

Higher Education Sustainability Initiative - Stanford University

1. Overview - Sustainability at Stanford
2. Overview - SUS Project-Based Learning
3. Past SDG Work - San José, CA Sustainability Dashboard
4. Current SDG Work - Chinatown, SF
Sustainability Dashboard
5. Long-term Vision - Bay Area SDG Dashboard
6. Upcoming Work - Bay Area Resilient by Design



DEREK OUYANG
LECTURER, STANFORD

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



Overview - Sustainability at Stanford



Slides from Sara-Katherine Coxon, Office of Sustainability

Sustainable Stanford: A Balanced approach



Infrastructure & Systems

ENERGY

WATER

WASTE

TRANSPORTATION

BUILDINGS



Behavior & Education

ANALYSIS

CONSERVATION PROGRAMS

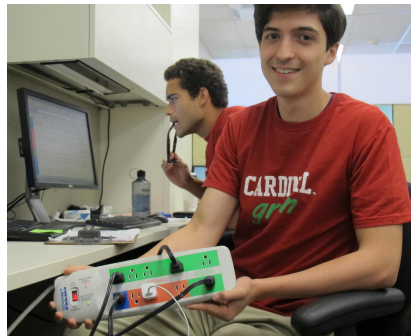
EVALUATION

COMMUNICATION

TRAINING & EDUCATION

Ideas into Action: Engaging Students in Campus Sustainability

- ❖ **Seasonal Conservation Campaigns** focus on conserving water, energy, and reducing waste
- ❖ **Annual Earth Day Festival** brings together campus sustainability partners to showcase efforts for students, staff and faculty
- ❖ **Sustainable Stanford Internship Program** connects student with ongoing campus sustainability projects
- ❖ **Year-Round Trainings** educate members of the campus community on energy efficiency, waste reduction, and planning green events
- ❖ **My Cardinal Green** individual action platform incentivizes small actions with a big impact



My Cardinal Green: Rewarding Individual Actions

Launched in May 2017, this new program offers a range of small but impactful sustainability actions, tailored to each user's lifestyle.

- ❖ Provides tangible steps one can take to reduce their environmental footprint, based on their role on campus (e.g., building manager, student, event planner)
- ❖ Connects users to campus programs, information and resources on sustainable energy use, water, transportation, food, waste, purchasing and campus life
- ❖ Tracks energy and cost savings on a user-friendly online dashboard





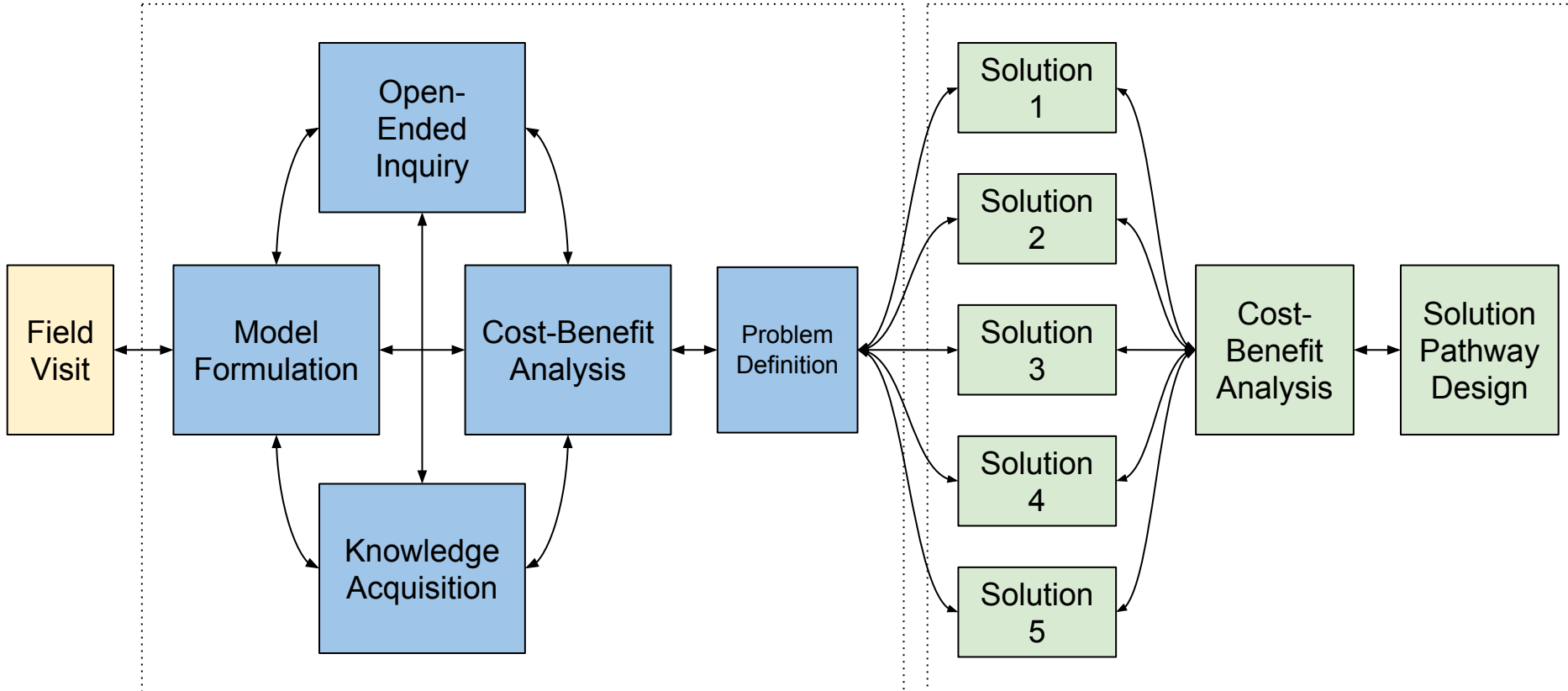
Overview - SUS Project-Based Learning

Stanford | ENGINEERING
Sustainable Urban Systems Initiative

SUS Project-Based Learning Methodology

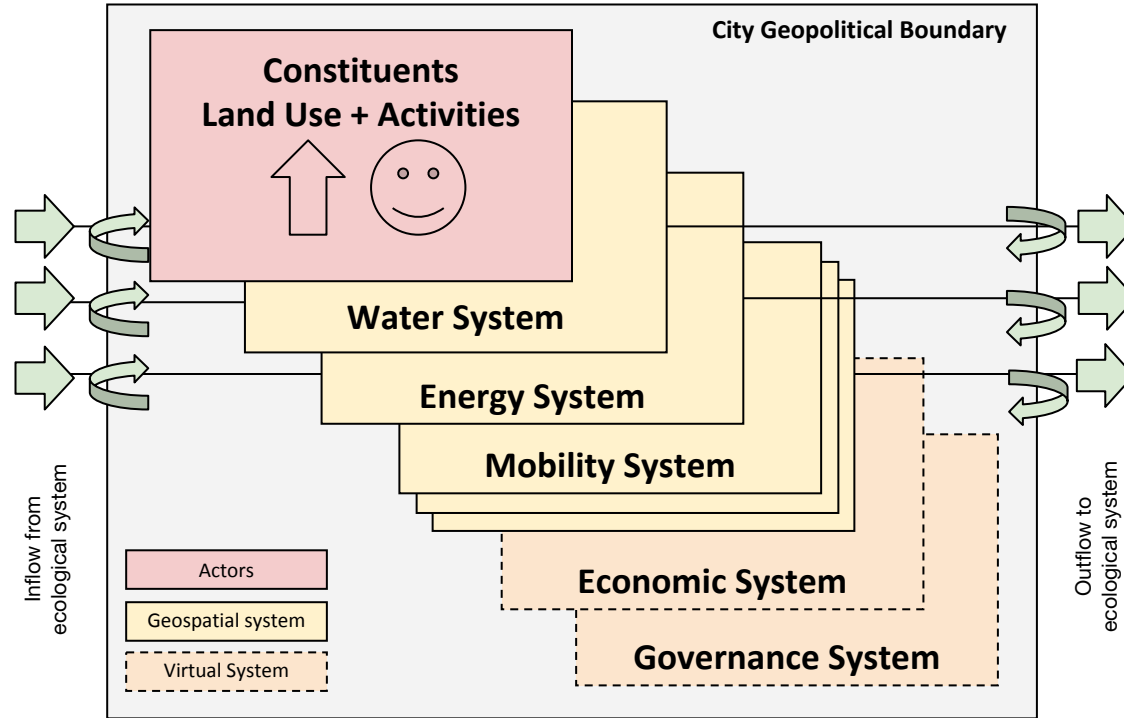
Problem Definition

Problem Solving

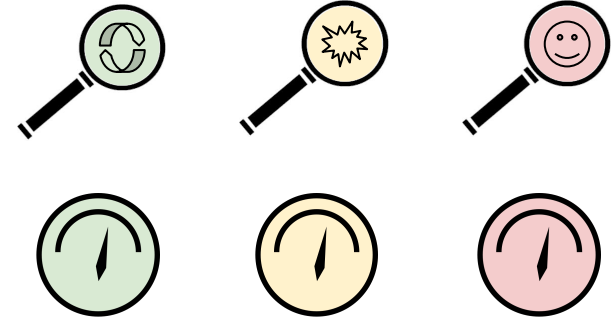


Model Formulation in SUS

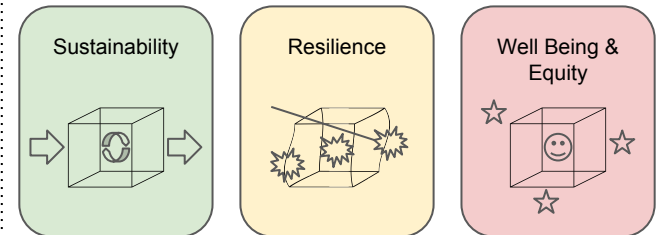
Data / Blueprint of Infrastructure



Dashboard of Indicators



Roadmap of Goals





Past SDG Work - San José, CA

Sustainability Dashboard

Stanford | **ENGINEERING**
Sustainable Urban Systems Initiative

Data Methodology for Carbon Emissions Indicator (SDG 9)



Total City-Wide Emissions

Electricity

Food

Transportation

Goods

Emissions per Capita in each Blockgroup

Blockgroup Level Proxy Data

Electric Utility Payments

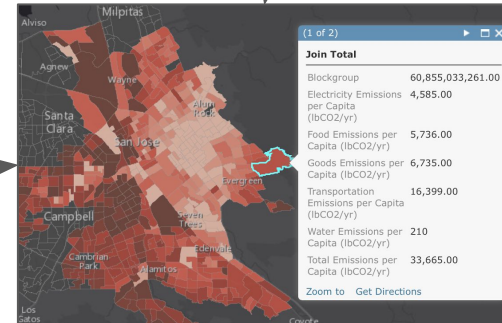
Annual Beef Purchases

Annual Gas and Airfare Purchases

Annual Apparel Purchases



**Additional
SDG
Indicators**





Current SDG Work - Chinatown, SF Sustainability Dashboard

Stanford | ENGINEERING
Sustainable Urban Systems Initiative

Sustainable Chinatown Dashboard Indicators

Performance Area

Indicators

PEOPLE & PLACE

Demographics

- Age of residents
- Race of residents
- % of population linguistically isolated
- % Foreign born

Economic Prosperity

- % of households living in poverty
- Household income
- Educational attainment of residents
- Unemployment rate

Health

- Preventable hospitalizations

Land Use & Affordable Housing

- Land Use
- Permanently affordable rental housing stock
- Non-permanent affordable rental housing stock
- Private building typology
- % owner/renter
- Excessive rent burden
- Residential housing violations
- Overcrowding

Safety

- Violent crimes

Transportation

- Mode share
- Level of service and quality of major transit lines
- Traffic injuries

Usage and Sources

- Energy use per capita
- Energy use intensity
- Electricity sources mix

Local Renewables

- Solar potential
- Renewable energy installations

Climate Change

- Greenhouse Gas (GHG) emissions from buildings & transportation

Usage

- Residential potable water consumption per capita per day
- Gross Potable Water Use per capita per day

Diversion

- Total waste collected
- Diversion rate (% of waste composted, recycled, landfilled)

Access

- Neighborhood open space
- Tree canopy
- Impermeable ground surfaces

Quality & Use

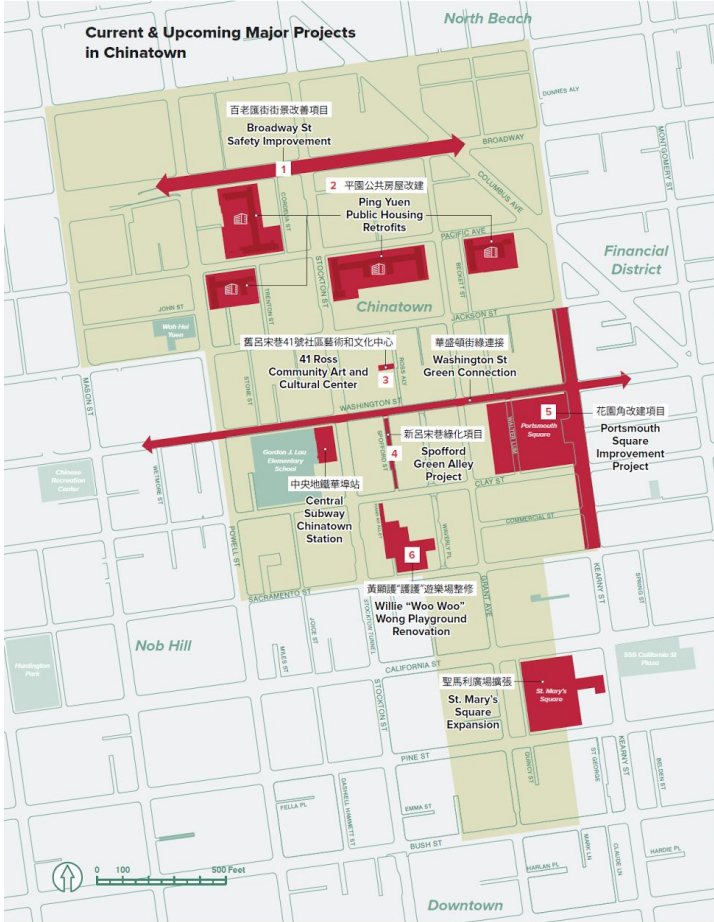
- Frequency & types of uses (from potential public life study in the future)

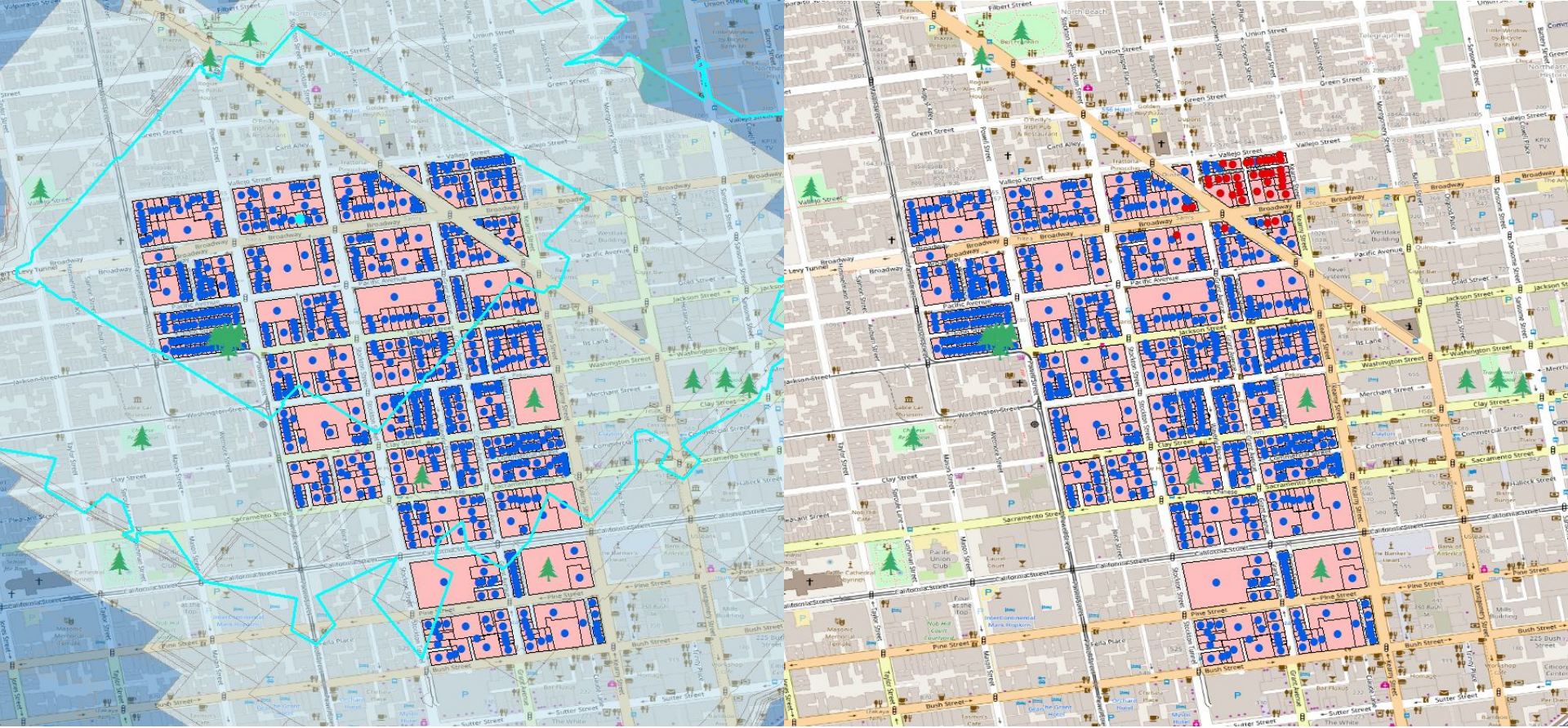
ENERGY

WATER

WASTE

URBAN ECOLOGY & PUBLIC REALM





Network Analyst was used to calculate walking radii from each parcel in Chinatown and identify which parcels (red on right) cannot access a park within 5 minutes of walking.



Long-term Vision - Bay Area SDG Dashboard

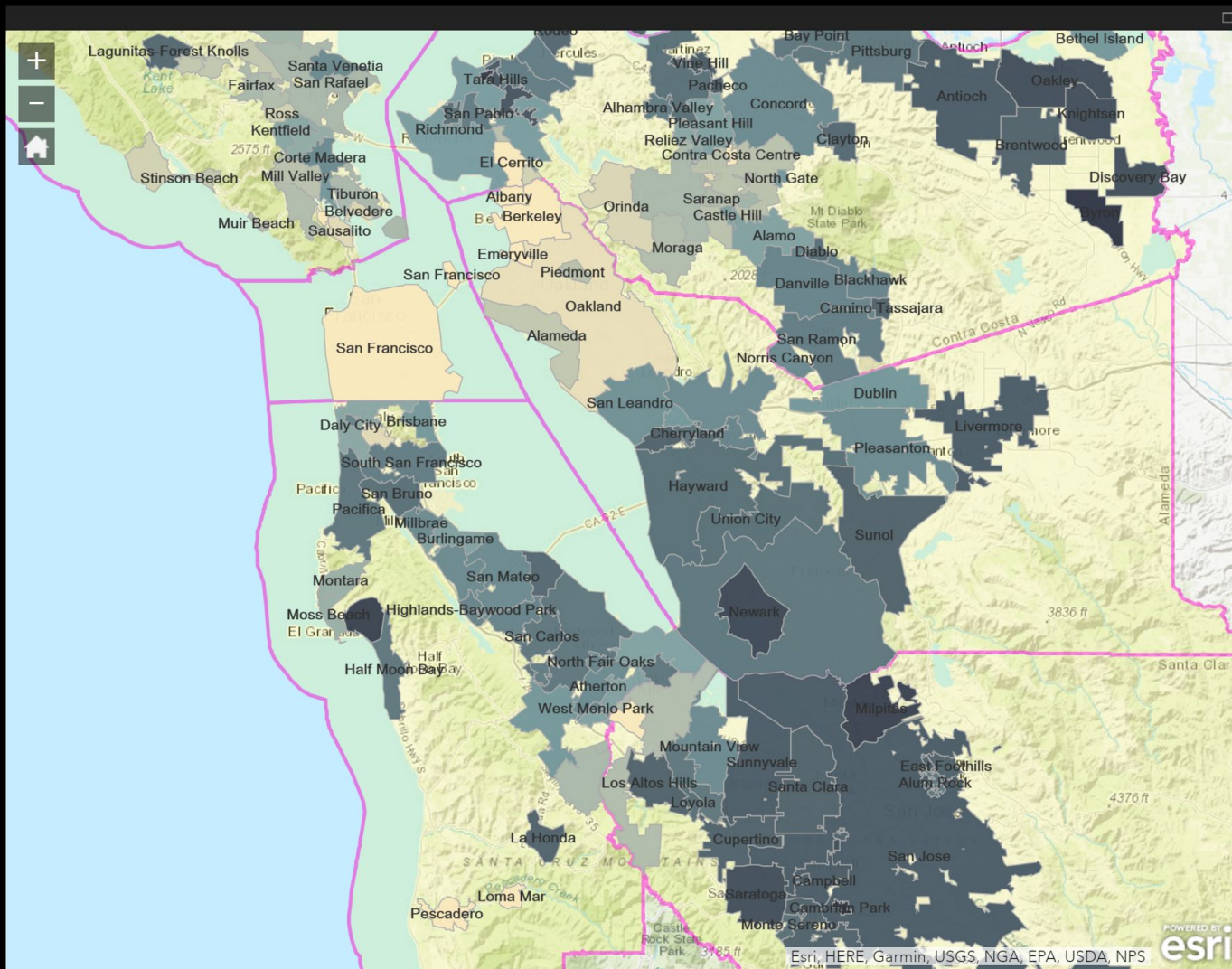
Stanford | **ENGINEERING**
Sustainable Urban Systems Initiative

Bay Area SDG Coverage as of July 2017



41 metrics total

sus.stanford.edu/sdg



Layer List

3. - 2016 Mortality Index

...

4.3.1. - 2016 Fraction Enrolled in School

...

4.c.1. - 2016 Number of Employees in Educational Services

...

5.4.1 - 2016 Fraction of Women in Management Positions

...

7.2.1. - Fraction of Home Heating from Solar

...

8.5.2. - 2016 Fraction of Men Unemployed

...

8.5.2 - 2016 Fraction of Women Unemployed

...

8.5.2. - 2016 Fraction Unemployed

...

☒ 9.1.2. - 2016 Fraction taking Private Vehicle to Work

...

9.5.1. - Number of Businesses in Scientific R&D

...

11.2.2. - 2016 Fraction taking Public Transit to Work

...

12.2.2. - Consumer Expenditures Household Average

...

16.1.3. - 2012 Violent Crime Rate per 100K

...

17.8.1. - 2016 Fraction with Internet Access

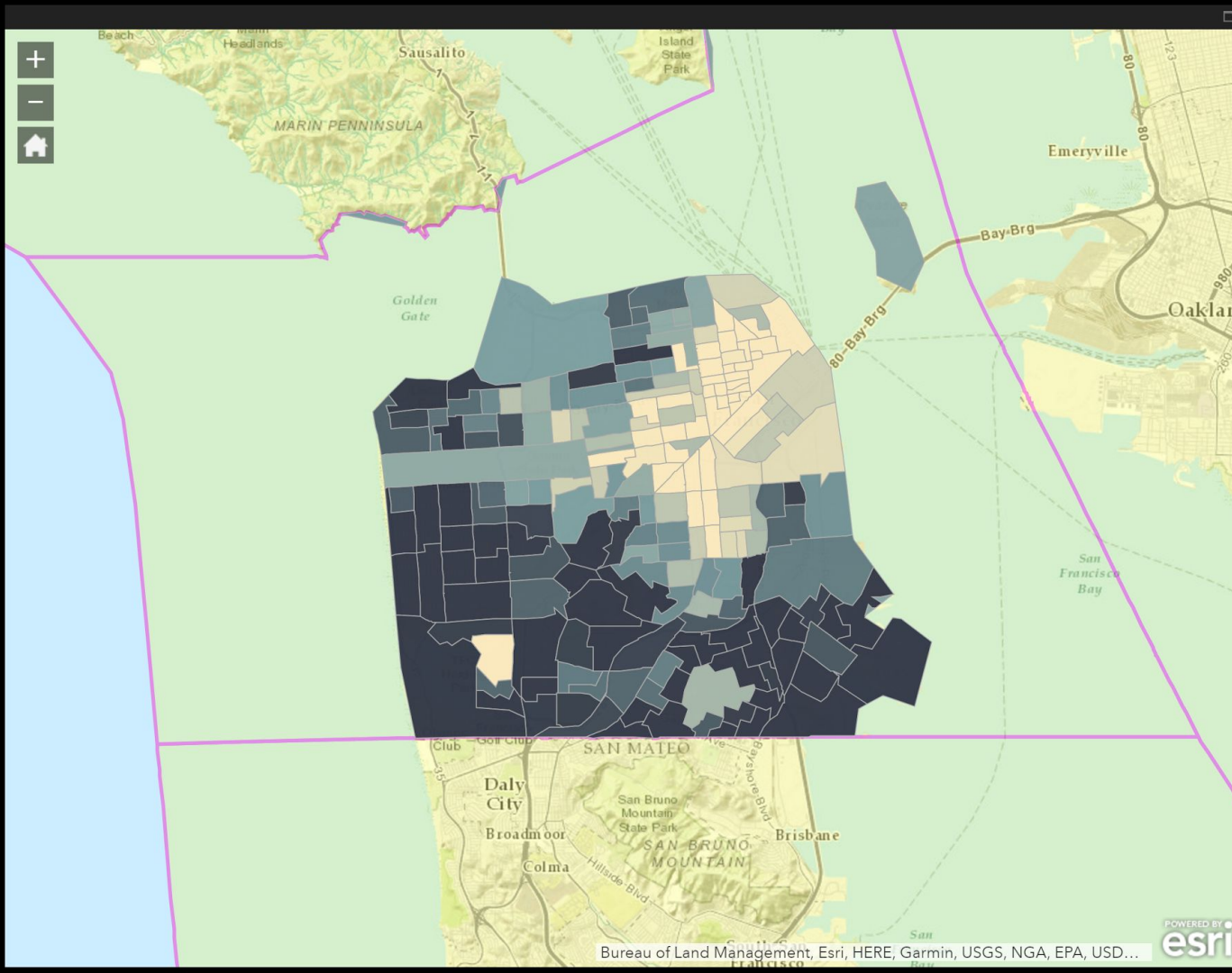
...

EmpVehicle

> 0.94

0.783

< 0.62



About

California Bay Area SDG Dashboard

This is a DRAFT dashboard visualizing the California Bay Area's performance on the Sustainable Development Goals, developed by students in Stanford University's Sustainable Urban Systems Initiative. The team compiled a list of indicators, some official and others newly constructed, across many of the SDGs and at multiple spatial scales (county, city, and census tract level), demonstrating the diversity of sustainable development outcomes across the Bay. Next steps include the

Layer List

11.2 - 2016 Fraction taking Private Vehicle to Work ***

EmpVehicle

> 0.6

0.438

< 0.27

Chart

Options

Chart Results

Santa Clara County, CA

San Francisco County, CA

Marin County, CA

Alameda County, CA

0 0.2 0.4 0.6 0.8 1

Clear



RESILIENT

BAY AREA CHALLENGE

BY

DESIGN

Building Regional Momentum

Upcoming Work - Bay Area Resilient by Design

Stanford | ENGINEERING
Sustainable Urban Systems Initiative

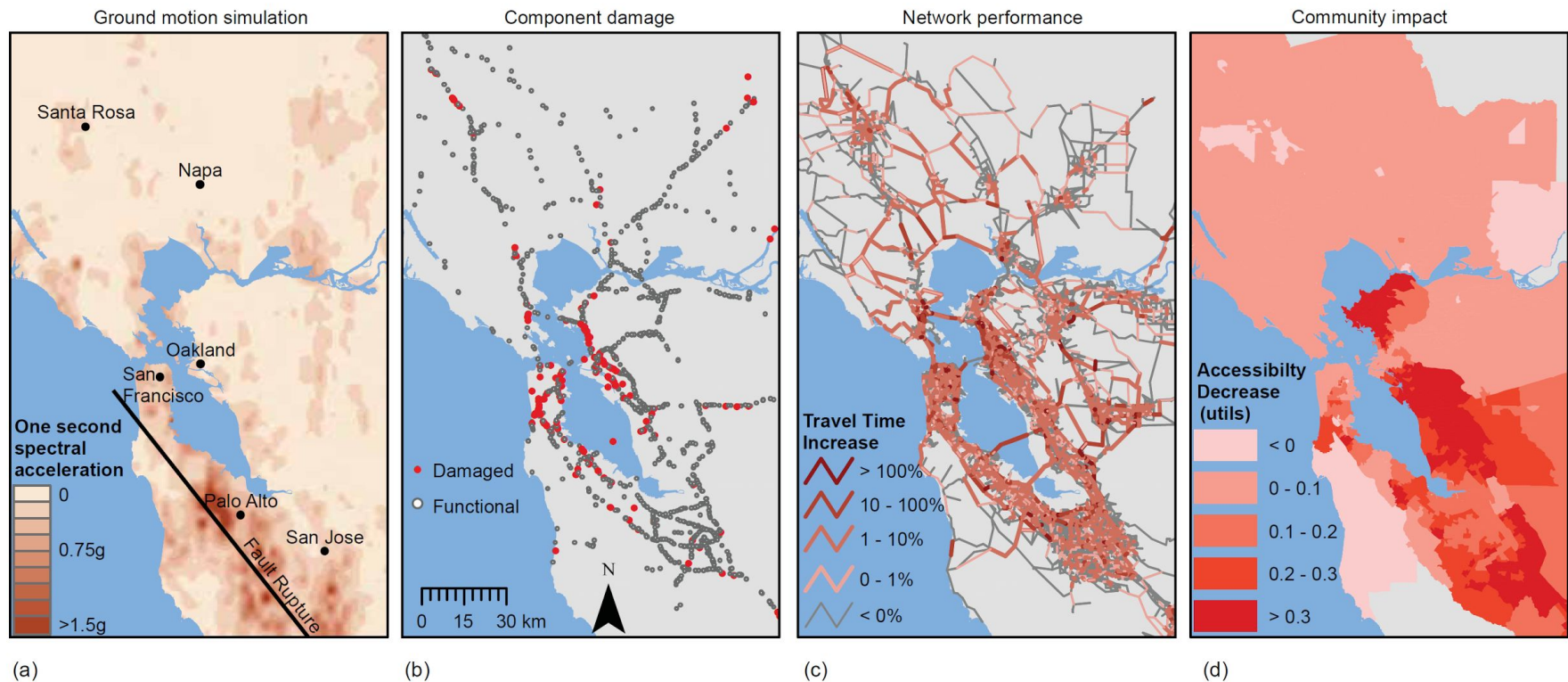


Figure 2: Illustration of the risk framework for one earthquake event including a) earthquake rupture and one-second spectral acceleration (ground motion intensity) map, b) bridge (component) damage map, c) map of travel time increase (network-performance measure) values and d) map of average accessibility decrease per travel analysis zone.

Miller, M., and Baker, J. W. (2016). "Coupling mode-destination accessibility with a quantitative seismic-risk assessment to identify at-risk communities." *Reliability Engineering and System Safety*, 147, 60–71.