E = environmental carrying capacity
  - Demographic transition
  - Demographic-economic paradox/Kuznets Curve
  - Malthus' Principle of Population







Same Technology, Very Different Outcomes



- Annual energy use
- New Las Vegas single family houses with identical energy efficiency
- Household consumption varies by over a factor of five

Source: National Renewable Energy Laboratory

What Explains Variation?

- Normal random variability

But, also demographics, such as:

- Household size
- Income
- Age of household members
- Stage of household life cycle
- Lifestyle
- Educational attainment – inconclusive
- Gender - inconclusive

And, then, motivational factors, like:

- Attitudes
- Beliefs
- Information intervention

Stephanie Grantham, *LITERATURE REVIEW Household energy consumption, conservation & efficiency*, Alice Solar City, 2010

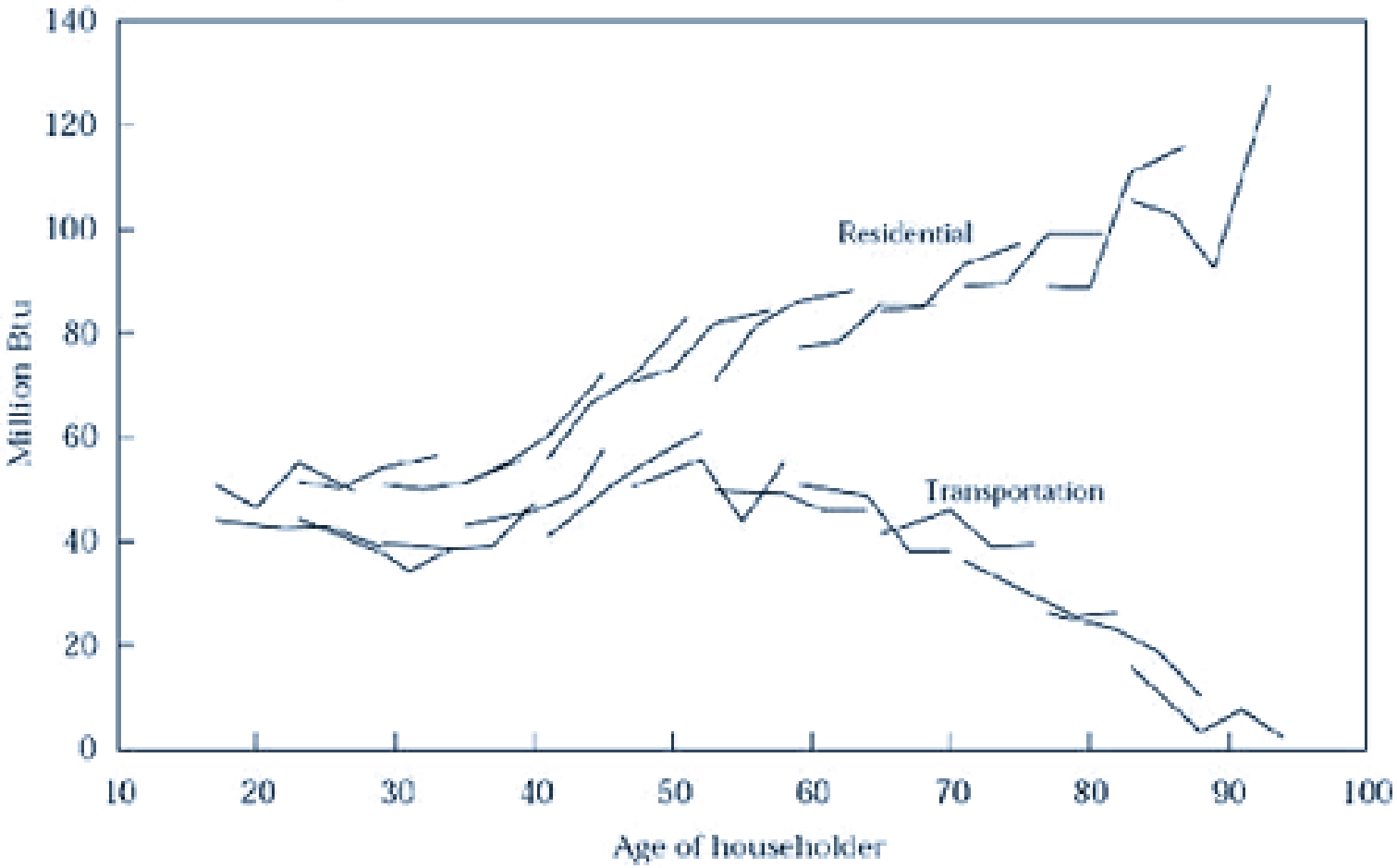
Total Household Impact Depends on Density and Location

	Suburban 8 DU/acre 0.25 FAR	Urban 40 DU/acre 2.5 FAR

CO_2 Lbs/Yr/Household		
Buildings	24,000	11,000
Transportation	26,000	9,000
Total	50,000	20,000

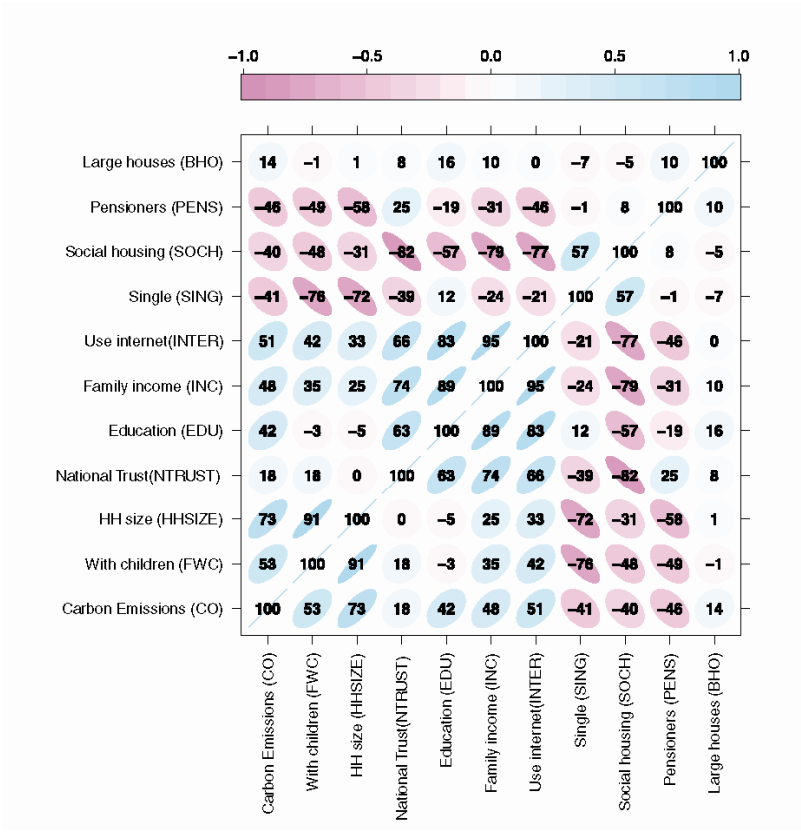
Eliot Allen, “Cool Spots: Carbon Footprint Reduction through Community Planning,” November 2008

Age and Energy Use



O'Neill and Chen, 2002: Demographic determinants of household energy use in the United States. Popul. Dev. Rev. 28:53-88.

Correlation of "Social Factors" with Greenhouse Gas Emissions



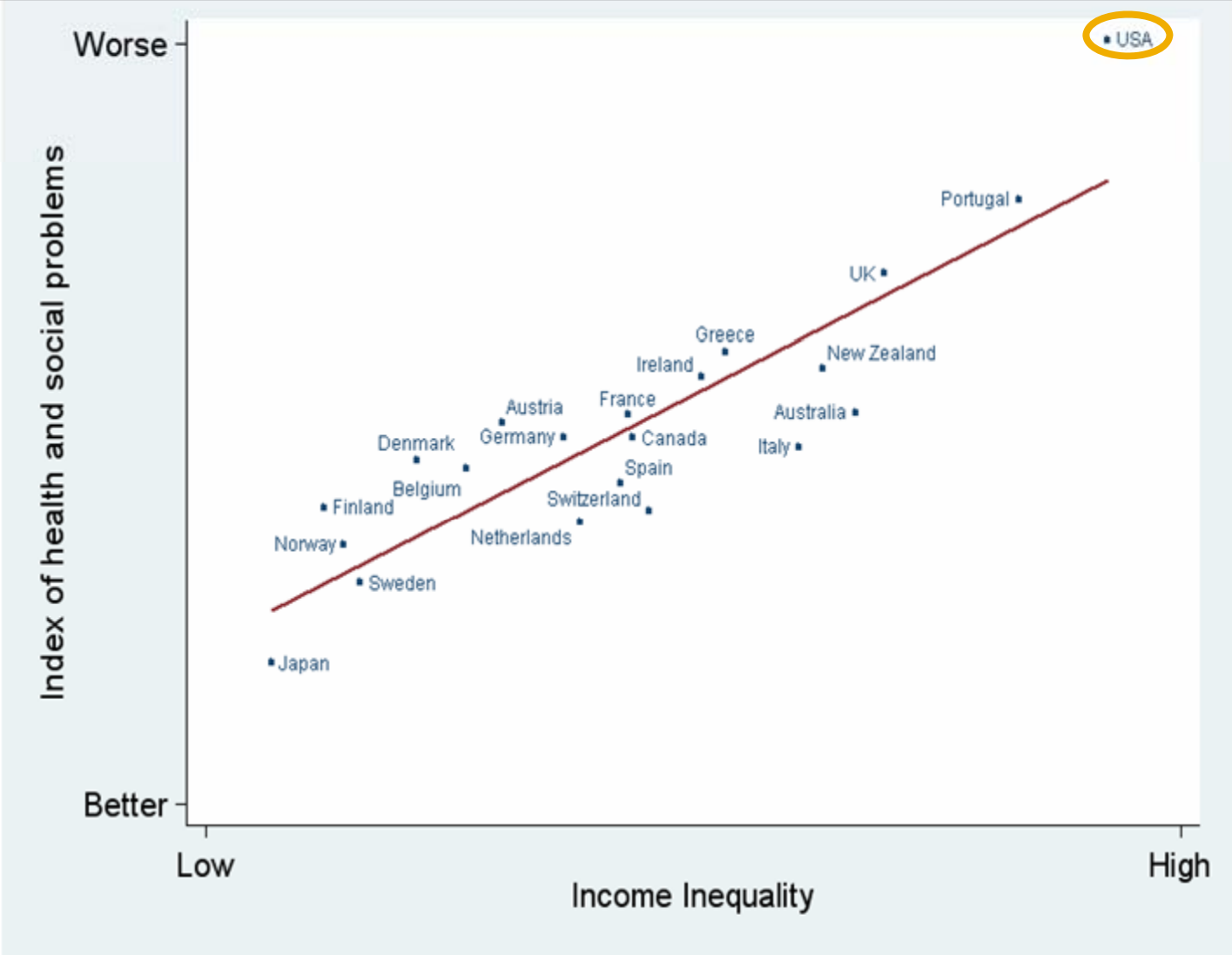
- Household size
- Education
- Income
- etc.

Baiocchi, Giovanni, Minx, Jan and Hubacek, Klaus, The Impact of Social Factors and Consumer Behavior on Carbon Dioxide Emissions in the United Kingdom: A Regression Based on Input-Output and Geodemographic Consumer Segmentation Data. *Journal of Industrial Ecology*, Vol. 14, Issue 1, pp. 50-72, January/February 2010.

Health and Social Index and Gini Coefficient

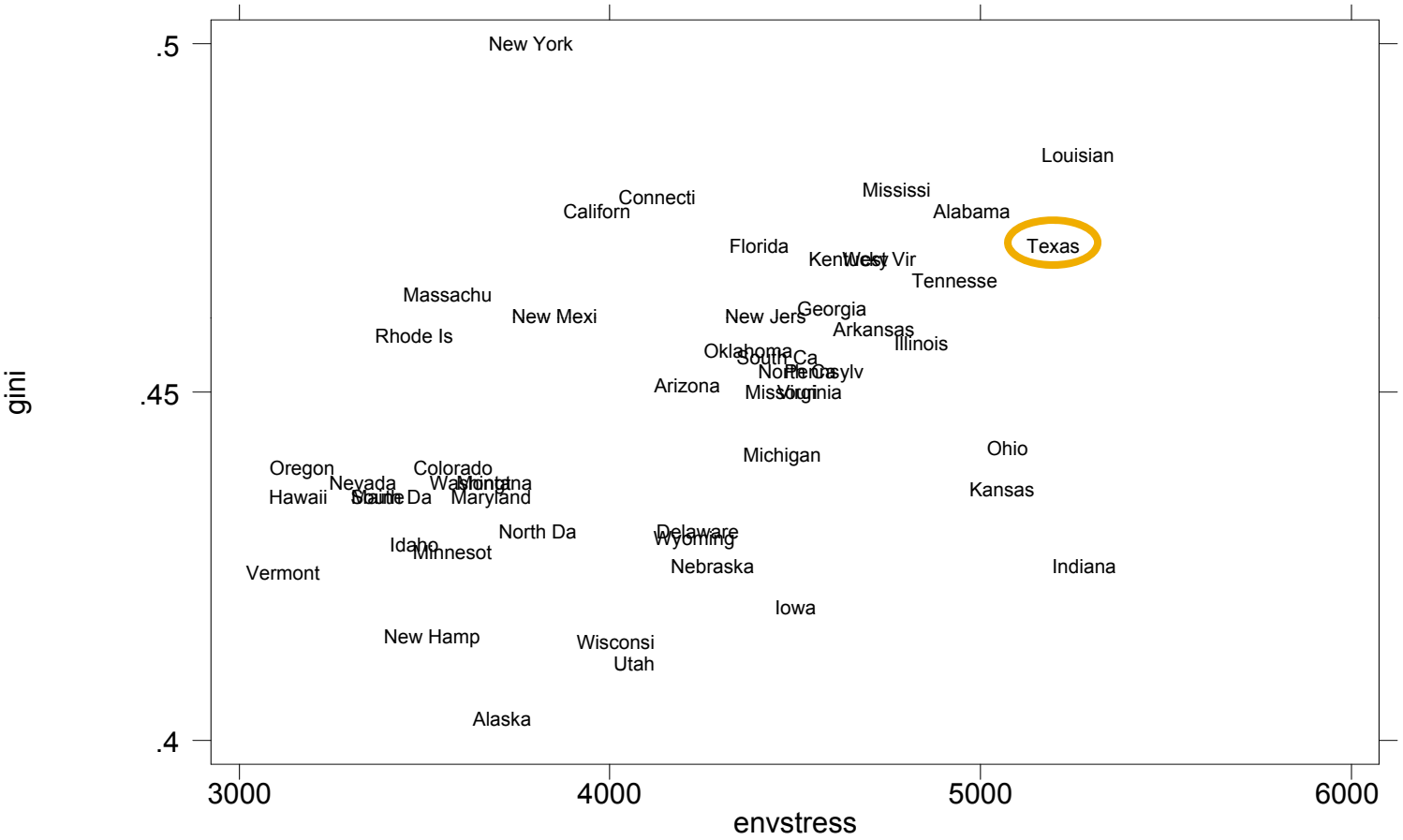
Index of:

- Life expectancy
- Math & Literacy
- Infant mortality
- Homicides
- Imprisonment
- Teenage births
- Trust
- Obesity
- Mental illness – incl. drug & alcohol addiction
- Social mobility



Source: Wilkinson & Pickett, The Spirit Level (2009)

Gini Coefficient and State Environmental Stress Index



(p <= 0.05 significance level)

C. Linn Gould, “Income Inequality, Health, and Sustainability: How are they connected?” Sustainable Seattle: Driving Change and Getting Results, September 14th, 2005

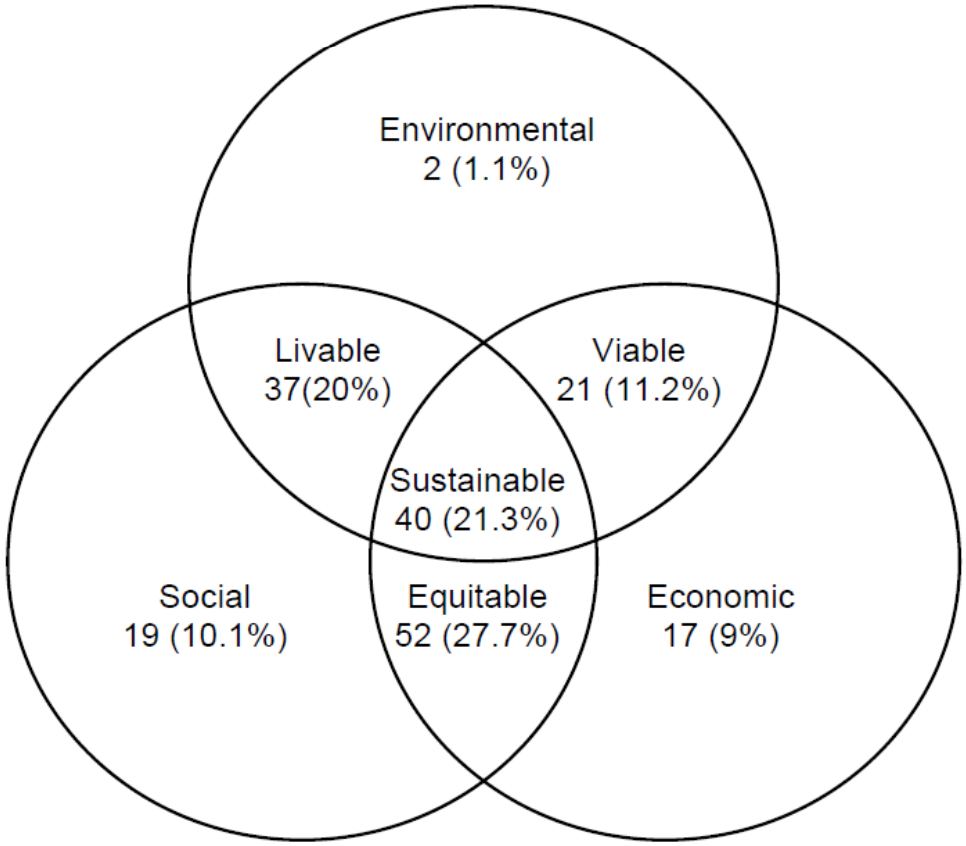
Boyce et al (1999) “Power distribution, the environment, and public health: a state level analysis”, *Ecological Economics*

So what?

- Clearly, demographic factors impact the magnitude of water and energy consumption, environmental degradation, as well as health and social problems
- However, many demographic parameters are difficult to change with public policy
- Are there some influence points?

CIRANO City Sustainability Indicators

- Reviewed 17 indicators studies from Europe and North America
- 7 of 29 frequently used indicators relate directly to "sustainable"
  - Adopted sustainable development policies
  - Density of urban population
  - Daily per capita water consumption
  - Ecological footprint
  - State of health of population
  - Percent using mass transit
  - Percent of space allocated to nature conservation

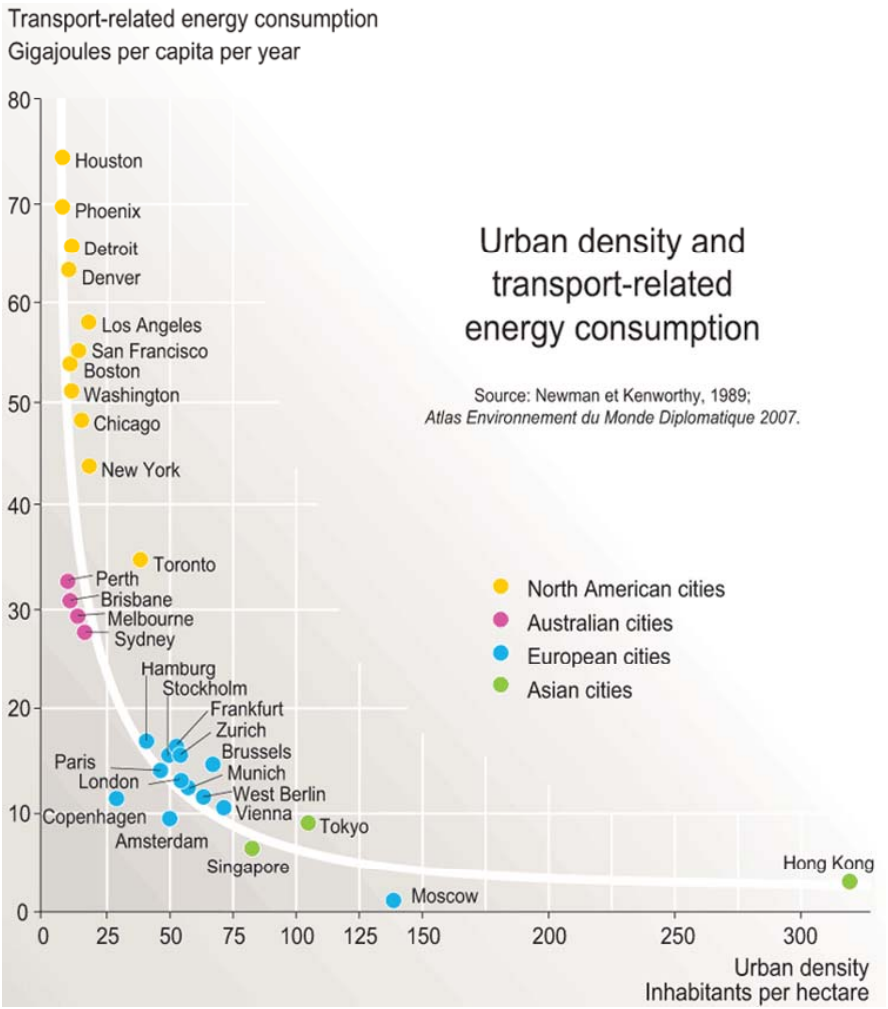


Source: Georges A. Tanguay, *Measuring the Sustainability of Cities: A Survey-Based Analysis of the Use of Local Indicators, CIRANO, January 2009* ©

Population Density

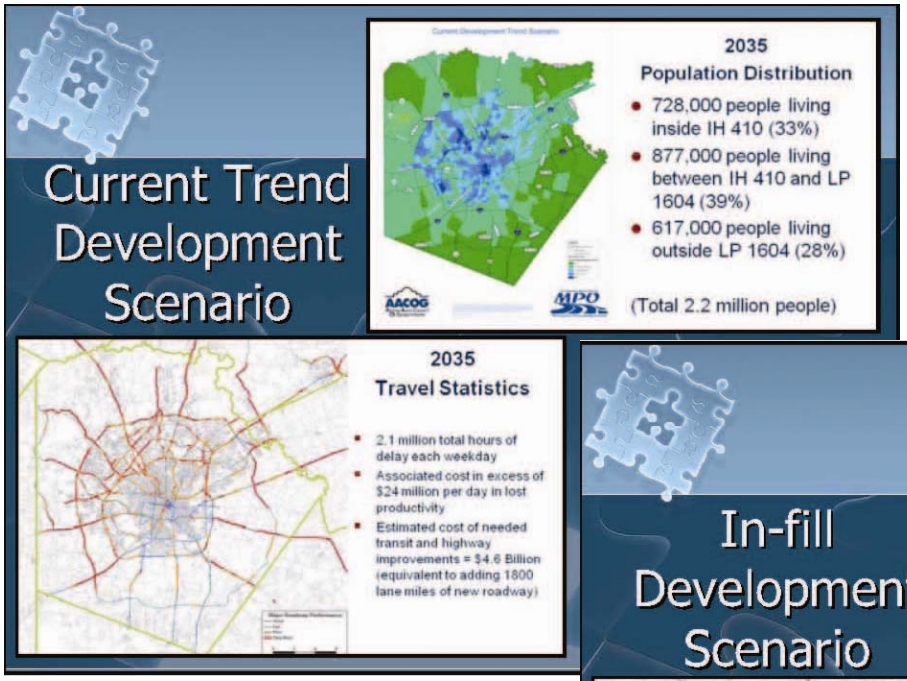
Water-Related Benefits of High Density (10 units/acre vs 3 units/acre), 2,300-Unit Residential Development:

- Reduced cost of infrastructure for water and sewer: 30-year total of $17,739,000
- Reduced water use: Annual reduction of 309 acre feet for a 30-year savings of $1,113,000
- Reduced runoff: Annual reduction of 66 acre feet

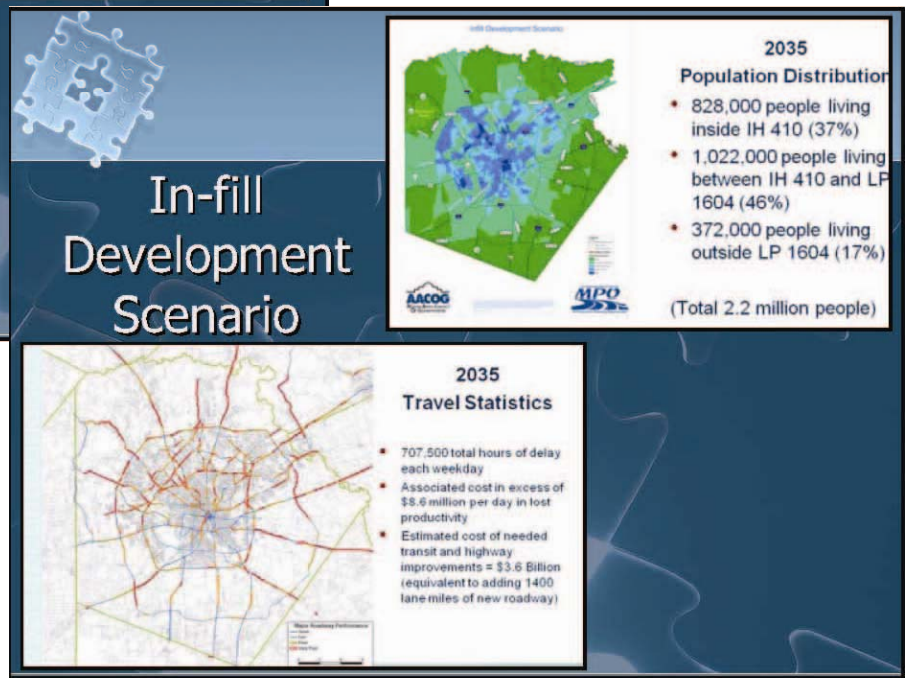


Dr. David Gallo, "Water Resource Impacts of Low and High Density Residential Development: A Comparative Analysis", The Center for Economic Development, California State University, Chico

2035 San Antonio – Infill vs Current Trend



- Current trend
  - 2.1M annual hours of delay
  - $24M daily lost productivity
- Infill
  - 0.7M annual hours of delay
  - $8.6 daily lost productivity



Infill development will improve transportation system performance more than any transportation network investment!

Source: San Antonio - Bexar County Metropolitan Planning Organization

GEN Y AND BABY BOOMERS: LARGEST MKT SEGMENTS NATIONALLY, SAN ANTONIO

Generation	Born	2010 Age	2010 Pop.	2010 % of Nation	S.A. MSA 2010 Pop.	2010 % of S.A. MSA
Eisenhowers	Before 1946	64+	41M	13%	220K	11%
Baby Boomers	1946 – 1964	45 – 64	80M	26%	470K	23%
Gen X	1965 – 1980	29 – 45	62M	20%	417K	21%
Gen Y (Millenials)	1981 – 1999	10 – 29	85M	27%	603K	30%
Gen Z (?)	2000 and After	0 – 10	42M	14%	322K	16%

SOURCES: RCLCO, using Claritas, and National Center for Health Statistics

GEN Y WILL PAY FOR WALKABLE, MIXED-USE

CHALLENGE IS PROVIDING PRODUCT THEY CAN AFFORD

- Driven by convenience, connectivity, and a healthy work-life balance to maintain relationships
- **1/3 will pay more** to walk to shops, work, and entertainment
- 2/3 say that living in a walkable community is important
- More than 1/2 of Gen Y would trade lot size for proximity to shopping or to work
- Even among families with children, one-third or more are willing to trade lot size and "ideal" homes for walkable, diverse communities

SOURCE: RCLCO Consumer Research

Demographic "Pressure Points"

Factor	Impact	Regional Policy Variable
Population	●	○
Household size	●	○
Income	●	○
Age	●	○
Household life cycle	●	○
Educational attainment	⭘	⭘
Gender	○	○
Density/sprawl	●	●
Equity	●	⭘
Lifestyle	⭘	⭘

Conclusions

- Demographic analysis helps pinpoint opportunities for advancing sustainability
- Geographic scale is a factor
- Population density and distribution seem to be the parameters that appear to be important and can be impacted at the regional scale
- Education, equity and lifestyle are other areas with some promise

Bill Barker, AICP
Office of Environmental Policy
City of San Antonio, TX
(210) 207-6322
bill.barker@sanantonio.gov

Disclaimer: The views presented in this paper are solely those of the author and are not necessarily those of the City of San Antonio.