LA100

The Los Angeles 100% Renewable Energy Study

Environmental Justice

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September 19, 2019

LA DWP Los Angeles Department of Water & Power | NREL Transforming ENERGY

Overview

- Recap and background
  - Recap of prior AG presentation on Environmental Justice
- Cal EnviroScreen metrics and methods
  - Designation of EJ neighborhoods
- Approach to assess environmental justice effects of LA100 scenarios

AG Meeting #6: August 16, 2018: Where does EJ analysis fit in study sequence

Environmental Modeling Requires Results of Electric-Sector and Loads Modeling

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1. Data collection, scenario development
2. Estimate load growth and demand profiles
3. Determine renewable resource availability and generation profiles
4. Estimate distribution system hosting capacity and upgrade costs
5. Develop optimal expansion plan and distributed resource adoption scenario
6. Simulate grid operations and performance including load balancing, operating reserves and resource adequacy
7. Evaluate transmission system reliability
8. Validate distribution system operation and integrated T&D system performance
9. Evaluate environmental benefits and impacts
10. Evaluate local job and economic development impacts
11. Visualization and reporting

AG Meeting #6: August 16, 2018

- Additional EJ metrics have been added to LA100 evaluation since last AG (beyond Cal EnviroScreen)

City Council Requirements

August 1, 2017	"The prioritization of environmental justice neighborhoods as the first immediate beneficiaries of localized air quality improvements and GHG reduction."	Requires the analysis of air quality-related impacts
August 1, 2017	"Incorporation of the CalEnviro Screen …"	Basis of EJ neighborhood determination early in the project

- Many neighborhoods in LA experience **socioeconomic** and **environmental** challenges; the simultaneous experience of both is what is known as **environmental justice or EJ**
- As with air quality, LA has a long history of identifying and addressing EJ challenges
- Reducing emission sources, especially local ones, is the **key strategy** to addressing EJ concerns, and all 100% RE scenarios should positively address EJ issues
- The study will discern differences in local air pollutant concentrations and health impacts between EJ neighborhoods and non-EJ neighborhoods, for the base case and evaluated 100% RE scenarios

Defining EJ neighborhoods

- Since AG6, we found an OEHHA memo defining official cut-off for DAC (EJ) designation which we will use

How to Define EJ Neighborhoods

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- There are many approaches to defining EJ
- Active discussion within several regional organizations as to the most appropriate definition for the LA region and (sometimes) for specific uses (grant funding, city services)
  - We are consulting with the City's Planning Department to learn about the status of various local efforts to define EJ
- City Council required that this study utilize **CalEnviroScreen** (latest version: 3.0)

CES 3.0 Variables

CES ranks census tracts on these variables (0-100 score) using retrospective data from national and state sources

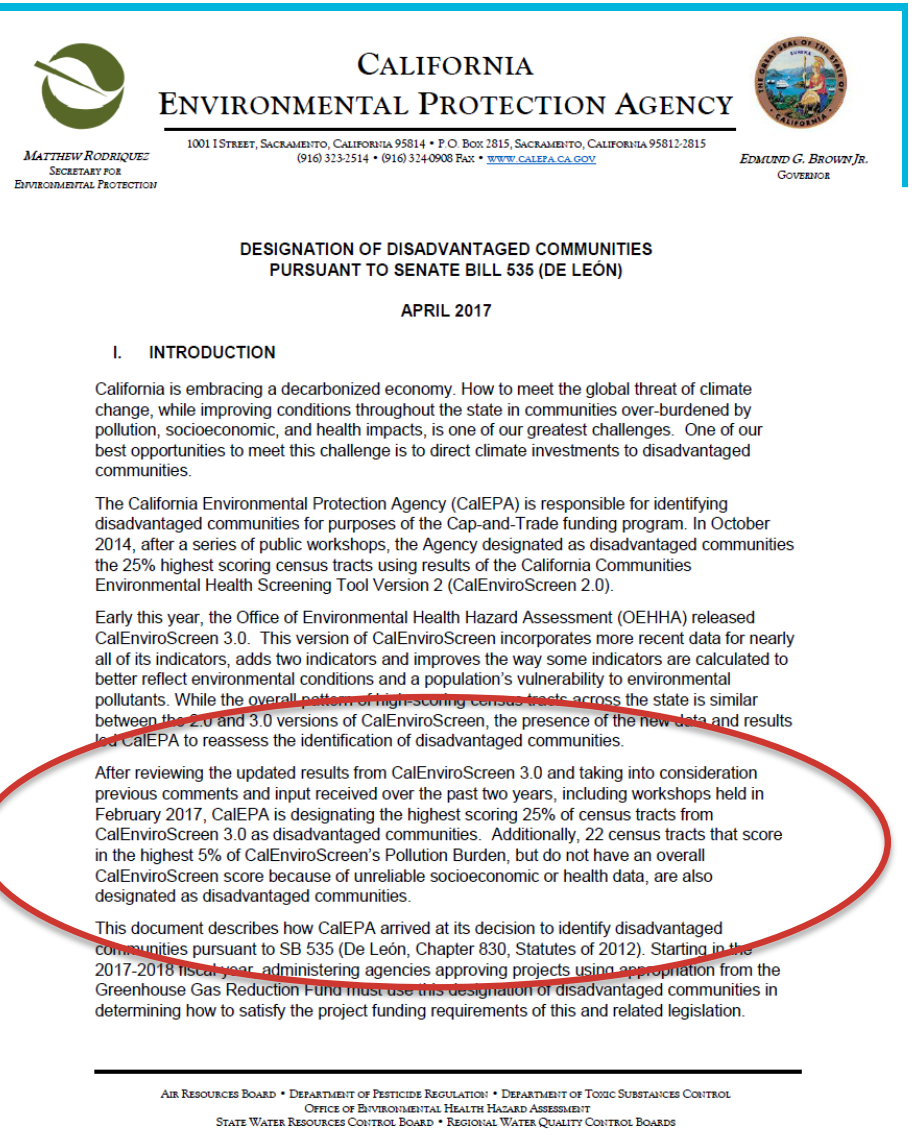
Pollution Burden	Population Characteristics
Exposures • Ozone concentrations • $PM_{2.5}$ concentrations • Diesel PM emissions • Drinking water contaminants • Pesticide Use • Toxic releases from facilities • Traffic density	**Sensitive populations** • Asthma emergency department visits • Cardiovascular disease (emergency room visits for heart attacks) • Low birth-weight infants
Environmental effects • Cleanup sites • Groundwater threats • Hazardous waste • Impaired water bodies • Solid waste sites and facilities	**Socioeconomic factors** • Educational attainment • Housing burdened low income households • Linguistic isolation • Poverty • Unemployment

LA100 environmental justice analysis approach: Seeking your feedback

1. **Identify Environmental Justice (EJ) neighborhoods**
   A. Follow Cal OEHHA definition.
2. **Quantify environmental health benefits:**
   A. Changes to applicable pollution exposure and sensitive populations criteria used in the Cal EnviroScreen.
3. **Quantify technology deployment benefits:**
   A. Distributed PV,
   B. Energy efficiency in buildings, and
   C. Electric vehicle adoption.
4. **Evaluate degree of prioritization of benefits to EJ neighborhoods**

Defining EJ neighborhoods

1. Identify Environmental Justice (EJ) neighborhoods
   - A. Use 'Disadvantaged Communities' definition of the top 25% of Cal EnviroScreen (CES) scores, in alignment with recommendation by Cal OEHHA
     - i. Plus several other census tracts which don't have complete CES scores but are high on the part of the score that exists



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GOVERNOR

DESIGNATION OF DISADVANTAGED COMMUNITIES PURSUANT TO SENATE BILL 535 (DE LEÓN)

APRIL 2017

I. INTRODUCTION

California is embracing a decarbonized economy. How to meet the global threat of climate change, while improving conditions throughout the state in communities over-burdened by pollution, socioeconomic, and health impacts, is one of our greatest challenges. One of our best opportunities to meet this challenge is to direct climate investments to disadvantaged communities.

The California Environmental Protection Agency (CalEPA) is responsible for identifying disadvantaged communities for purposes of the Cap-and-Trade funding program. In October 2014, after a series of public workshops, the Agency designated as disadvantaged communities the 25% highest scoring census tracts using results of the California Communities Environmental Health Screening Tool Version 2 (CalEnviroScreen 2.0).

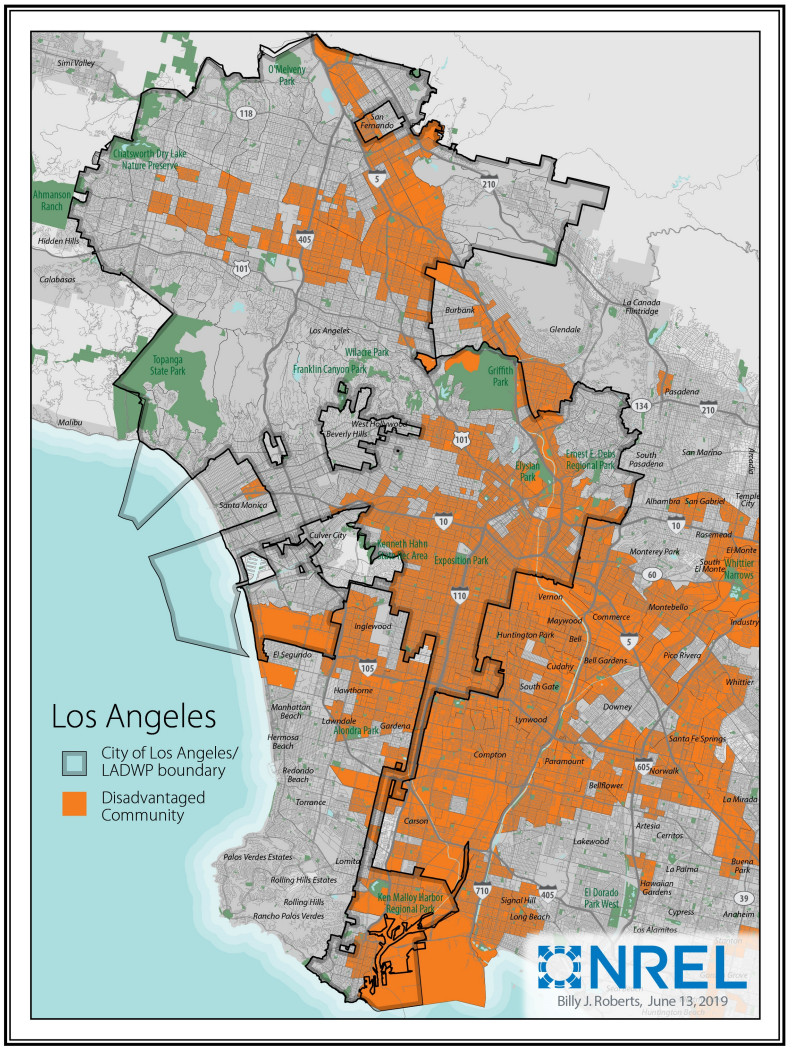
Early this year, the Office of Environmental Health Hazard Assessment (OEHHA) released CalEnviroScreen 3.0. This version of CalEnviroScreen incorporates more recent data for nearly all of its indicators, adds two indicators and improves the way some indicators are calculated to better reflect environmental conditions and a population's vulnerability to environmental pollutants. While the overall pattern of high-scoring census tracts across the state is similar between the 2.0 and 3.0 versions of CalEnviroScreen, the presence of the new data and results led CalEPA to reassess the identification of disadvantaged communities.

After reviewing the updated results from CalEnviroScreen 3.0 and taking into consideration previous comments and input received over the past two years, including workshops held in February 2017, CalEPA is designating the highest scoring 25% of census tracts from CalEnviroScreen 3.0 as disadvantaged communities. Additionally, 22 census tracts that score in the highest 5% of CalEnviroScreen's Pollution Burden, but do not have an overall CalEnviroScreen score because of unreliable socioeconomic or health data, are also designated as disadvantaged communities.

This document describes how CalEPA arrived at its decision to identify disadvantaged communities pursuant to SB 535 (De León, Chapter 830, Statutes of 2012). Starting in the 2017-2018 fiscal year, administering agencies approving projects using appropriation from the Greenhouse Gas Reduction Fund must use this designation of disadvantaged communities in determining how to satisfy the project funding requirements of this and related legislation.

Defining EJ neighborhoods

1. **Identify Environmental Justice (EJ) neighborhoods**
   - A. Use 'Disadvantaged Communities' definition of the top 25% of Cal EnviroScreen (CES) scores, in alignment with recommendation by Cal OEHHA
     - i. Plus several other census tracts which don't have complete CES scores but are high on the part of the score that exists
   - B. **About 50 percent of census tracts in LADWP service territory are classified as EJ/Disadvantaged Communities.**



CES 3.0 Variables

Pollution Burden	Population Characteristics
Exposures • Ozone concentrations • $PM_{2.5}$ concentrations • Diesel PM emissions • Drinking water contaminants • Pesticide Use • Toxic releases from facilities • Traffic density	**Sensitive populations** • Asthma emergency department visits • Cardiovascular disease (emergency room visits for heart attacks) • Low birth-weight infants
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Applicable CES 3.0 Variables

Red font for variables whose changes can be measured in LA100

Pollution Burden	Population Characteristics
Exposures • **Ozone concentrations** • **PM2.5 concentrations** • Diesel PM emissions • Drinking water contaminants • Pesticide Use • Toxic releases from facilities • Traffic density	**Sensitive populations** • **Asthma emergency department visits** • **Cardiovascular disease (emergency room visits for heart attacks)** • Low birth-weight infants
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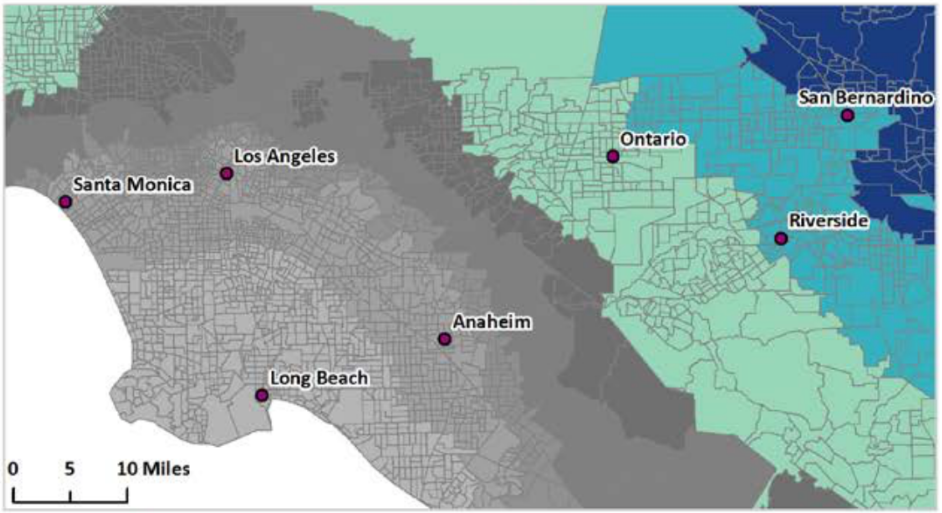
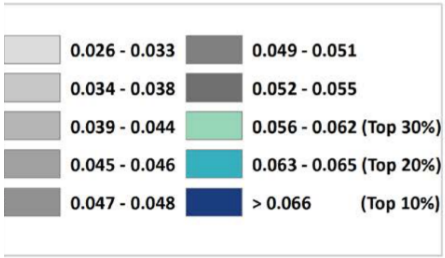
Air quality measures

CES Method: Ozone



Greater Los Angeles Area

8-hour ozone concentrations, ppm (2011-2013)

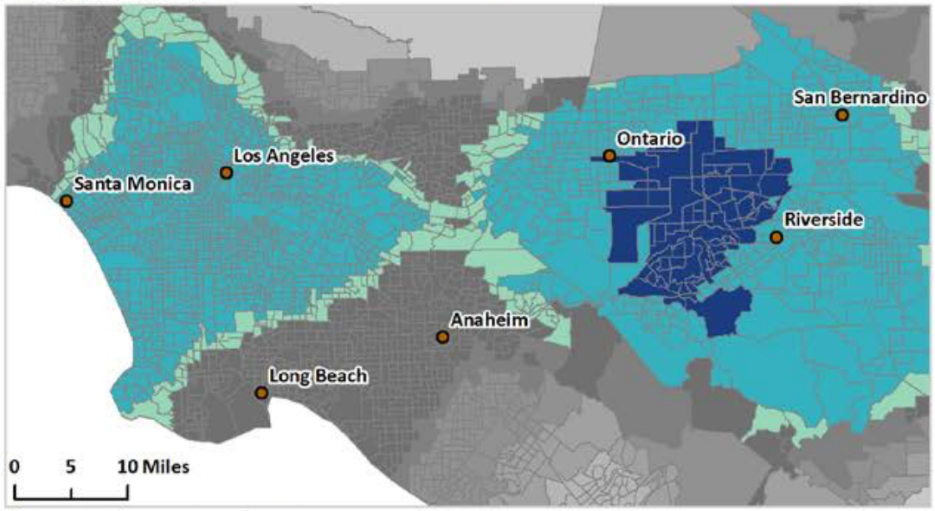


- California Air Resources Board (CARB) monitoring network measurements.
- Inverse distance weighting (IDW) from monitors assigns values to census tracts.

Source: OEHHA CES 3 Report, p.22-25

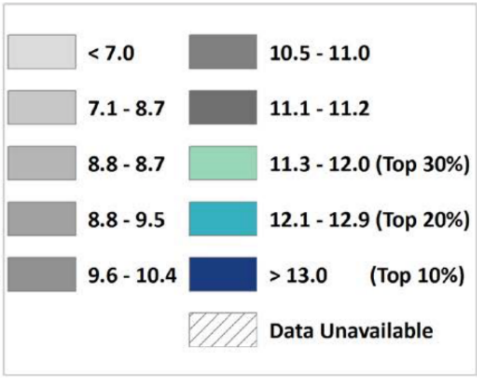
OEHHA CES 3.0 Report p. 22-25

CES Method: $PM_{2.5}$



Greater Los Angeles Area

Annual mean concentration of $PM_{2.5}$ ($\mu g/m^3$) (2012-2014)



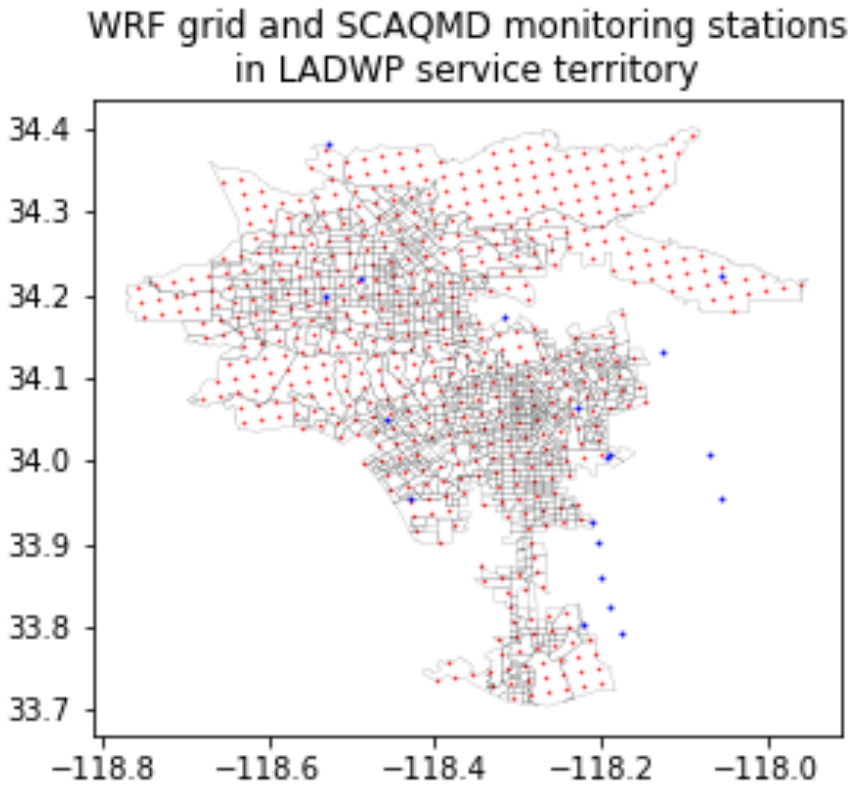
- California Air Resources Board (CARB) monitoring network measurements.
- Mean concentrations estimated at census tract center using ordinary kriging.

Source: OEHHA CES 3 Report, p.26-29

OEHHA CES 3.0 Report p. 26-31

Resolving air quality measurements and simulations

- WRF-Chem simulations yield ozone and PM2.5 concentration estimates at a 2x2 kilometer resolution.
  - Finer than CalEnviroScreen.
- However, we must be cautious to not assign too much accuracy to individual grid-cell concentration estimates when attempting to estimate tract-level changes.



WRF = Weather Research and Forecasting-Chemistry air quality model

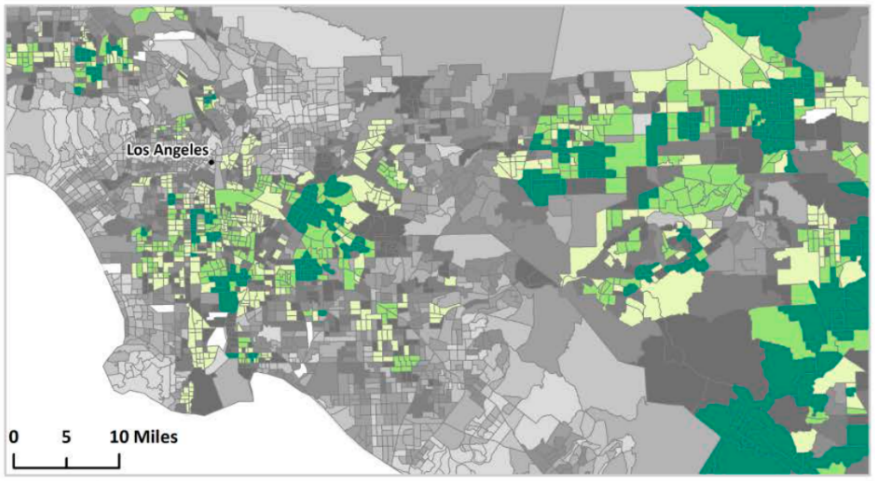
LA100: Quantifying air quality changes

- Statistically compare absolute concentration and improvements (compared to current) among CES-classified EJ and non-EJ census tracts.
- Also adjust CES scores for the individual criteria, comparing EJ to non-EJ tracts
  - We will also calculate composite CES score changes, but since only 2 of 12 pollution burden indicators will have modeled changes, total CES score is unlikely to change much.
- For both, leveraging more spatially granular underlying data than CES

Public health measures

CES Method:

Cardiovascular Disease



Greater Los Angeles Area

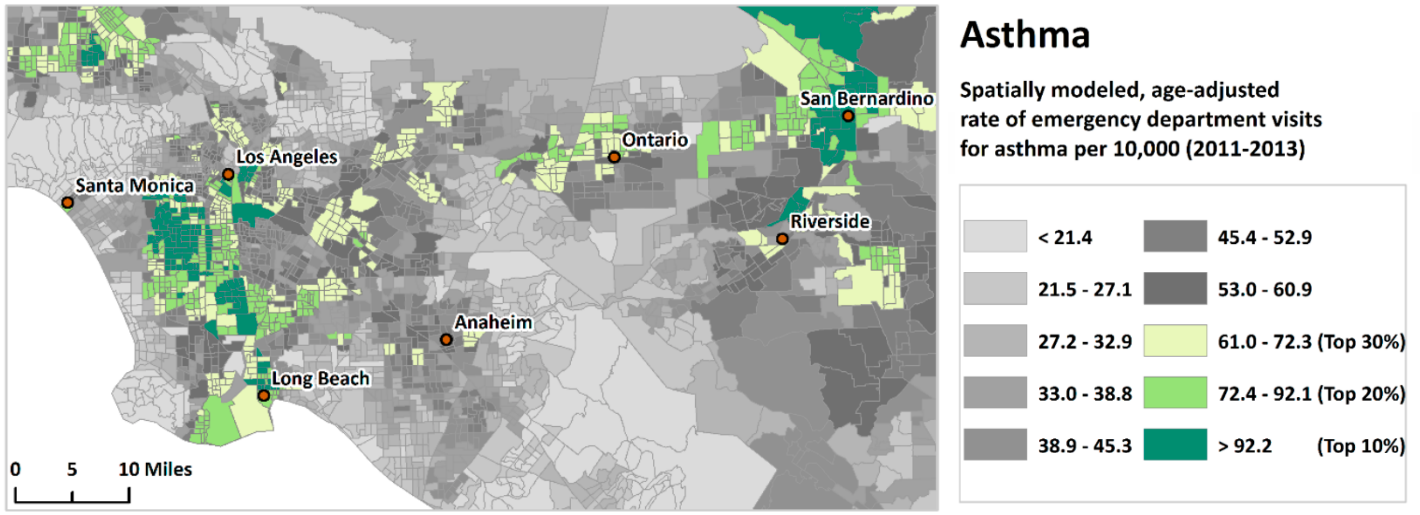
- California Office of Statewide Health Planning and Development, California Environmental Health Tracking Program data
- ZIP code-scale emergency department visits for heart attacks assigned to tracts based on population

Source: OEHHA CES 3 Report, p.111-114

OEHHA CES 3.0 Report p. 111-115

CES Method:

Asthma



Greater Los Angeles Area

- California Office of Statewide Health Planning and Development, California Environmental Health Tracking Program data
- ZIP code-scale emergency department visits for asthma assigned to tracts based on population

Source: OEHHA CES 3 Report, p.106-109

OEHHA CES 3.0 Report p. 106-110

LA100: Quantifying EJ-relevant health effects

- Develop a method to estimate tract-level changes to asthma and cardiovascular disease:
  - Statistically compare health effects in EJ and non-EJ census tracts based on USC health effects modeling grid (2x2 km)
  - Consider if we can adjust CES indicator scores for asthma and cardiovascular disease metrics based on USC health effect modeling results
- As with air quality, we will be leveraging more spatially granular results than CES's

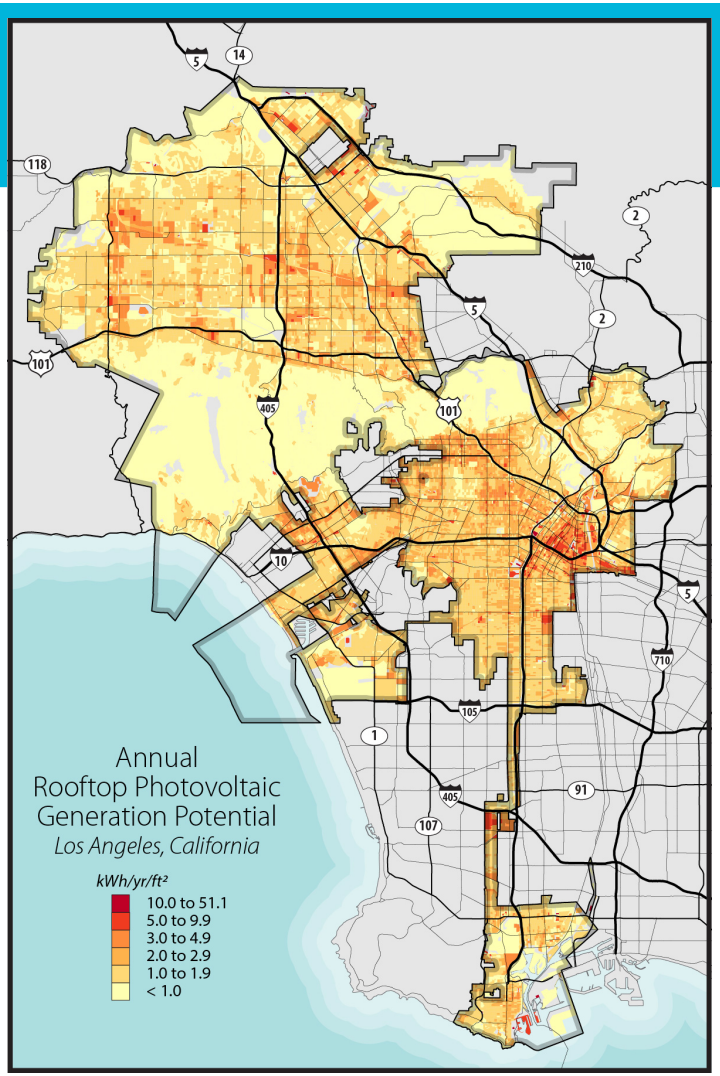
Technology deployment benefits

LA100 modeling: Technology deployment

- Under each scenario evaluated, we aim to quantify implementation by tract-level EJ status for:
  - Rooftop solar (dGen)
  - Energy efficiency in residential and commercial buildings (ResStock, ComStock)
  - Electric vehicles and charging infrastructure (EVI-Pro)
- NREL models primarily estimate physical implementation, e.g., PV modules (MW), number of electric vehicles, or change in building energy use intensity

Residential and community solar, and storage

- We will compare simulated PV adoption levels (installed capacity) in EJ and non-EJ tracts in LADWP service territory.
  - We will evaluate the cases that dGen analyzes
- We could also compare simulated storage (installed capacity) in EJ and non-EJ tracts



Energy efficiency in buildings

- Buildings energy-demand modeling will identify opportunities for greatest energy savings, which will naturally prioritize energy efficiency measures to the housing stock not as recently built or renovated.
- We will compare tract-level change in energy use intensity (EUI) for each modeled scenario, inside and outside of EJ tracts, for both building types.

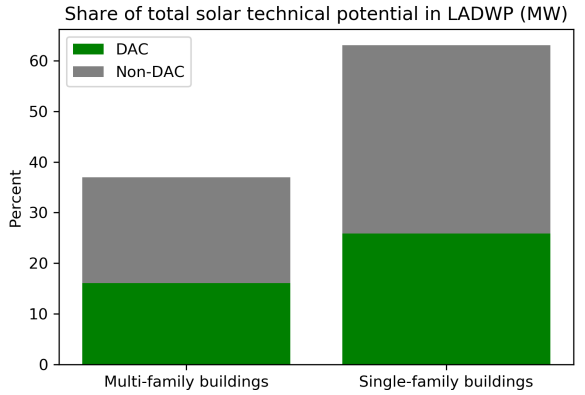
Electric vehicles and charging infrastructure

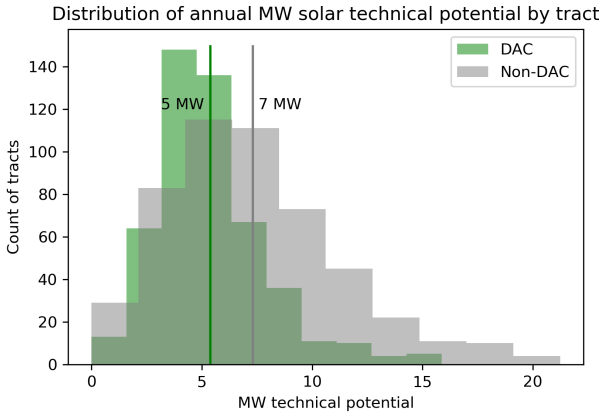
- EVI-Pro models:
  - Light-duty electric vehicle adoption aggregated to tracts.
    - Note that adoption is based on historical sales only. Historic sales occurred mostly in wealthier neighborhoods.
  - Deployment of direct current fast charging (DCFC) plugs/stations by tract.
- We will compare both metrics inside and outside of EJ tracts, in terms of number of vehicles and DCFC chargers deployed.
- Also, for transit buses, we will attempt to compare the number of stops serviced by electrified buses inside and outside of EJ tracts.

Evaluating technology deployment equity: Overview

1. Report deployment model outputs at the tract level, by EJ status.
2. Calculate fraction of total deployment between EJ and non-EJ tracts
   a) Consider statistical tests for difference in mean technology deployment
   b) Report results to inform question of whether deployment was prioritized according to stakeholder and decision-maker values

SAMPLE MOCK RESULTS





Summary

- Evaluate two aspects of EJ using best-in-class models with realistic deployment
  - Air quality and environmental health
    - Within framework of Cal EnviroScreen
  - Energy efficiency and renewable energy deployment
    - Distributed solar and storage
    - Building retrofits
    - Electric vehicle and charging infrastructure
- We will compare benefits in EJ and non-EJ census tracts
- Results will point to where prioritization of EJ communities is achieved while minimizing costs, and where programs or policies could be considered to achieve a satisfactory level of prioritization.

Thank you

The Los Angeles 100% Renewable Energy Study