Building an SDG Data Dashboard for **The California Bay Area**

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Tokyo, Japan -- June 29, 2017

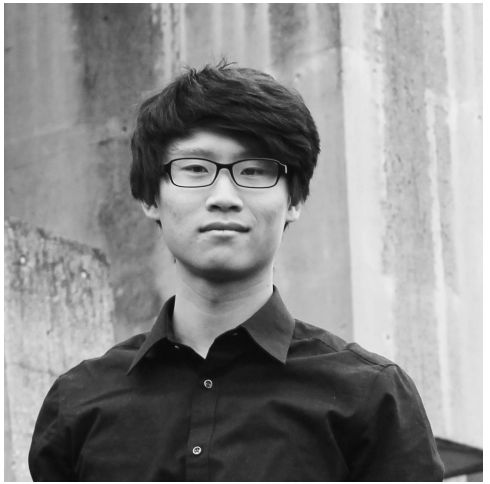
Stanford | ENGINEERING
Sustainable Urban Systems Initiative

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK
A GLOBAL INITIATIVE FOR THE UNITED NATIONS

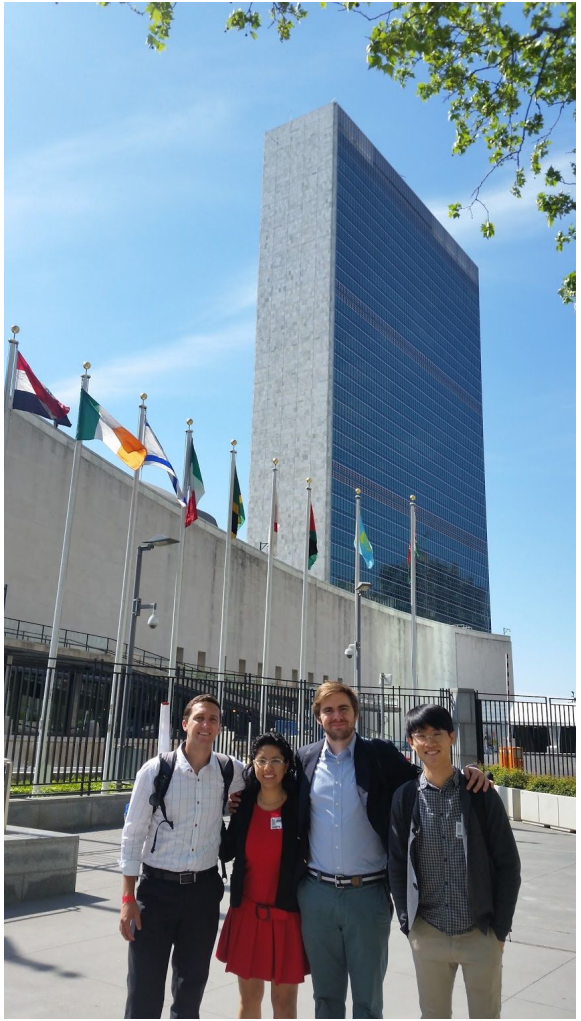
Outline

- “Why localize the SDGs?”
- U.S. National Reporting Platform
- Sustainable Development Solutions Network U.S. Cities SDG Index
- SDSN USA Sustainable Cities Initiative
- The California Bay Area and the City of San Jose
- Stanford Sustainable Urban Systems
- SUS methodology, process, and recommendations



DEREK OUYANG
LECTURER, STANFORD

Stanford Degrees
B.S. Architectural Design
B.S. Civil & Environmental Engineering
M.S. Structural Engineering & Geomechanics




SUSTAINABLE
DEVELOPMENT
GOALS
UN OFFICIAL LANGUAGES

Why should we care about the SDGs?

- International commitment
- Moral obligation
- Economic, political, and social benefits
- Unlock knowledge sharing across previously siloed approaches to sustainable development
- Unlock new financing opportunities?
- **Evidence-based decision making**

"You can't improve what you can't measure"

Goal 1: No Poverty

1.2.1 Proportion of population living below the national poverty line, by sex and age

1.5.1 Number of deaths, missing persons and persons affected by disaster per 100,000 people

1.5.2 Direct disaster economic loss in relation to global gross domestic product (GDP)

Goal 2: No Hunger

2.1.2 Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)

2.2.2 Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight)

Goal 3: Good Health and Well-Being

3.2.1	Under-five mortality rate
3.4.1	Mortality rate attributed to cardiovascular disease, cancer, diabetes, or chronic respiratory disease
3.4.2	Suicide mortality rate
3.6.1	Death rate due to road traffic injuries
3.8.2	Number of people covered by health insurance or a public health system per 1,000 population
3.9.1	Mortality rate attributed to household and ambient air pollution
3.9.2	Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services)
3.c.1	Health worker density and distribution

Goal 4: Quality Education

4.1.1 Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex

4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill

Goal 5: Gender Equality

5.6.2 Number of countries with laws and regulations that guarantee women aged 15-49 access to sexual and reproductive health care, information and education

Goal 6: Clean Water and Sanitation

6.1.1 Proportion of population using safely managed drinking water services

6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water

6.3.1 Proportion of wastewater safely treated

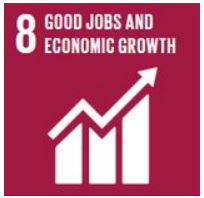
6.4.1 Change in water-use efficiency over time

Goal 7: Affordable and Clean Energy

7.2.1 Renewable energy share in the total final energy consumption

7.3.1 Energy intensity measured in terms of primary energy and GDP

Goal 8: Good Jobs and Economic Growth



8.2.1 Annual growth rate of real GDP per employed person

8.4.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP

8.5.1 Average hourly earnings of female and male employees, by occupation, age and persons with disabilities

8.5.2 Unemployment rate, by sex, age and persons with disabilities

Goal 9: Innovation and Infrastructure

9.1.1 Proportion of the rural population who live within 2 km of an all-season road

9.1.2 Passenger and freight volumes, by mode of transport

9.4.1 CO_2 emission per unit of value added

9.c.1 Proportion of population covered by a mobile network, by technology

Goal 10: Reduced Inequalities

10.2.1 Proportion of people living below 50% of median income, by age, sex, and persons with disabilities

Goal 11: Sustainable Cities and Communities

11.1.1	Proportion of urban population living in slums, informal settlements, or inadequate housing
11.2.1	Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities
11.3.1	Ratio of land consumption rate to population growth rate
11.6.1	Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities
11.6.2	Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)
11.7.1	Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities

Goal 12: Responsible Consumption and Production

12.4.2 Hazardous waste generated per capita and proportion of hazardous waste treated, by type of treatment

12.5.1 National recycling rate, tons of material recycled

Goal 13: Climate Action

Goal 14: Life Below Water

14.1.1 Index of coastal eutrophication and floating plastic debris density

Goal 15: Life on Land

15.3.1 Proportion of land that is degraded over total land area

Goal 16: Peace, Justice, Strong Institutions

16.1.1 Number of victims of intentional homicide per 100,000 population, by sex and age

16.1.3 Proportion of population subjected to physical, psychological or sexual violence in the previous 12 months

16.5.1 Proportion of persons who had at least one contact with a public official and who paid a bribe to a public official, or were asked for a bribe by those public officials, during the previous 12 months

Goal 17: Partnerships for the Goals

17.1.1 Total government revenue as a proportion of GDP, by source

17.17.1 Amount of United States dollars committed to public-private and civil society partnerships

Why should we care about **localizing** the SDGs?

- Most of the SDGs depend on action at the local (urban) level
- SDGs involve both public and private sector action
- Better targeting of causes rather than symptoms
- More focused and prioritized intervention
- Increased accountability of local actors
- Knowledge sharing across local actors

Mike Bloomberg
@MikeBloomberg

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We can’t wait for national governments to act on climate change. For solutions, look to cities. #ClimateofHope

Climate of Hope by Michael Bloomberg and Carl Pope

Cities can’t wait for national governments to act. They must find their own ways to help people protect themselves affordably.” So declares Michael Bloomberg in this i...

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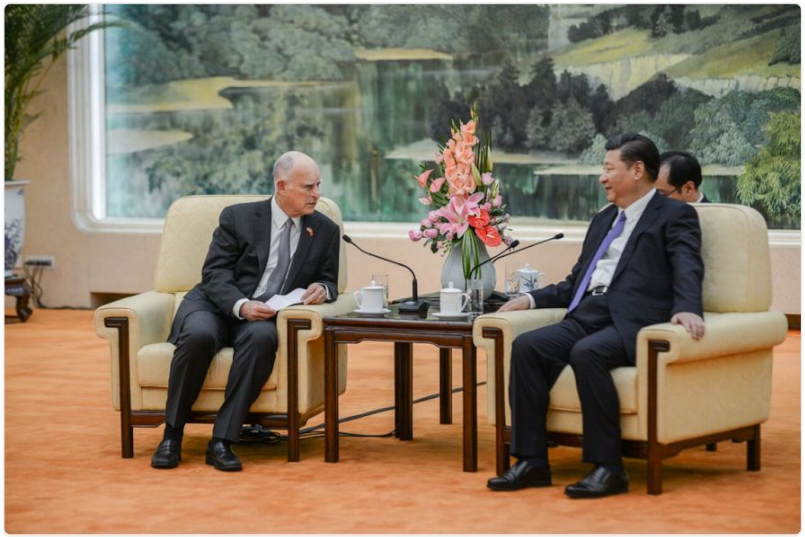

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How do we start **localizing** the SDGs?

- We should begin by identifying the SDG indicators that are more universal across nations, easiest to measure locally, and have the greatest ROI
- Develop “Smart city” architecture with data collaboration by both public and private sector
- Develop a knowledge sharing platform that standardizes SDG localization domestically and internationally, tracks/rewards progress, and documents best practices

Urban development SDG indicators to start with

- Housing and transportation affordability
- Economic productivity
- Resource consumption and CO2 emissions per capita, per business
- Air and water quality indices
- Accessibility measures to key services (healthy food, health services, schools, green space, work) by sustainable modes of transit
- Waste management indicators
- Resilience indicators (TBD)

U.S. National Statistics for the UN Sustainable Development Goals

Click on each goal for U.S. national statistics for Sustainable Development Goal global indicators.

THE GLOBAL GOALS
For Sustainable Development

Reporting Status

Overall Reporting Status 241 indicators

92 Improving measures	80 Exploring data	3 Statistics in progress	66 Reported online
38%	33%	1%	27%

No Poverty 12 indicators

4 Improving measures	5 Exploring data	0 Statistics in progress	3 Reported online
33%	42%	0%	25%

Zero Hunger 14 indicators

5 Improving measures	6 Exploring data	0 Statistics in progress	3 Reported online
36%	43%	0%	21%

Goal 1 - End poverty in all its forms everywhere

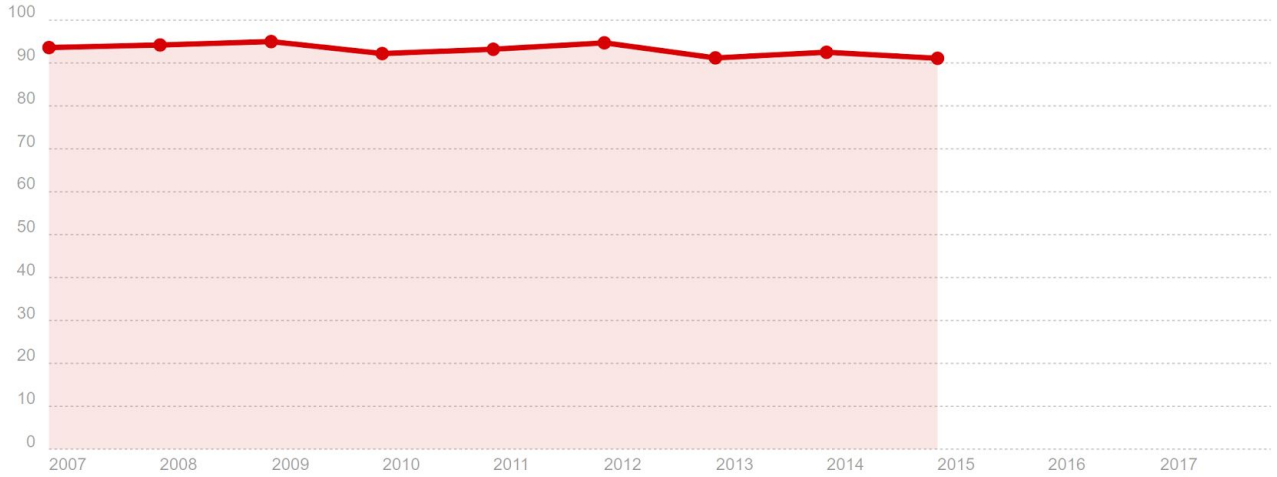
Exploring Data	1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural)
Reported Online	1.2.1 Proportion of population living below the national poverty line, by sex and age
Exploring Data	1.2.2 Proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions
Reported Online	1.3.1 Proportion of population covered by social protection floors/systems, by sex, distinguishing children, unemployed persons, older persons, persons with disabilities, pregnant women, newborns, work-injury victims and the poor and the vulnerable
Improving Measures	1.4.1 Proportion of population living in households with access to basic services
	1.4.2 Proportion of total adult population with secure tenure rights to land, with legally

Goal 3 - Ensure healthy lives and promote well-being for all at all ages

Exploring Data	3.1.1 Maternal mortality ratio
Reported Online	3.1.2 Proportion of births attended by skilled health personnel
Reported Online	3.2.1 Under-five mortality rate
Reported Online	3.2.2 Neonatal mortality rate
Reported Online	3.3.1 Number of new HIV infections per 1,000 uninfected population, by sex, age and key populations
Exploring Data	3.3.2 Tuberculosis incidence per 1,000 population
	3.3.3 Malaria incidence per 1,000 population

Indicator 6.1.1 – Proportion of population using safely managed drinking water services

Percent of US population that receives drinking water from community water systems in compliance with drinking water standards



See metadata tab for sources, definitions, and methodology information

Global Metadata

This table provides information on metadata for SDG indicators as defined by the UNSC. Complete global metadata documentation on all indicators in Goal 6 is provided by the UN Statistics Division.

SDG Indicator Name	Proportion of population using safely managed drinking water services
SDG Target Addressed	By 2030, achieve universal and equitable access to safe and affordable drinking water for all.
Definition of SDG Indicator	Population using a basic drinking water source ('improved' sources of drinking water used for MDG monitoring i.e. piped water into dwelling, yard or plot; public taps or standpipes; boreholes or tubewells; protected dug wells; protected springs and rainwater) which is located on premises and available when needed and free of faecal (and priority chemical) contamination.
	Household surveys and censuses currently provide information on types of basic drinking water sources listed above, and also indicate if sources are on premises. These data sources often have information on the availability of water and increasingly on the quality of water at the household level, through direct testing of drinking water for faecal or chemical contamination. These data will be combined with data on availability and

Limitations of National Reporting Platform

- Frequency of data
- Granularity of data
- Actionability of data

Our Challenge: Develop the data architecture to link the U.S. National Reporting Platform down to local reporting platforms to empower states, metropolitan areas, counties, cities, and neighborhoods to take leadership and collaborate on sustainable development.

Useful Local Scales in the U.S.

Scale	Definition	# in the US	Current Work
State		50	N/A
Combined Statistical Area (CSA)	MSA's with at least 15% employment interchange	166	N/A
Metropolitan Statistical Area (MSA)	Core urban (50,000+) and surrounding areas	389	SDSN U.S. Cities SDG Index (2017)
County	Collection of cities and unincorporated areas with governmental authority	3,144	N/A
City		~20,000	SDSN USA Sustainable Cities Initiative
Zip Code	Postal Codes	~43,000	Berkeley CoolClimate
Census Tract	Average about 4,000 people	~73,000	N/A
Block Group	Collection of blocks; 600-3000 people	~220,000	Stanford SUS Initiative

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SDSN U.S. Cities SDG Index (2017)

Indicator Name	Average of Percentage of Population with Access to Parks		
Dataset Year	2013		
Source	CDC		
Best Value	100	Worst Value	7.56
Description	Percentage of population living within 15 minutes of pedestrian travel to a public park and recreational space		

Indicator Name	Average of PM 2.5 average levels (population weighted)		
Dataset Year	2014		
Source	CDC		
Best Value	6.74	Worst Value	12.98
Description	Average levels of PM 2.5 pollutants over the year for the MSA		

Indicator Name	Ozone levels 8-hr (ppm)		
Dataset Year	2015		
Source	EPA		
Best Value	5.54	Worst Value	9.37
Description	On October 1, 2015, EPA strengthened the ground-level ozone standard to 0.070 ppm, averaged over an 8-hour period. This standard is met at an air quality monitor when the 3-		

Dataset Year	2014		
Source	BLS		
Best Value	20.13	Worst Value	7.69
Description	Percentage of jobs in the Leisure and Hospitality industry as measured by the Bureau of Labor Statistics (as a proxy for tourism). Jobs tables from each BLS region were combined to create a consolidated US Jobs table. Jobs in Leisure and Hospitality were divided by total number of jobs to get percentage value.		

Indicator Name	Carbon Emissions (Tons Per Capita)		
Dataset Year	2014		
Source	EPA		
Best Value	1.7	Worst Value	22.11
Description	Carbon dioxide (CO2) emissions. Zip codes were attributed to MSAs based on the location of their centroid using GIS, and carbon emissions per capita was calculated by averaging the per capita values of each zip code.		

Indicator Name	Green Open Space Per Capita (sq meter)
Dataset Year	2016

52 indicators for 100 most populous MSAs

Source: SDSN

Figure 2: Map of MSAs by Index Score

Figure 3: Dashboard by Census Regions

Region	West South Central	East North Central	East South Central	Middle Atlantic	Mountain	New England	Pacific	South Atlantic	West North Central
No Poverty	31.3	40.7	32.9	48.2	37.6	59.5	36.1	37.8	54.0
Zero Hunger	35.4	42.8	20.8	46.0	42.0	47.2	63.0	29.9	43.4
Good Health & Well-Being	40.4	53.1	31.8	61.4	61.6	78.1	62.8	47.3	58.2
Quality Education	40.7	45.5	42.7	46.2	46.2	55.3	41.0	48.6	49.0
Gender Equality	41.8	26.4	38.6	41.2	35.3	41.5	45.9	47.5	36.5
Clean Water & Sanitation	73.9	54.6	73.1	74.8	75.0	75.4	63.5	69.4	72.5
Affordable & Clean Energy	73.6	67.9	34.3	56.1	93.8	54.6	30.3	41.6	63.6
Decent Work & Economic Growth	55.3	57.2	44.1	56.7	54.5	59.1	47.6	48.1	67.3
Industry, Innovation & Infrastructure	17.2	17.4	8.6	17.2	30.1	17.7	30.3	19.5	20.5
Reduced Inequalities	35.4	24.7	20.3	36.8	55.6	36.6	46.1	31.2	40.9
Sustainable Cities & Communities	44.4	45.5	41.2	47.1	46.6	45.5	39.8	45.3	45.2
Responsible Consumption & Production	48.7	35.5	44.0	49.9	61.5	55.4	59.1	46.0	41.8
Climate Action	19.3	5.6	13.3	16.2	18.6	7.1	26.0	16.1	1.0
Life on Land	65.0	59.0	75.3	59.7	66.7	44.4	57.9	67.7	60.6
Peace, Justice & Strong Institutions	62.3	60.0	41.0	71.8	63.8	75.1	69.8	59.4	65.7
Partnership for the Goals	22.9	28.5	14.7	33.2	42.5	43.8	39.8	33.1	30.6
Overall Index	44.2	41.7	36.1	47.7	52.0	49.8	47.5	43.1	46.9

Source: SDSN

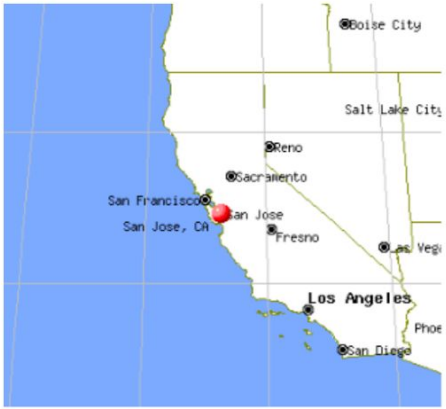
Table 1: The Top 10 U.S. City Regions

Rank	MSA	Index Score
1	Provo-Orem, UT	63.42
2	Urban Honolulu, HI	59.57
3	Albany-Schenectady-Troy, NY	58.85
4	San Jose-Sunnyvale-Santa Clara, CA	57.06
5	Minneapolis-St. Paul-Bloomington, MN-WI	56.71
6	Seattle-Tacoma-Bellevue, WA	55.98
7	Austin-Round Rock, TX	55.94
8	Boston-Cambridge-Newton, MA-NH	55.52
9	Ogden-Clearfield, UT	54.74
10	Salt Lake City, UT	54.63

Table 2: Bottom 10 US MSAs

Rank	MSA	Index Score
91	Bakersfield, CA	35.83
92	Chattanooga, TN-GA	35.6
93	Columbia, SC	35.49
94	Stockton-Lodi, CA	35.44
95	Cleveland-Elyria, OH	34.99
96	Memphis, TN-MS-AR	34.28
97	Augusta-Richmond County, GA-SC	34.01
98	Milwaukee-Waukesha-West Allis, WI	33.54
99	Jackson, MS	31.55
100	Detroit-Warren-Dearborn, MI	30.59

San Jose-Sunnyvale-Santa Clara, CA MSA



Rank: 4
Index Score: 57.06
High Scoring Goals: Goal 1, Goal 6, Goal 3, Goal 9, Goal 16, Goal 17
Population of MSA: 1,976,836
Median Real Personal Income: 57,334
Gross Metropolitan Product Growth Rate: 7.5%
GINI: 0.46

Source: SDSN

Useful Local Scales in the U.S.

Scale	Definition	# in the US	Current Work
State		50	N/A
Combined Statistical Area (CSA)	MSA's with at least 15% employment interchange	166	N/A
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City		~20,000	SDSN USA Sustainable Cities Initiative
Zip Code	Postal Codes	~43,000	Berkeley CoolClimate
Census Tract	Average about 4,000 people	~73,000	N/A
Block Group	Collection of blocks; 600-3000 people	~220,000	Stanford SUS Initiative

USA Sustainable Cities Initiative

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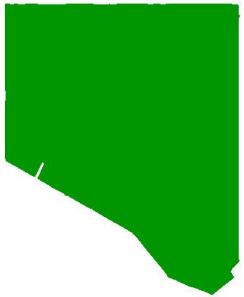
New York City, New York



Baltimore, Maryland

San Jose, California

	NYC	Baltimore	San Jose
Population	8.4 million	620,000	1.0 million
Population Density	28,000/sqmi	7,700/sqmi	5,700/sqmi
Jobs/Employed Residents Ratio	1.1	1.5	0.86
Work in another city	8.4%	38%	50%
Commute by single occupant vehicle	22%	70%	77%
Adult obesity rate	15%	32%	19%
Household median income	$52,000	$42,000	$81,000
Monthly housing costs	$1300	$980	$1700
Poverty	21%	23%	13%
Property tax per resident	$1500	$900	$290
Government full-time employees	390,000	24,000	4,700

GLOBAL VISION | URBAN ACTION

A City with Global Goals

VISION 1: Growth

Goal 1

NYC will have the space and assets to be a global economic leader and grow quality jobs across a diverse range of sectors.

- Increase the share of private sector jobs in innovation industries from 15% today to 20% in 2040.
- Spur more than 4.9 million jobs by 2040.
- Increase median household income.
- Continue to outperform the national economy, measured by growth in NYC gross city product versus US gross domestic product.

Goal 1 Initiatives

1. Maintain New York as the global capital for innovation by supporting the creation and affordability of the kinds of space that high-growth, high-value industries need.
2. Make triple-bottom line investments in infrastructure and cityowned assets to capture economic, environmental, and social returns.
3. Foster an environment in which small businesses can succeed.

Goal 2

NYC will have a workforce equipped with the skills needed to participate in the 21st century economy.

- Increase workforce participation rate from current rate of 61%.
- Increase the number of individuals receiving City-sponsored, industry focused training each year to 30,000 by 2020.
- Increase the number of NYC public school graduates attaining associate's or bachelor's degrees.

Goal 2 Initiatives

1. Train New Yorkers in high-growth industries, creating an inclusive workforce across New York City.
2. Leverage OneNYC investments in housing and infrastructure to train and employ New Yorkers of all skill levels.
3. Ensure that all New York City students have access to an education that enables them to build 21st century skills through realworld and work-based learning experiences.
4. Increase postsecondary attainment.

Source: NYC

Alignment across national, MSA, city work so far

National Reporting Platform	SDSN U.S. Cities SDG Index	OneNYC	Baltimore SCI Indicators	San Jose SCI Indicators (Proposed)
261 official SDG indicators, 66 reported	**52 unofficial SDG indicators** for 100 most populous MSAs	**69 unofficial SDG indicators** specific to New York City (developed by Mayor's Office)	**55 unofficial SDG indicators** specific to Baltimore (developed by University of Baltimore)	**35 unofficial SDG indicators** specific to San Jose (proposed by San Jose State University)

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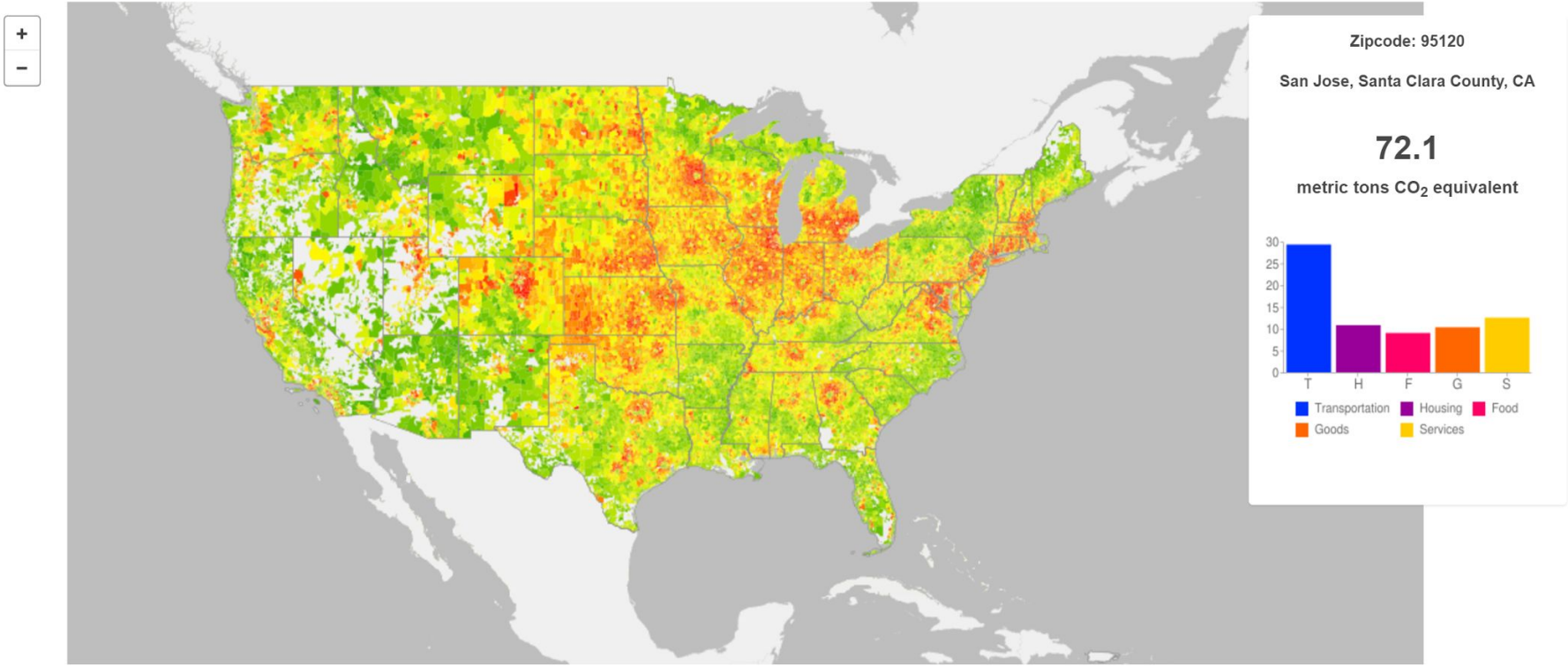
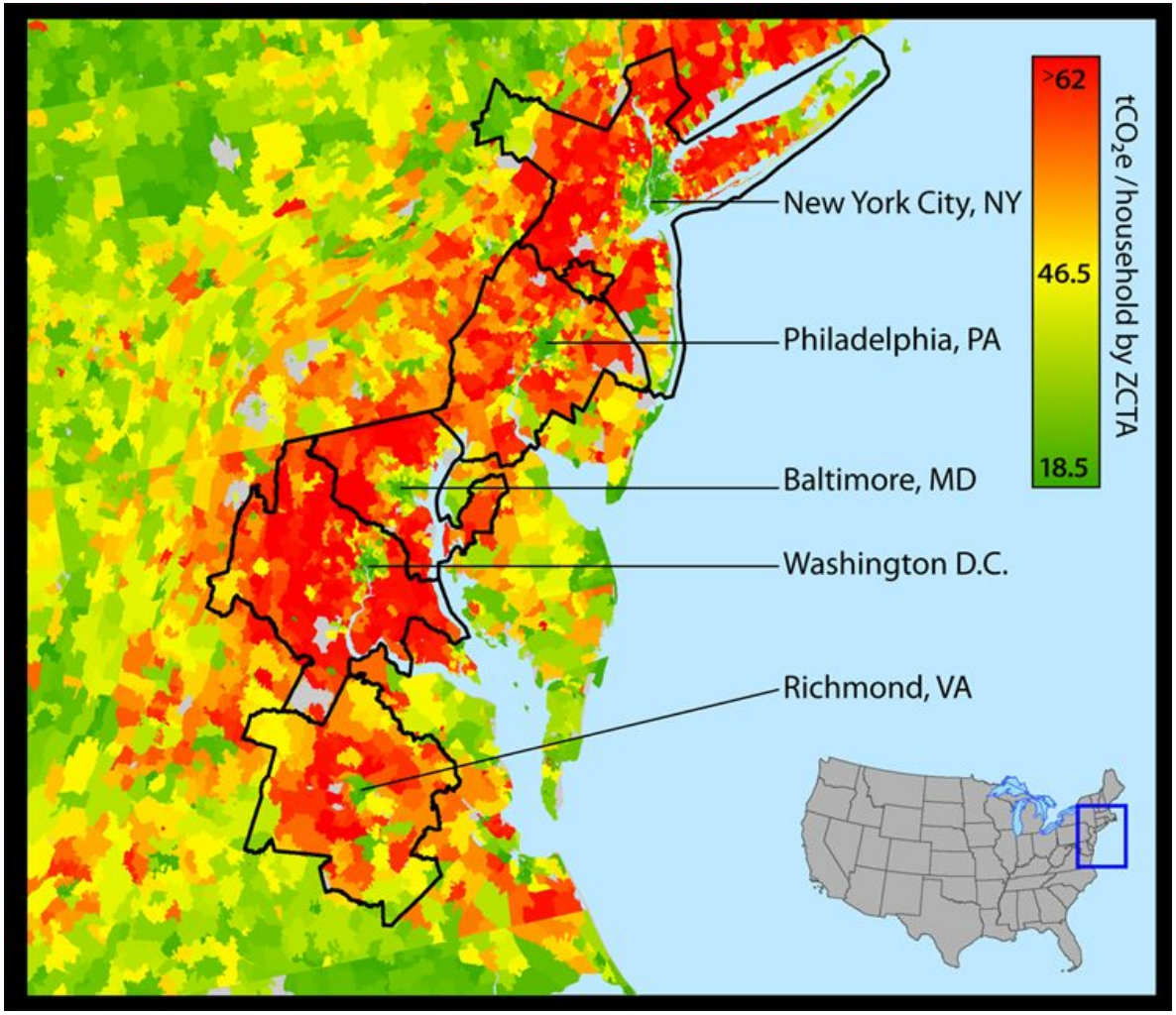
Berkeley CoolClimate Maps

Average Annual Household Carbon Footprint by Zip Code

Double click to zoom or drag map to any location. Hover for details.



Source: UC Berkeley



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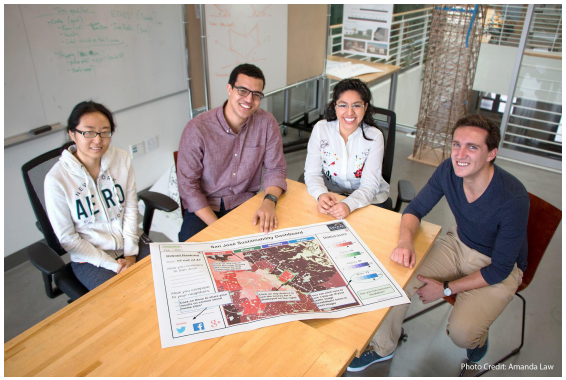
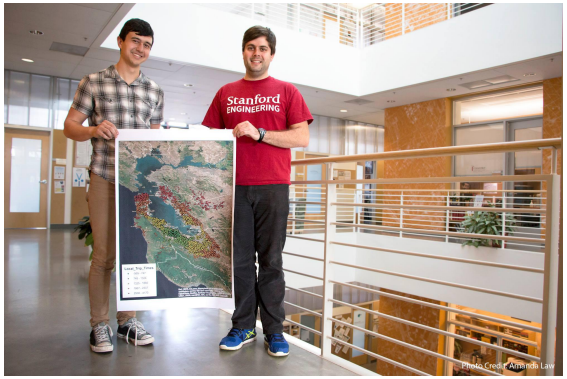
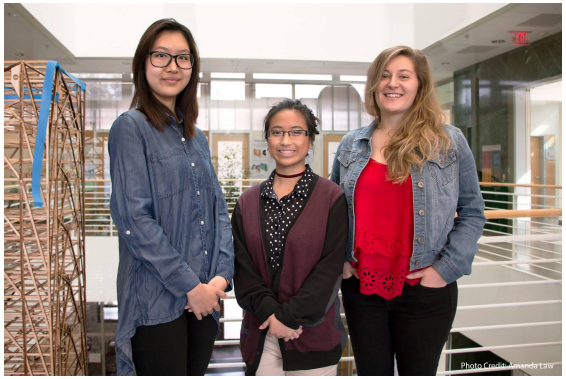
Sustainable Urban Systems Initiative

- Future research program
  - Quality of Life
  - Finance
  - Integrated Systems
  - Resilience
  - Digital Security
- Education program
  - Master of Science
  - Project-based learning
  - Interdisciplinary
  - Practical work (SDG)



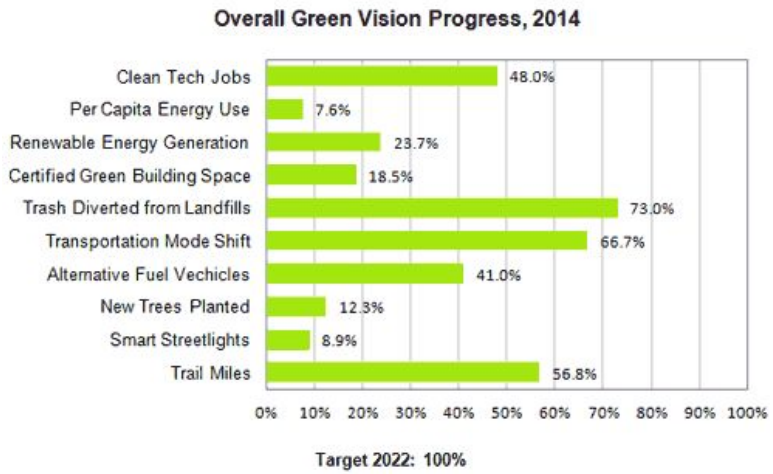




ENVISIONSAN JOSE2040

Environmental Sustainability Plan (2017)

San José Green Vision

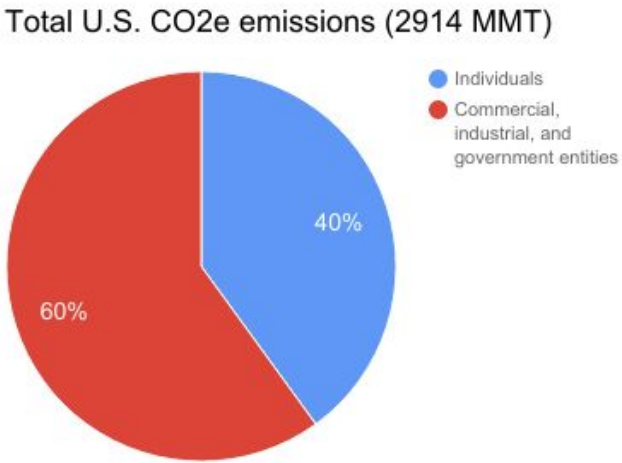


San José Smart City Vision

MY BROTHER'S KEEPER
MBK


1 NO POVERTY IN San Jose
2 ZERO HUNGER IN San Jose
3 GOOD HEALTH AND WELL-BEING IN San Jose
4 QUALITY EDUCATION IN San Jose
5 GENDER EQUALITY IN San Jose
6 CLEAN WATER AND SANITATION IN San Jose
7 AFFORDABLE AND CLEAN ENERGY IN San Jose
8 DECENT WORK AND ECONOMIC GROWTH IN San Jose
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE IN San Jose
10 REDUCED INEQUALITIES IN San Jose
11 SUSTAINABLE CITIES AND COMMUNITIES IN San Jose
12 RESPONSIBLE CONSUMPTION AND PRODUCTION IN San Jose
13 CLIMATE ACTION IN San Jose
14 LIFE BELOW WATER IN San Jose
15 LIFE ON LAND IN San Jose
16 PEACE AND JUSTICE STRONG INSTITUTIONS IN San Jose
17 PARTNERSHIPS FOR THE GOALS IN San Jose
THE SAN JOSE GOALS
For Sustainable Development

San Jose's Environmental Sustainability Plan (Fall 2017) will focus on top-down strategies



But holistic strategies must acknowledge the responsibility of multiple stakeholders

1 ***Raise Awareness***

2 ***Inspire Change***

3 ***Motivate Action***

How can we engage citizens directly in the Sustainable Development Goals?

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

PG&E

Cal

Total City-Wide Emissions

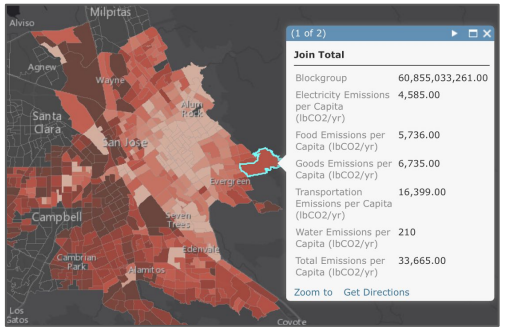
Electricity | Food | Transportation | Goods

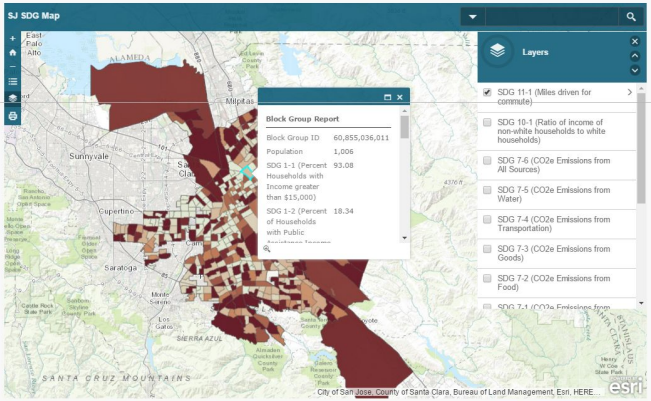
Blockgroup Level Proxy Data

Electric Utility Payments | Annual Beef Purchases | Annual Gas and Airfare Purchases | Annual Apparel Purchases

SimplyMap®
Powerful Data, Professional Results

Emissions per Capita in each Blockgroup





Want to view your neighborhood's progress on the Sustainable Development Goals?

Take a look at one of these pages dedicated to each of the ten districts in San Jose.

- District 1
- District 2
- District 3
- District 4
- District 5
- District 6
- District 7
- District 8
- District 9
- District 10

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CITY OF SAN JOSE CAPITAL OF SILICON VALLEY

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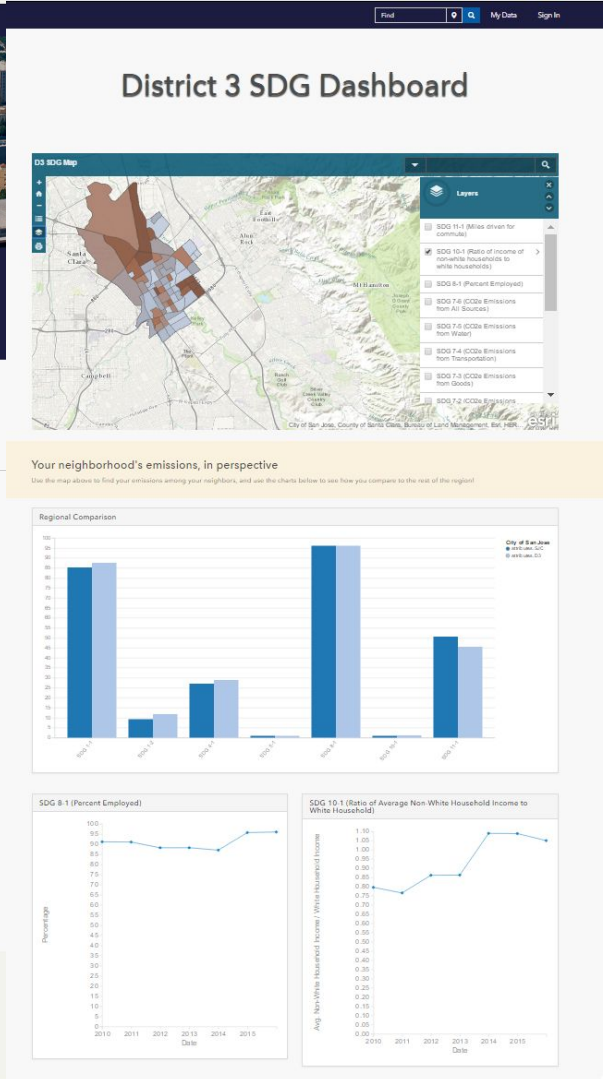
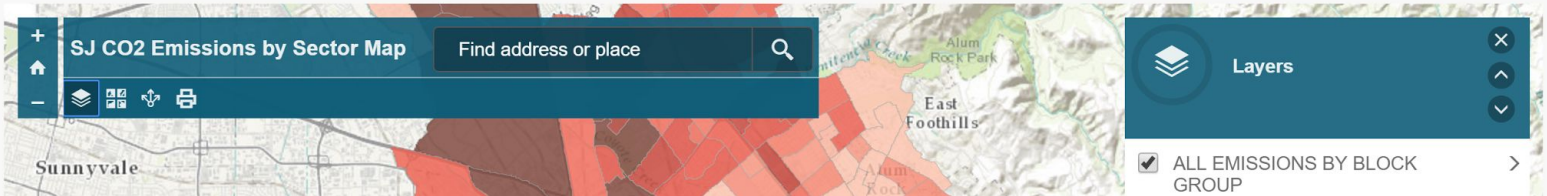
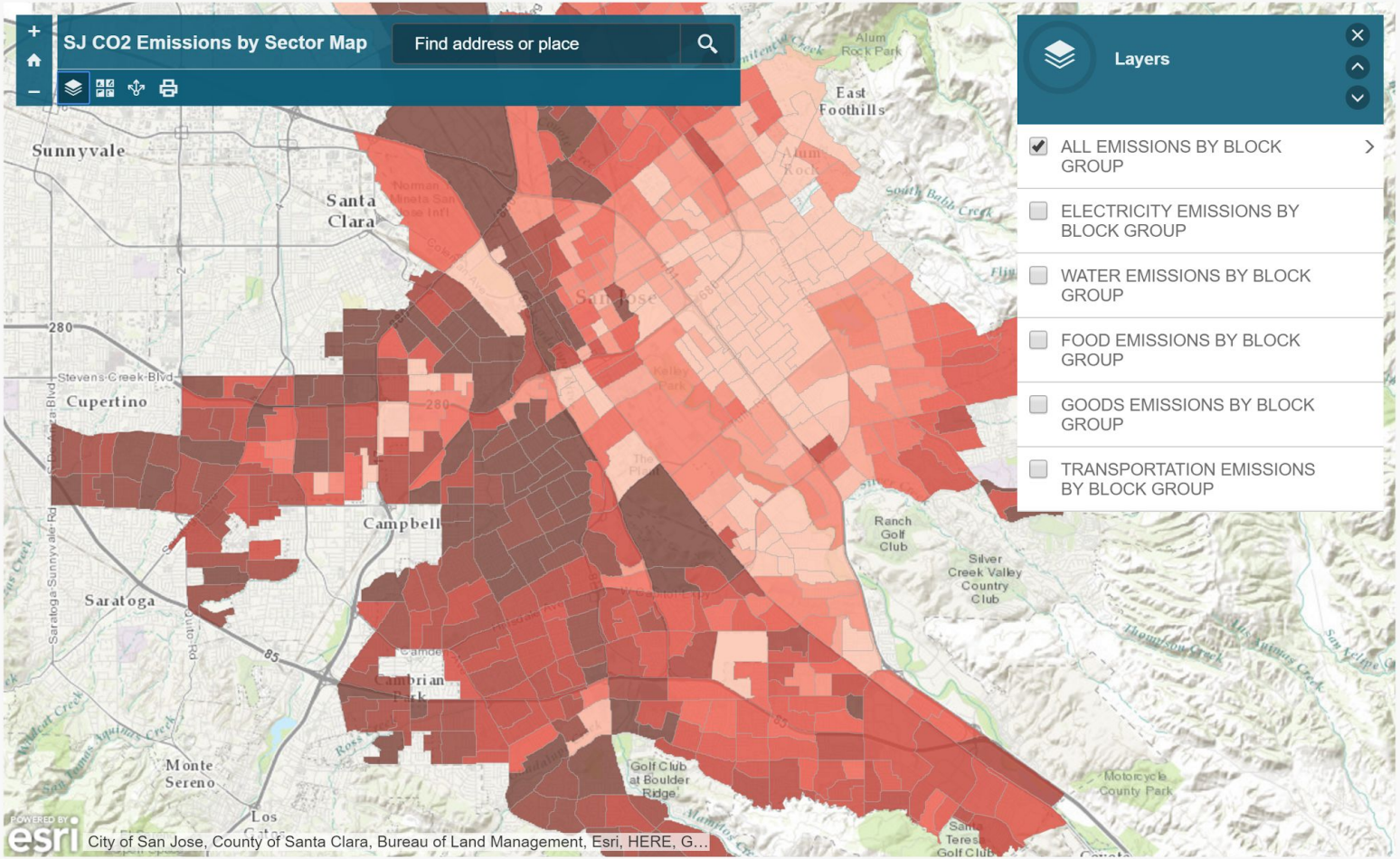


Using ESRI's Open Data Site platform, we prototyped a version of the SDG dashboard for San Jose. *(left)* Landing page for the dashboard, showing citywide map with options for the different indicators. (*right*) Page designed for District 3, showing comparative charts.

SDG Dashboard for San José

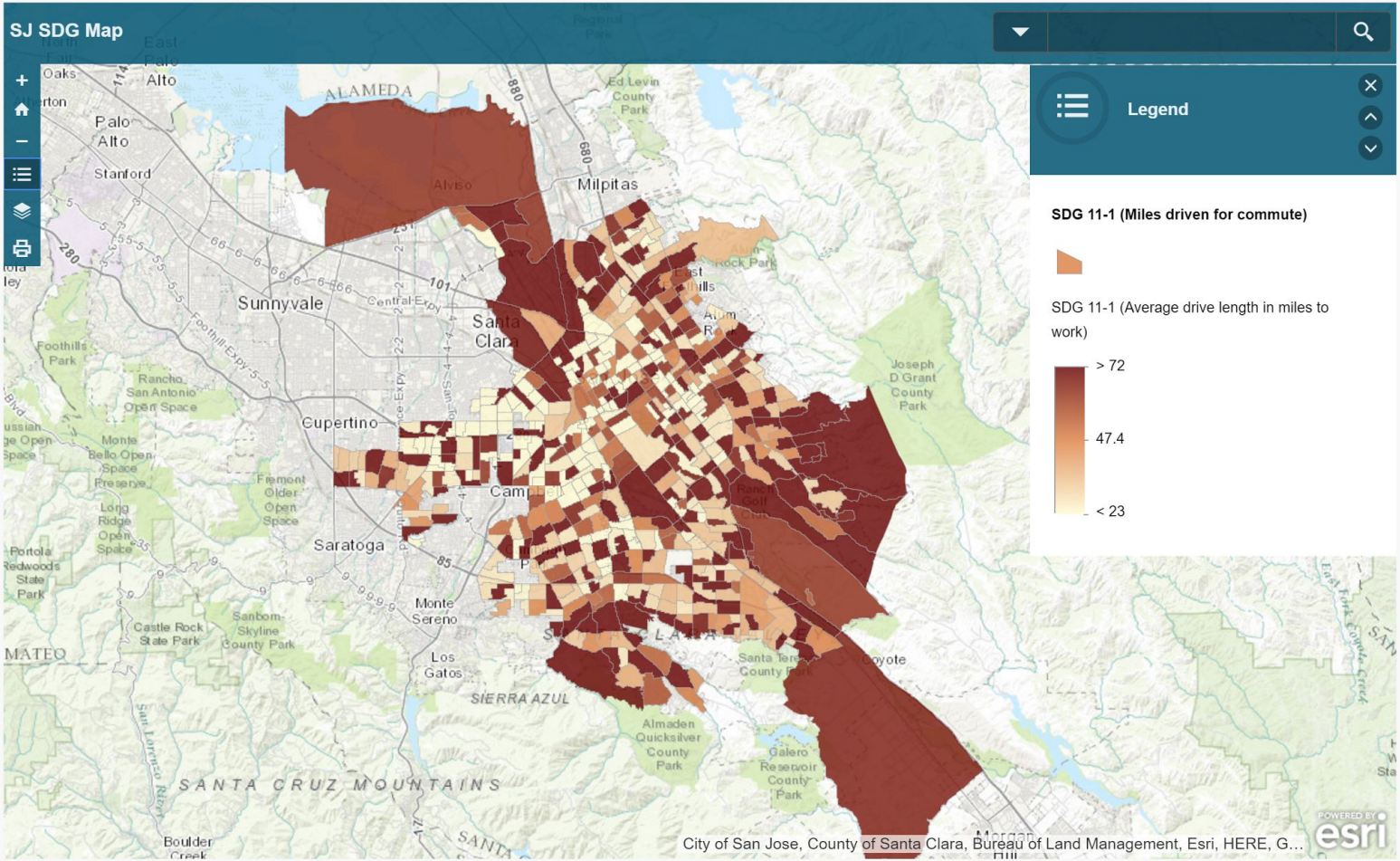
This is a preliminary draft of a sustainability dashboard which the Stanford Sustainable Urban Systems Initiative is developing for the City of San José, as part of the USA Sustainable Cities Initiative. A team of Stanford students is currently working with community leaders in District 3 to receive user feedback. All the data and interface design shown is preliminary. Please contact Lecturer Derek Ouyang at douyang1@stanford.edu if you have any questions.





Average Total Emissions (lbs per capita)

Total Residents in San José



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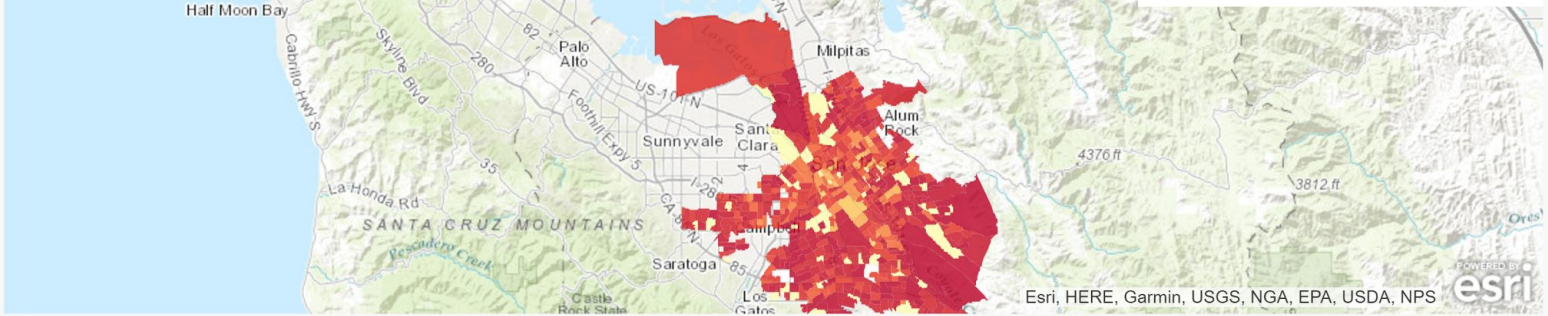

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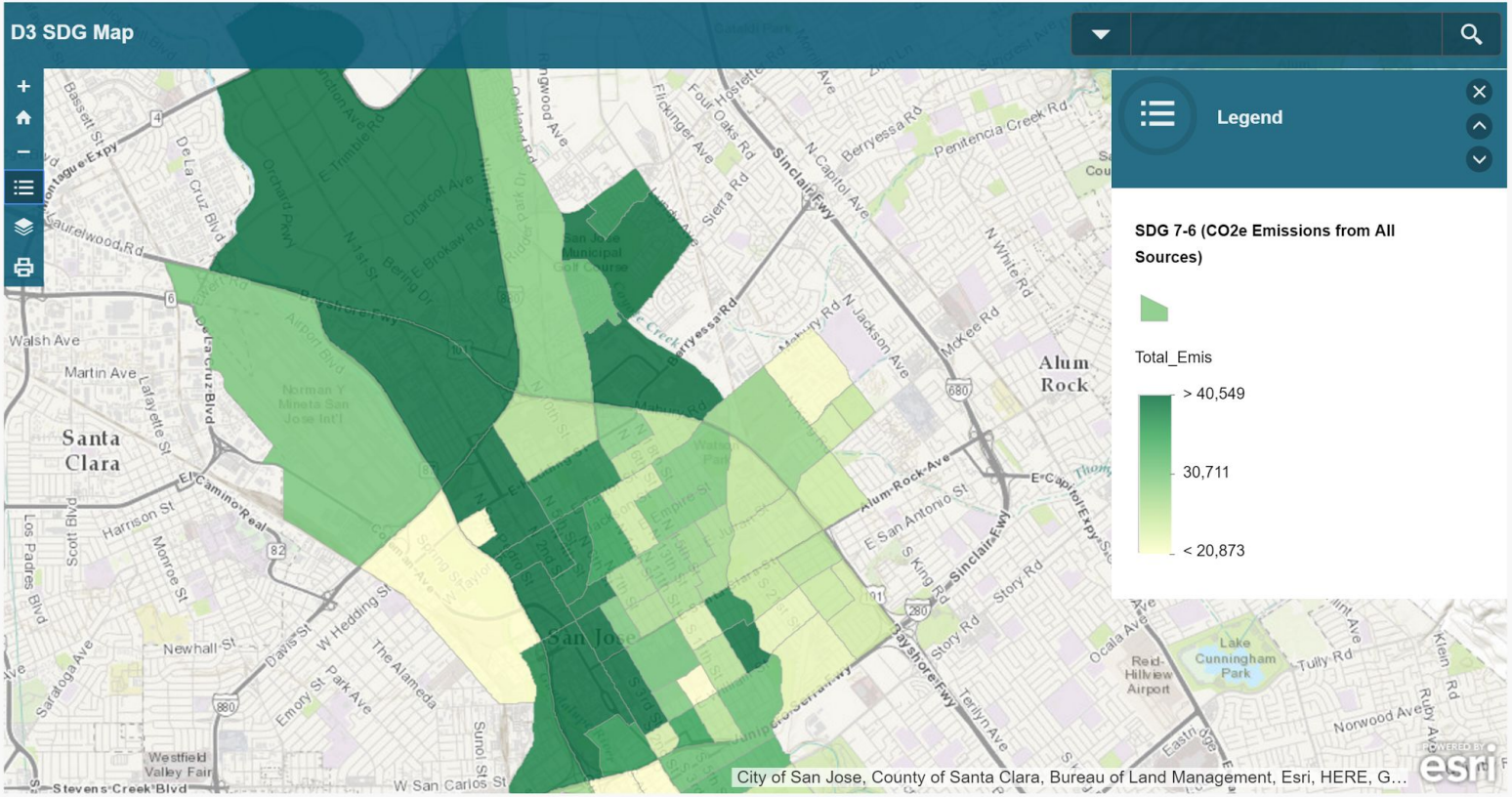
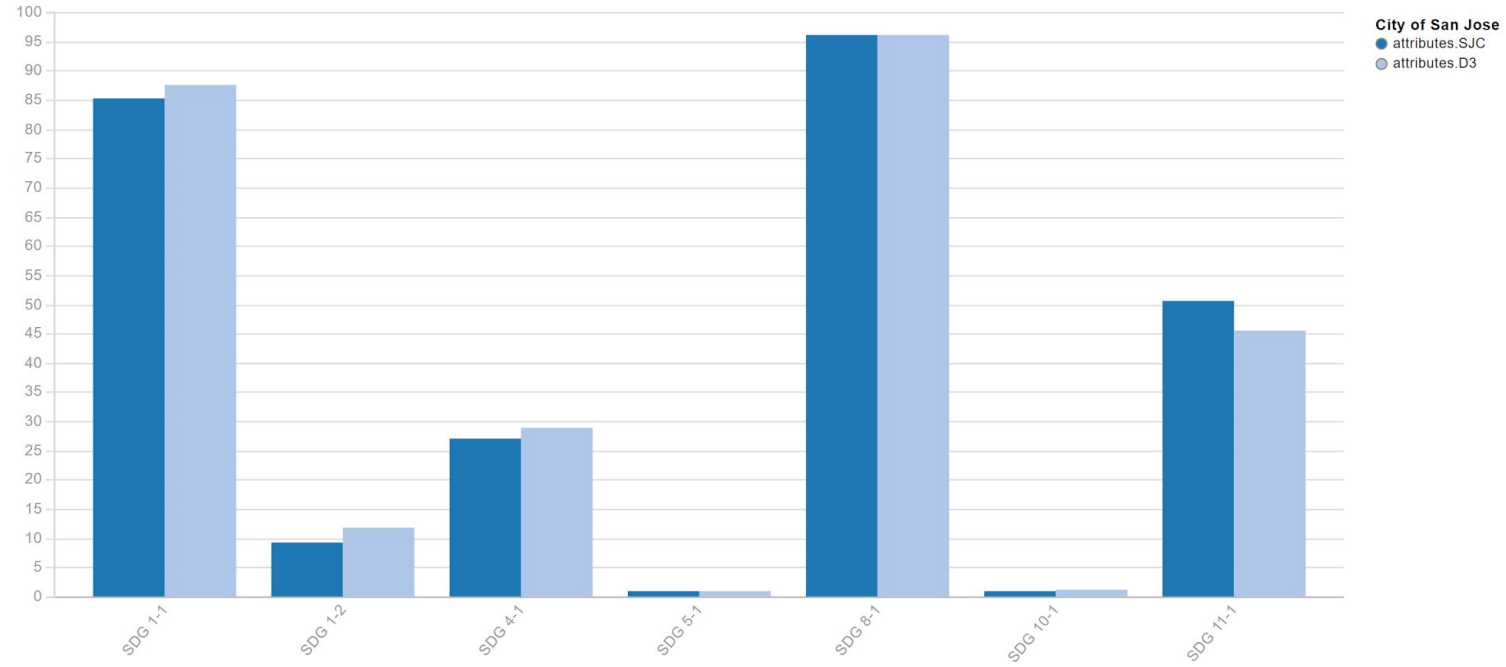
District 3 SDG Dashboard



Your neighborhood's emissions, in perspective

Use the map above to find your emissions among your neighbors, and use the charts below to see how you compare to the rest of the region!

Regional Comparison

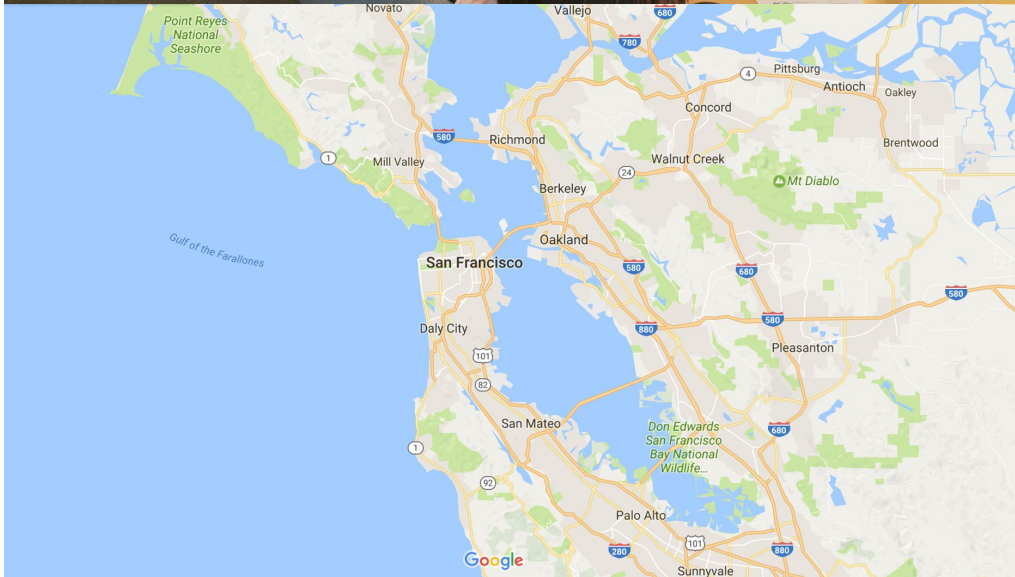


Key Challenges

- Understanding the neighborhood level data landscape
  - **Utility data difficult to obtain but valuable for energy and water indicators**
- Distinguishing different audiences for different data
  - **Governments vs. businesses vs. NGOs vs. residents**
- Understanding community data literacy and needs
- Data interoperability across multiple data owners
  - **From national reporting platform to local reporting platform**
  - **Value of academic institutions as data repository and management**
- Embedding data into decision-making and operations
- Scaling localized data platforms to other cities

SUS Next Steps

- Continue needfinding and design iteration with government and community stakeholders in San Jose's District 3
- Expand scope to include more metrics, more SDGs, more scales, and the entire Bay Area



Building an SDG Data Dashboard for **The California Bay Area**

Derek Ouyang (douyang1@stanford.edu), Lecturer, Stanford University
2017 ADB Asian Leadership Program - Session 7
Tokyo, Japan -- June 29, 2017

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