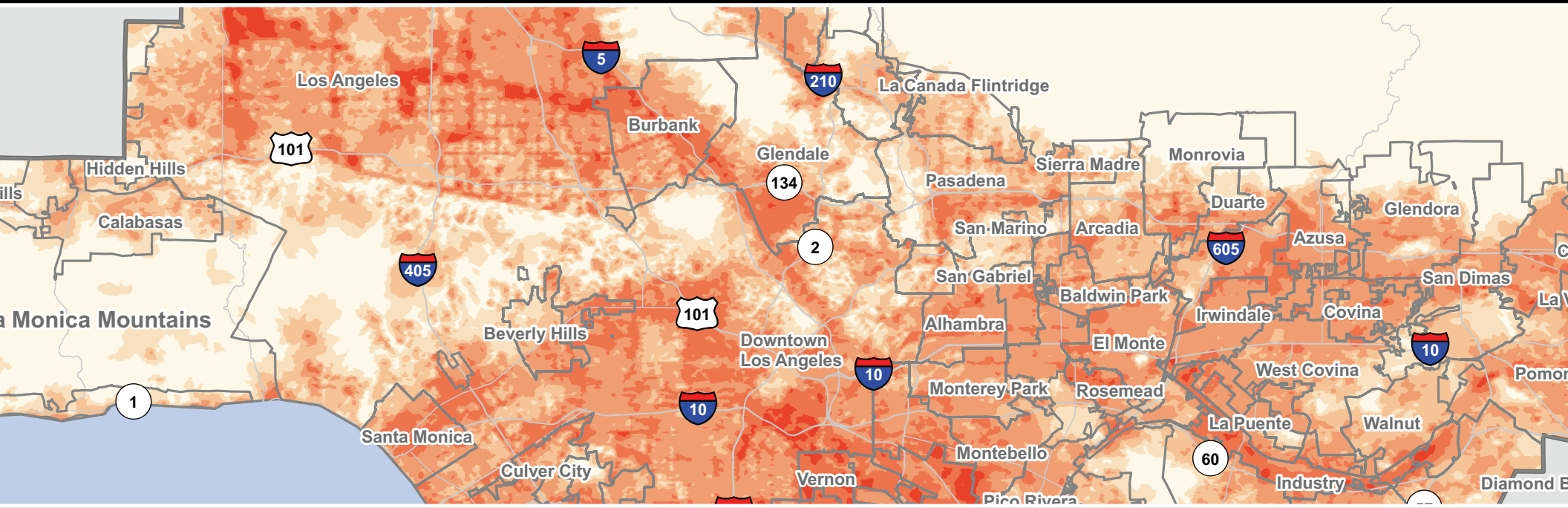
Profile of Clean Energy Investment Potential
Los Angeles County



EDF ENVIRONMENTAL DEFENSE FUND

UCLA Luskin School *of* Public Affairs
Luskin Center for Innovation

Profile of Clean Energy Investment Potential Los Angeles County

Los Angeles Solar and Efficiency Report (LASER) Version 2.0

Introduction

The Environmental Defense Fund commissioned the UCLA Luskin Center for Innovation to profile the potential for clean energy investments in Los Angeles County. The Los Angeles Solar and Efficiency Report (LASER): An Atlas of Investment Potential is multi-faceted. The LASER Atlas begins with this particular profile of clean energy investment potential at the county level. Other profiles that comprise the LASER Atlas are at the sub-regional level.

Objectives

This county level overview is designed to help community stakeholders identify areas of high potential for solar energy and the benefits of green economic investment. These benefits include capitalizing on incoming state and local funding while creating jobs and building community resilience to current environmental health and energy threats that climate change will exacerbate.

Importance of Project

This project is timely because of new state funding opportunities that could benefit communities throughout Los Angeles County. The maps identify disadvantaged communities that could be prioritized for funding from cap-and-trade auction proceeds (in the Greenhous Gas Reduction Fund) per Senate Bill 535 (de León). In addition, Proposition 39 will result in $2.5 billion to improve energy efficiency and expand clean energy generation.

Environmental Defense Fund

Environmental Defense Fund's mission is to preserve the natural systems on which all life depends. Guided by science and economics, we find practical and lasting solutions to the most serious environmental problems. This has drawn us to areas that span the biosphere: climate, oceans, ecosystems and health. Since these topics are intertwined, our solutions take a multidisciplinary approach.

UCLA Luskin Center for Innovation

Established with a gift from Meyer and Renee Luskin, the UCLA Luskin Center for Innovation translates world-class research into real-world policy and planning solutions. Organized around initiatives, the Luskin Center addresses pressing issues of energy, transportation and sustainability. The Luskin Center is based in the UCLA Luskin School of Public Affairs.

The following people from UCLA worked on this project:

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FOR MORE INFORAMATION

Contact the UCLA Luskin Center for Innovation www.innovation.luskin.ucla.edu.

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Contents

Table of Contents 1

A Hotter Region

- Description 2
- Map 3

Environmental Health Risk and Investment Potential

- Description 4
- Map 5

Solar Potential in LA County is Tremendous

- Description 6
- Map 7

Solar Installations in Los Angeles County

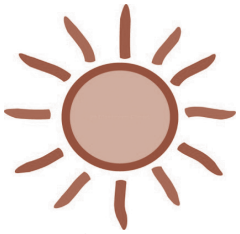
- Description 8
- Map 9

The Local Solar Generation and Clean Air Connection

- Description 10
- Map 11

References 12

A Hotter Region



4-5°F
temperature rise will mean that adaptation is inevitable.

This map illustrates "Mid-Century Warming in the Los Angeles Region." This is the first study to provide specific climate-change projections for the greater Los Angeles area, with unique projections down to the neighborhood level.[1]

The study looked at the years 2041–60 to predict the average temperature change by mid-century. Southern Californians should expect slightly warmer winters and springs but much warmer summers and falls, with more frequent heat waves. The map shows that climate change will cause temperatures in the Los Angeles region to rise by an average of 4-5°F by the middle of this century.[2]

All areas across the Los Angeles region will experience warming in the coming mid-century but an important aspect of this study is that it shows where *different* areas will experience *different* degrees of warming. According to the study, coastal areas like Santa Monica and Long Beach are likely to warm an average of 3 to 4 degrees, with other areas experiencing more warming. The study predicts a likely tripling in the number of extremely hot days in the downtown area and quadrupling the number in the valleys and at high elevations.

Adapting to a changing climate and building resiliency will be inevitable in the Los Angeles region.

How the Los Angeles Region Could Adapt[3]

Higher temperatures will increase the importance of **energy efficient buildings**. Conservation and improved energy efficiency—with higher performing heating, ventilating and cooling systems, efficient lighting, etc.—will reduce the demand for energy, thus saving money for residents, owners and taxpayers. Producing **solar energy** on rooftops as well as retrofitting roofs to reflect sunlight (**cool roofs**), can also reduce electricity bills, while reducing emissions that contribute to climate change.

Municipal buildings can serve as **cooling centers**. This will be important because without this and other planning measures in place, hospitals will likely see an increase in patients suffering from heat stroke and heat exhaustion, as well as smog-related respiratory effects. Air quality is profoundly affected by higher temperatures because heat increases ozone smog formation. Ozone is a known lung irritant associated with asthma attacks, pneumonia and other respiratory diseases.

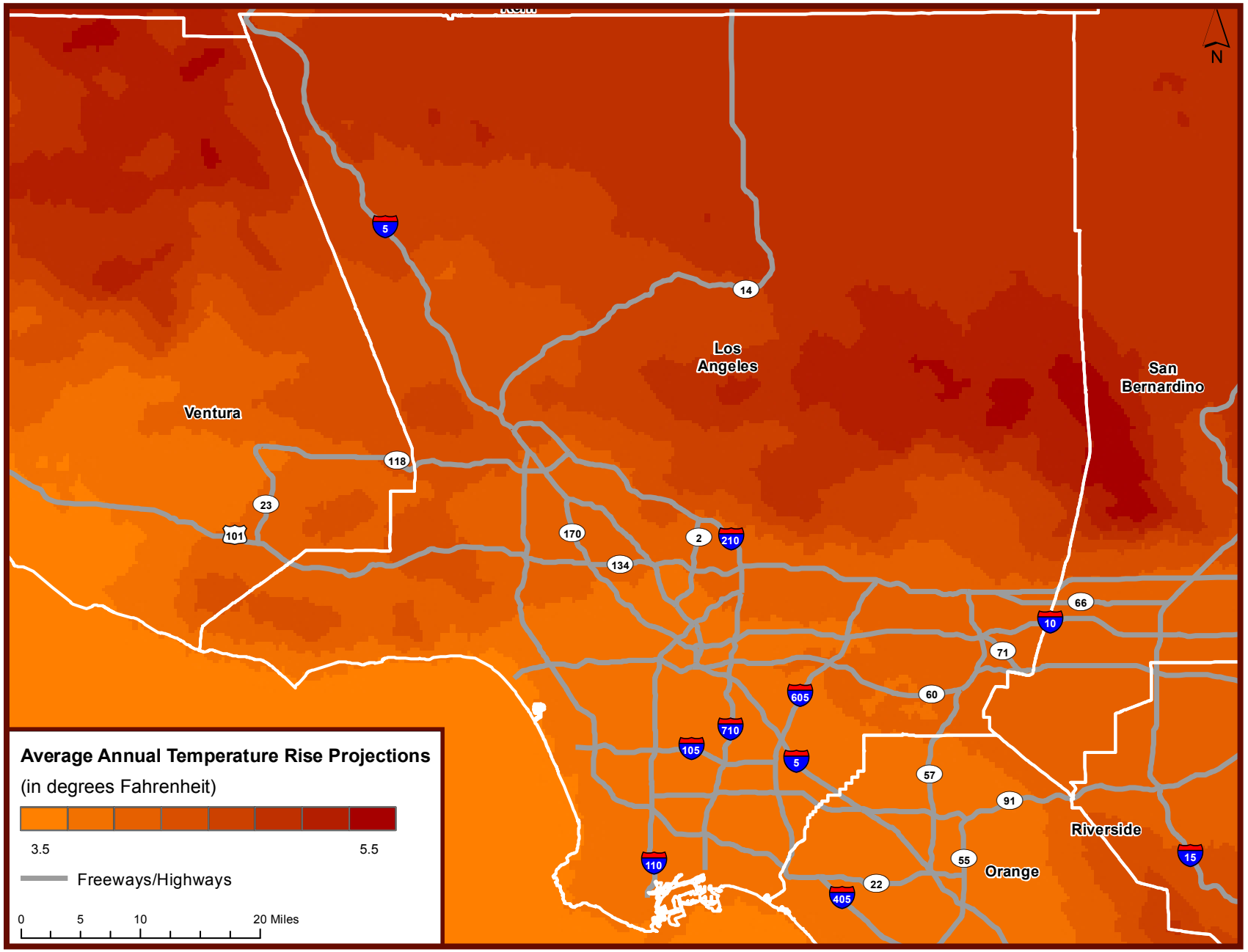
Green spaces and trees reduce the heat island effect caused by buildings and streets, and provide a place for people to cool off. Transit provides transportation access to parks, medical care and other services that can improve community resiliency to climate change.

1 Alex Hall, Fengpeng Sun, Daniel Walton, et al, 2012. "Mid-Century Warming in the Los Angeles Region." University of California, Los Angeles. *See reference page for more details.*

2 Ibid. *See reference page for details about the uncertainty ranges and methodology.*

3 Adapted from the "C-Change-LA" website. Written and published by Climate Resolve. *See reference page for more details.*

Mid-century Warming in the Los Angeles Region



Source: Alex Hall, Fengpeng Sun, Daniel Walton, et al, 2012. "Mid-Century Warming in the Los Angeles Region." University of California, Los Angeles. Full report at http://c-change.la/. *See footnote 2, on reference page, for information about the uncertainty ranges and other details.*

Environmental Health Risk and Investment Potential

50% of Californians who live in a disadvantaged community are residents of LA County.

This map illustrates the screening tool that the State of California developed to identify communities disproportionately burdened by and vulnerable to multiple sources of pollution. Called the "California Communities Environmental Health Screening Tool 2.0" (CalEnviroScreen 2.0), it generates environmental health risk scores and rankings for census tracts throughout the state, incorporating data from 19 indicators within two categories: 1) pollution burden, exposure and environmental effect indicators; and 2) population characteristics, sensitive populations and socioeconomic factor indicators. High rankings indicate relatively high vulnerability. The map zooms into LA County, a region that faces elevated levels of environmental health vulnerabilities but should commensurately benefit from resources to address these issues.

Here's why: CalEnviroScreen will inform the State's identification of disadvantaged communities pursuant to **Senate Bill 535 (SB 535)**. SB 535 requires that at least 25 percent of monies from the **Greenhouse Gas Reduction Fund** be directed to projects that benefit disadvantaged communities and at least 10 percent of program funding expended be directed to projects located in disadvantaged communities. With revenue from the State's cap-and-trade program, the Greenhouse Gas Reduction Fund is expected to soon generate billions of dollars every year for projects that reduce greenhouse gas emissions, create jobs and produce other co-benefits.

GHG Reduction Fund is an Important Opportunity for LA County

Just one county, LA County, is home to 50 percent of all Californians who live in a census tract likely to be identified as a disadvantaged community for purposes of implementing SB 535. In fact, 38 percent of LA County residents (3.7 million people) live in one of these communities that could be eligible for prioritized allocations from the Greenhouse Gas Reduction Fund.[4] At the time of publication, the State had not officially determined the "disadvantaged community" threshold, but it is likely that the top 20 percent of communities ranked by CalEnviroScreen 2.0 would be classified as such. The aforementioned numbers use this threshold while the map outlines with light grey lines the top 10 percent of communities. This map and others in the series can help decision-makers and community members think about where and what to invest in to reduce pollution, expand clean energy generation, and create jobs.

Eligible Investments from the GHG Reduction Fund

Sustainable Transportation

- Sustainable Communities Strategies: including public transit, rail modernization and system integration, transit-oriented development, and active transportation.
- Low-carbon Freight Equipment and Zero-Emission Passenger Transportation: includes vehicles and fueling/charging infrastructure.

Energy Efficiency and Clean Energy

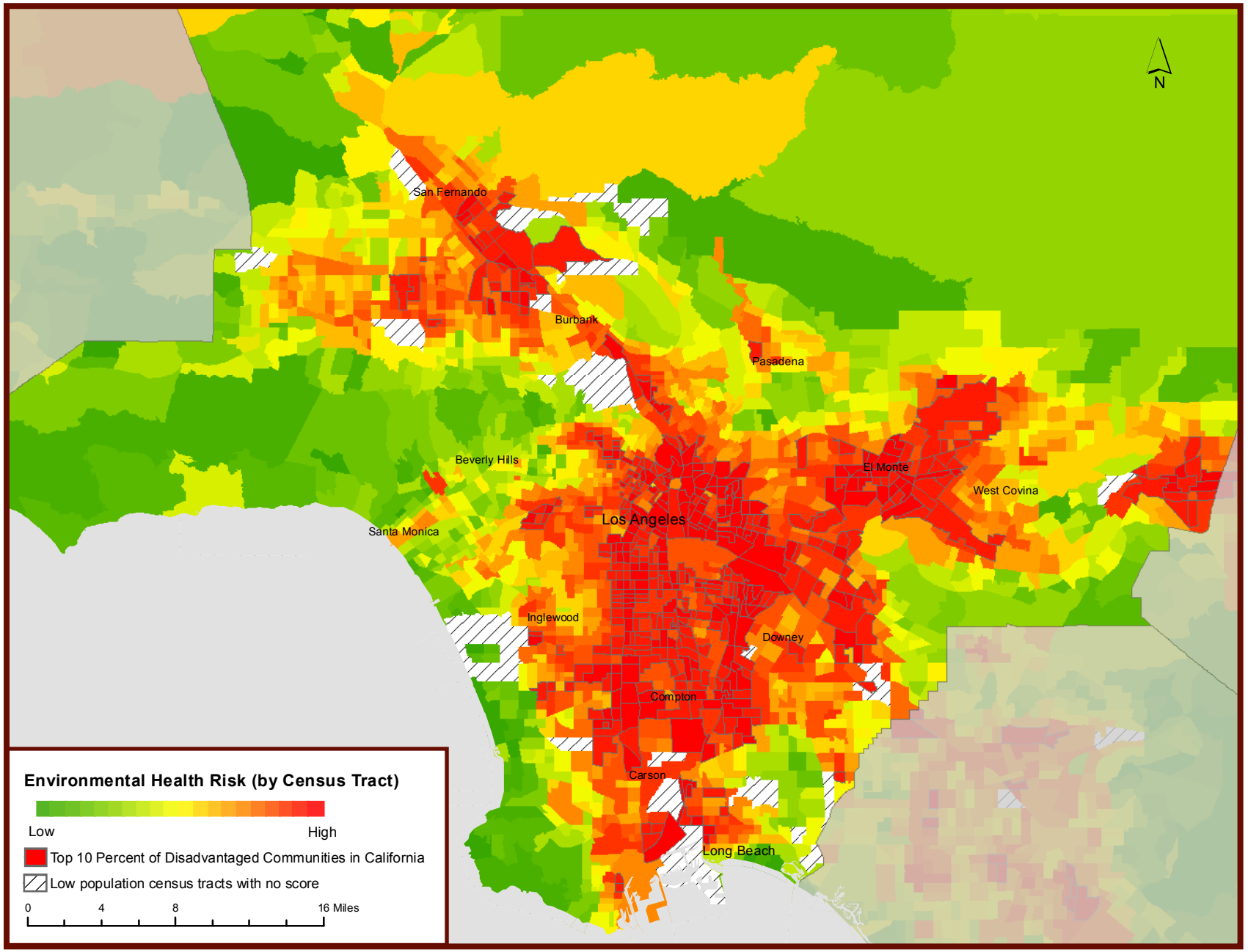
- Residential: weatherization retrofits for low-income households, energy efficiency and clean energy financing, and solar incentive programs for low-income dwellings.
- Public: water system and use efficiency, such as in water pumping/conveyance.
- Industrial/Agricultural: energy efficiency improvements.

Natural Resources and Waste Diversion

- Forests and Ecosystem Management: urban forestry and other practices to sequester carbon and reduce black carbon.
- Waste Diversion: reduction and recycling strategies.

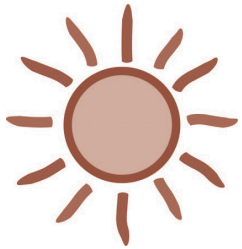
4 Derived from the "California Communities Environmental Health Screening Tool Version 2.0" (2014), developed by the California Environmental Protection Agency and the Office of Environmental Health Hazard Assessment. http://oehha.ca.gov/ej/ces2.html.

Environmental Health Risk in Los Angeles County



Source: California Environmental Protection Agency and the Office of Environmental Health Hazard Assessment, "California Communities Environmental Health Screening Tool Version 2.0" (2014). http://oehha.ca.gov/ej/ces2.html. For the purpose of this report, the highest scoring 10% of census tracts are identified as disadvantaged communities and are delineated with a grey border and red color.

Solar Potential in LA County is Tremendous



This map illustrates that Los Angeles County is endowed with both bountiful sunshine and vast expanses of urban development that offers valuable siting opportunities for distributed solar energy generation. Los Angeles County has over 19,000 megawatts (an estimated 19,113 MW) of rooftop photovoltaic potential spread out across the county (see map and map source).

We are only beginning to tap into this tremendous solar resource. Los Angeles County is currently leaving around 97 to 98 percent of its solar capacity untapped.[5] Reaching just 10 percent of its solar potential could create approximately 47,780 job years and reduce nearly 2.5 million tons of carbon dioxide annually, the equivalent of taking almost 500,000 cars off the road.[6]

47,780
job years could be created if 10% of rooftop solar in LA County was realized.

MAP Statistics			
Total Rooftop Solar Potential	19,113 megawatts	Single Family Sites (not sq. footage)	77%
Median Rooftop Availability	17.6%	Multi-unit Residential Sites	15%
Median Potential of Available Parcels	4.1 kilowatts	Commercial & Industrial Sites	7%
Total Potential Sites	1,481,814 rooftops	Government & Non-profit Sites	1%

Funding Opportunities

Often driven by State policies, local utilities provide financial incentives for solar investments. A key incentive throughout California is **Net Energy Metering**, in which utility customers receive credit for the electricity generated by the solar system on their rooftop, thereby reducing their electricity bills. In addition, **the California Solar Initiative** (CSI) is the solar rebate program for Californians that are customers of an investor-owned utility, such as Southern California Edison. CSI incentives include rebates on solar photovoltaics and other solar thermal generating technologies. Publicly-owned utilities offer a variety of incentive programs, the details of which are often unique to the utility. This includes the Los Angeles Department of Water and Power's **Feed-in Tariff**, in which the utility pays participating property owners for solar energy generated.

Other state policies that expand opportunities for solar include Proposition 39's **Clean Energy Job Creation Fund** as well as AB 32's **Greenhouse Gas Reduction Fund** (cap-and-trade auction proceeds). Stakeholders throughout Los Angeles County will have to be vigilant to maximize benefits of these opportunities locally.

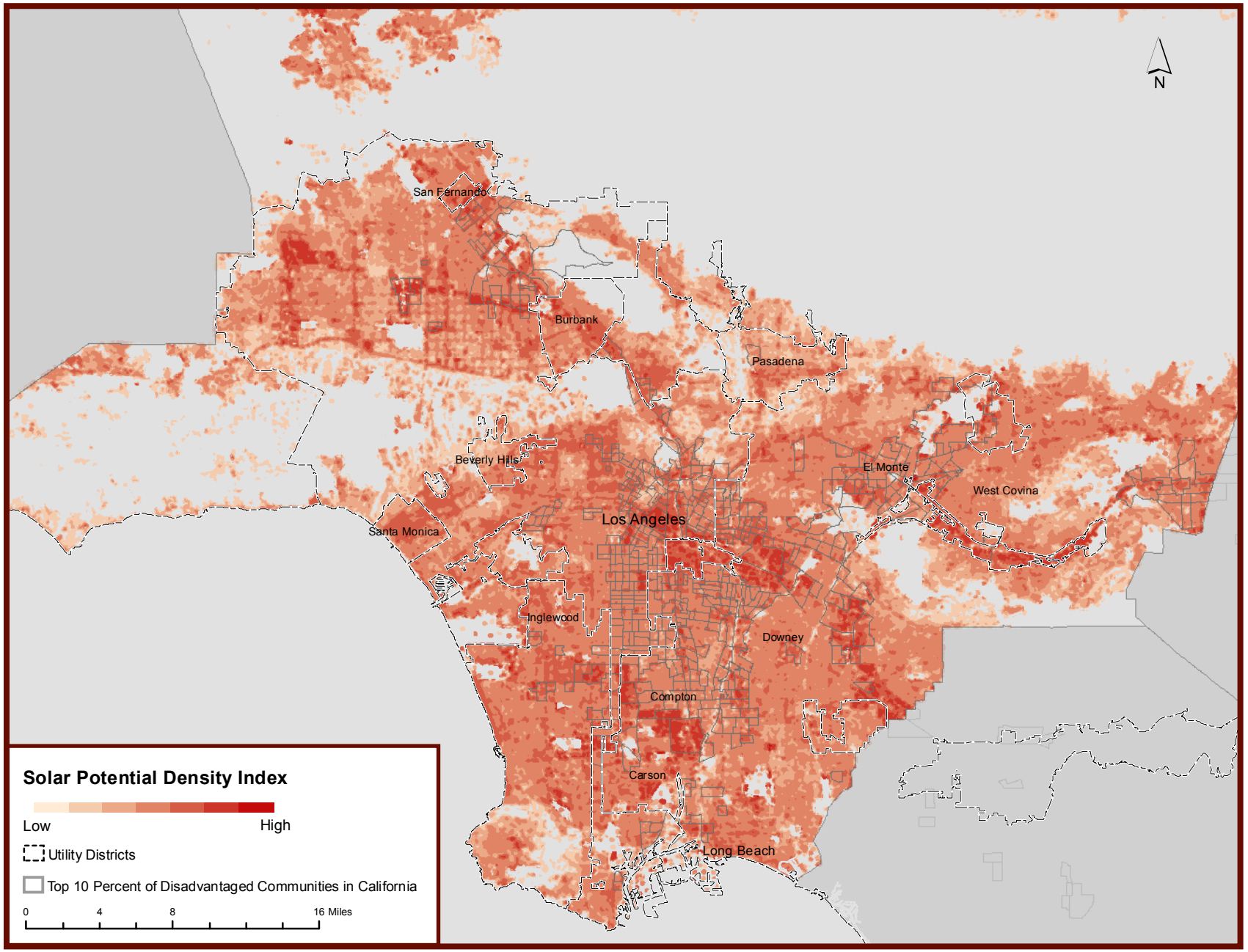
A **federal investment tax credit** (ITC) is also available for both residential and commercial consumers who install photovoltaics or solar water heating systems. For eligible solar systems placed in service on or before December 31, 2016, both business taxpayers and residential taxpayers are eligible for a credit equal to 30% of the expenditure. [7]

5 Derived from an estimated 400 MW of total installed solar capacity in the utility service areas encompassing the vast majority of LA County: Los Angeles Department of Water and Power territory (approximately 200 MW) and the Southern California Edison territory (approximately 200 MW). Source: State of California, California Energy Commission & California Public Utilities Commission, "California Solar Statistics" website (accessed on May 8, 2014). http://www.californiasolarstatistics.ca.gov/current_data_files/ Additional source: Los Angeles Department of Water and Power, "Feed-in Tariff Program" presentation to the Board of Water and Power Commissioners meeting, May 6, 2014. According to UCLA Luskin Center's "Los Angeles Solar Atlas," LA County has 19,113 MW of rooftop solar potential. Based on these available sources, about two percent of LA County's solar capacity has been realized but this could be closer to three percent. *See page 10 for details.*

6 Job multiplier derived from the US Department of Energy, "SunShot Vision Study" (2012). Carbon dioxide equivalent estimates derived from the US Environmental Protection Agency, "Emissions & Generation Resource Integrated Database." http://www.epa.gov/cleanenergy/energy-resources/calculator.html. This calculator may overestimate the reductions of carbon dioxide equivalent for the LA region, where the electricity generation fuel mix is cleaner compared to the national average. The numbers are used for discussion rather than policy purposes. *See reference page for more details.*

7 US Department of Energy, "Database of State Incentives for Renewables & Efficiency" website (accessed May 14. 2014). http://www.dsireusa.org/incentives/index.cfm?state=us

Solar Rooftop Potential in Los Angeles County



Source: UCLA Luskin Center, "Los Angeles County Solar Atlas" (2011). UCLA used and modified data from the Los Angeles County Chief Information Office, the Los Angeles County Solar Map. http://solarmap.lacounty.gov. Disadvantaged communities are outlined in grey lines and identified per California Environmental Protection Agency and the Office of Environmental Health Hazard Assessment, "California Communities Environmental Health Screening Tool Version 2.0" (2014). http://oehha.ca.gov/ej/ces2.html.

Solar Installations in Los Angeles County

Los Angeles County has the largest amount of installed local solar capacity of any county in California. Within LA County, there is more than 200 megawatts of solar capacity in the Southern California Edison (SCE) service area and approximately 200 megawatts in the Los Angeles Department of Water and Power service areas, for a total of more than 400 megawatts.[8] This is an under-representation because the 400 megawatts number does not include data from all of the municipal utility territories in LA County. In addition, the SCE data only includes the solar installations for which there was an application to receive an incentive from the California Solar Initiative. Some property owners install solar projects without applying for an incentive.

#1

LA County has the largest amount of installed solar capacity in California.

Disadvantaged Communities are Benefiting from Solar

The following map illustrates the number of solar installations in disadvantaged communities within the SCE service area in LA County. The data source is the California Solar Initiative. Only investor-owned utilities participate in the full CSI program, thus the data is focused on the SCE territory and does not include data from the municipal utilities in LA County, including the Los Angeles Department of Water and Power. In LA County's SCE territory, over 1,400 solar systems are located on rooftops in disadvantaged communities.[9] These numbers indicate that real progress is being made to bring solar to affordable housing.

Financial Programs are Incentivizing Solar for Affordable Housing, but do not Exist Everywhere

Two statewide programs funded by the California Solar Initiative focus on stimulating the adoption of solar power for affordable housing in California's investor-owned utility districts. The Single-family Affordable Solar Housing (SASH) and Multi-family Affordable Solar Housing (MASH) programs provide financial incentives to owners of low-income residential housing. In LA County alone, the SASH program has supported about 400 solar installations in low-income communities. And almost 50 solar projects on low-income multi-family dwellings in Los Angeles County have been supported by the MASH program, according to the CSI database.

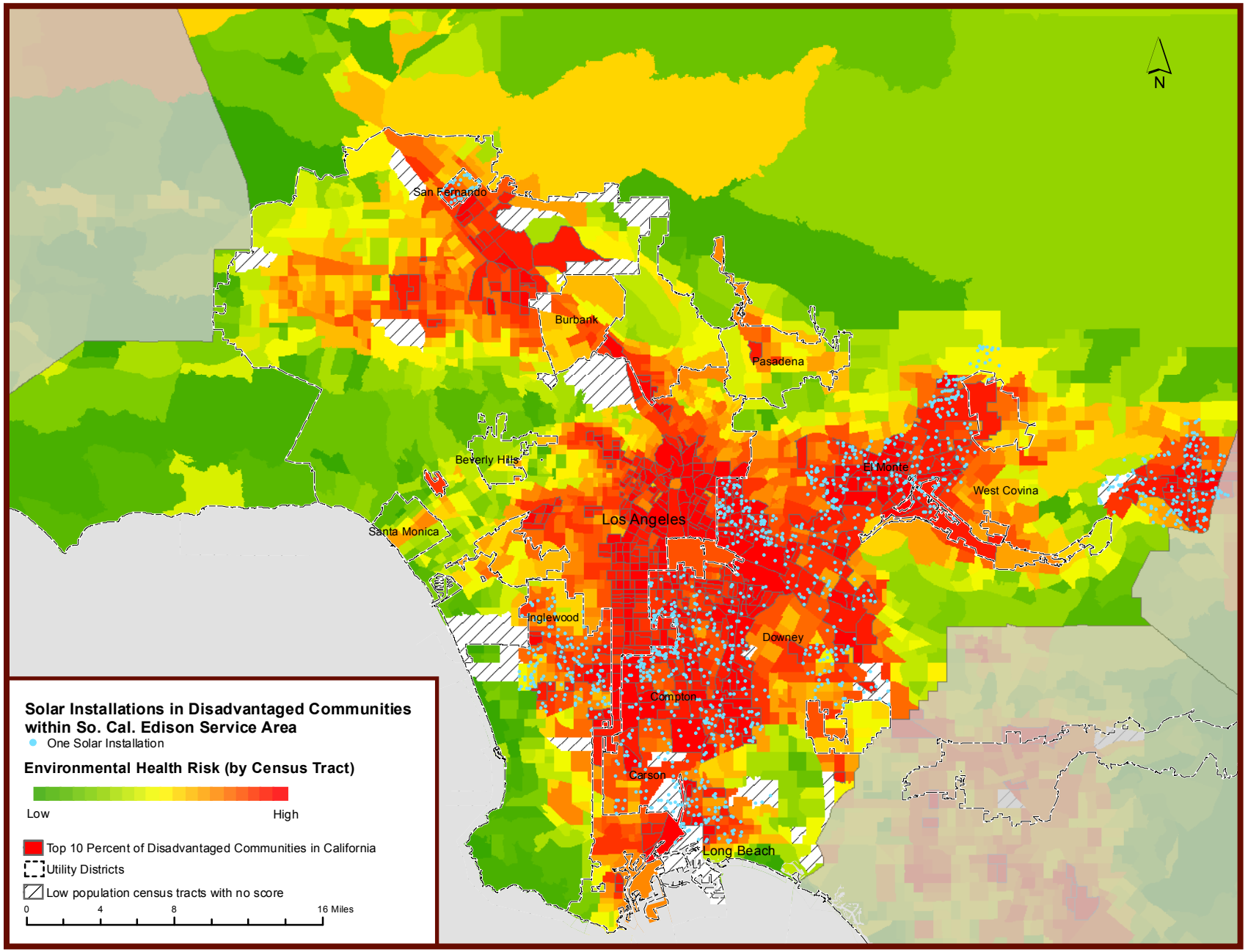
By offering financial incentives for solar projects in the affordable housing sector, these programs are improving energy utilization and overall quality of affordable housing, decreasing electricity usage costs without increasing monthly household expenses for affordable housing occupants, and increasing awareness of the benefits of solar power for affordable housing occupants and developers.

The MASH and SASH programs do not exist in municipal utility service territories. Instead, the municipal utilities offer other incentive programs. An important example is the Feed-in Tariff (FiT) program offered by the Los Angeles Department of Water and Power. This program is designed to tap into the fact that Los Angeles has both bountiful sunshine and multifamily housing, office, commercial and industrial rooftops.

8 "California Solar Statistics" website, operated by the State of California, California Energy Commission & California Public Utilities Commission (accessed on May 8, 2014). http://www.californiasolarstatistics.ca.gov/reports/locale_stats/ Addition source: Los Angeles Department of Water and Power, "Feed-in Tariff Program" presentation to the Board of Water and Power Commissioners meeting, May 6, 2014.

9 The number of solar installs in disadvantaged communities is estimated by comparing the California Solar Initiative (CSI) incentive solar project application database with the CalEPA CalEnviroScreen tool. The CSI data is aggregated to the zip code level to respect the privacy of solar incentive applicants. We then use CalEnviroScreen 1.1 (2013) because this tool is also at the zip code level. CalEnviroScreen 2.0 (2014) is at the census tract level. For the purpose of this map, we combined CalEnviroScreen 1.1 and 2.0. *See reference page for sources*.

Solar in Disadvantaged Communities: SCE Territory in LA County



Source: "California Solar Statistics" website, data exported from the California Solar Initiative (CSI) incentive solar project application database (accessed January 29, 2014). http://www.californiasolarstatistics.ca.gov/current_data_files/. This map represents solar installations in disadvantaged communities in So. Cal. Edison territory. The resulting dot density map represents one install with one dot, randomly distributing the dots within their corresponding zip code boundaries. For further detail on mapping methodology, please see footnote 9.

The Local Solar Generation and Clean Air Connection

Residents and businesses in Los Angeles County are benefitting from solar on their rooftops through reduced energy bills. What is less known, however, is the benefit to those without a solar system on their roof. The connection between local air quality and local generation of renewable energy is complex but worth exploring.

Local solar generation may reduce air pollution impacts in the Los Angeles Basin. This could result in cleaner air for disadvantaged communities that are often located near polluting power plants, as illustrated in the following map. Here's how:

Rooftop Solar Energy Can Reduce Total Peak Power Demand, and the Need to Fully Operate Local Polluting Power Plants

Widespread installation of rooftop solar energy systems and energy efficient technology by homeowners and businesses can reduce the total peak power demand from the grid in the Los Angeles basin. This then reduces the need to operate local fossil fuel power plants at full capacity.

Los Angeles County is uniquely situated to benefit from the installation of local solar energy systems. The Los Angeles basin is designated as a transmission constrained "local area" by California's Independent System Operator, the organization that controls the central electricity grid in most of the state.[10] This "local area" designation means that the electricity grid in the LA basin has system-level constraints that limit the importation of power over transmission lines from other regions of the state. Under peak demand conditions, the central transmission grid may not be able to import all the power demanded by consumers within the LA basin.

To operate the grid safely and mitigate the risk of power shortages within the LA basin, the grid operator requires that enough power generation capacity be available within the local area to meet the expected peak demand. The vast majority of this local need is currently met with local fossil fuel power plants that emit not only greenhouse gas emissions but also particulate matter and other pollutants linked to adverse health effects for people exposed.

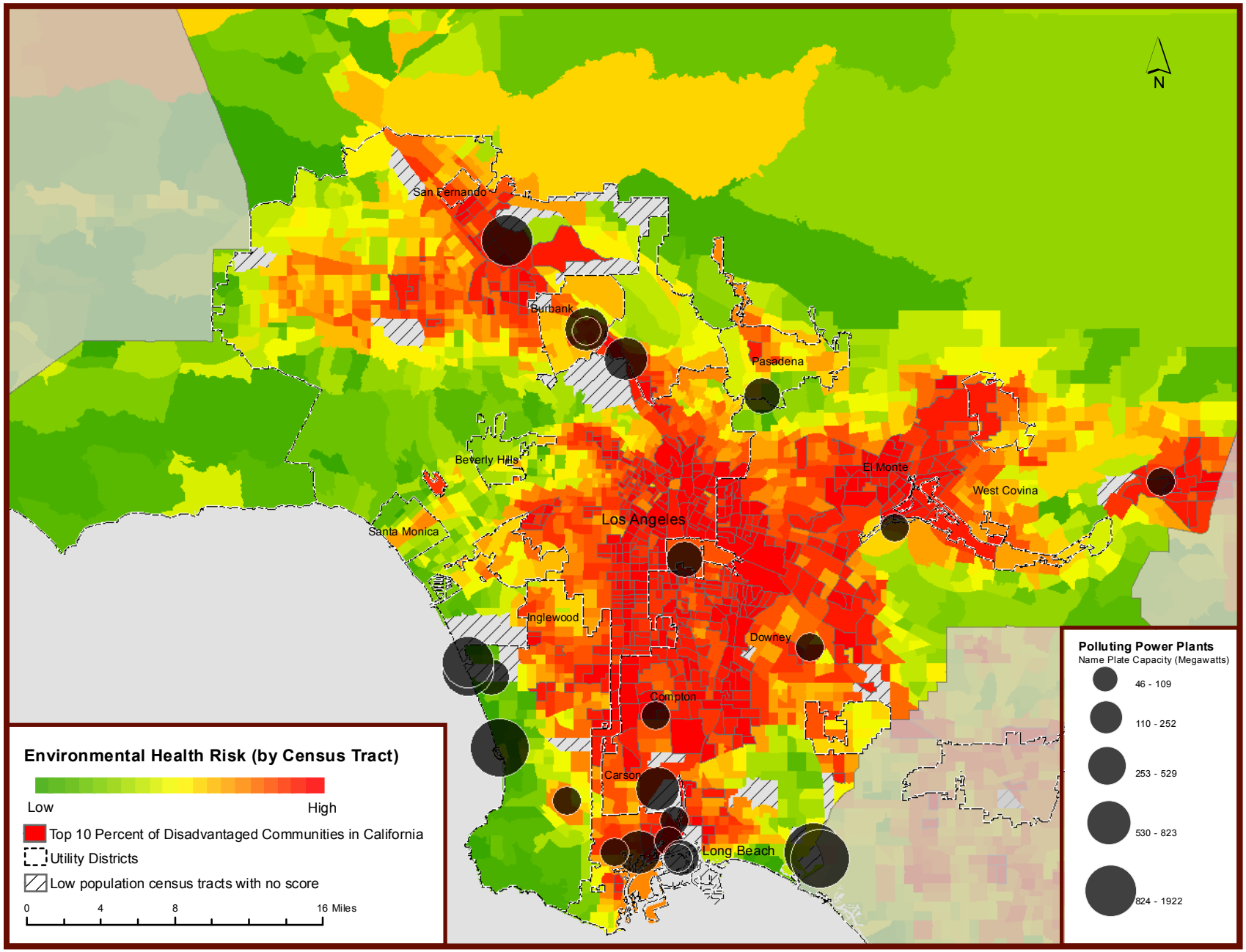
As homeowners and businesses in the Los Angeles region install solar energy systems and conserve energy to reduce greenhouse gas emissions and lower their utility bills, they also help to clean up local air pollution and reduce health risks.

All 10 million residents of LA County are exposed to high levels of ozone and particulate pollution, with higher concentrations near pollution sources.[11]

10 California Independent System Operator, "2014 Local Capacity Technical Analysis" (accessed March 8, 2014). http://www.caiso.com/Documents/Final2014LocalCapacityTechnicalStudyReportApr30_2013.pdf. For a map, see California Energy Commission, "California Energy Maps," (accessed March 10, 2014). http://www.energy.ca.gov/maps/reliability/LCR_Southern.html , or see the "2012 Local Capacity Technical Analysis" http://www.caiso.com/Documents/2012FinalLCRManual.pdf.

11 American Lung Association,"State of the Air 2014" (2014). This report ranked Los Angeles-Long Beach as the most polluted in the nation for ozone (smog) and the third most polluted for year-round particulate matter 2.5, giving LA County a failing grade due to unhealthy pollution levels for at least part of year. The report uses recent quality-assured air pollution data, collected by federal, state and local governments and tribes in 2010, 2011, and 2012.

Polluting Power Plants in Los Angeles County



Source: U.S. Environmental Protection Agency, "Emissions & Generation Resource Integrated Database" (2010), (accessed on February 25, 2014). http://www.epa.gov/cleanenergy/energy-resources/egrid/.

References

Data sources are listed immediately below the respective map except for the data sources repeated throughout the map listed here:

County map layer: US Census Bureau (2010), "Census Tracts, ZIP Code Tabulation Areas." http://www.census.gov/geo/reference/zctas.html.

Cities, freeways, gray basemap: ESRI Online.

Utility map layer: UCLA self-generated, from city and Southern California Edison service area boundaries.

1. Alex Hall, Fengpeng Sun, Daniel Walton, et al. (2012), "Mid-Century Warming in the Los Angeles Region." Part of the Climate Change in the Los Angeles project. Produced by UCLA with funding and support from the City of Los Angeles, in partnership with the Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC). http://c-change.la/

2. There is a 95% confidence that the warming will be between 1.7 and 7.5°F. To account for uncertainty associated with the trajectory of future greenhouse gas emissions and other factors affecting the planet's energy balance, the researchers inputted projections for both the standard "business-as-usual " (RCP8.5) and "mitigation" (RCP2.6) emission scenarios. In the map we illustrate the average annual temperate increases modeled under the business-as-usual scenario. Yet the study found that even the best case scenario will lead to significant warming due to emissions that are already moving through the Earth's atmosphere.

3. Adapted from the "C-Change-LA" website, written and published by Climate Resolve and hosted by the Los Angeles Regional Collaborative for Climate Action and Sustainability, housed at the UCLA Institute for the Environment and Sustainability (accessed February 10, 2014). http://c-change.la/los-angeles/

4. Derived from the "California Communities Environmental Health Screening Tool Version 2.0" (2014), developed by the California Environmental Protection Agency and the Office of Environmental Health Hazard Assessment. http://oehha.ca.gov/ej/ces2.html.

5. State of California, California Energy Commission & California Public Utilities Commission, "California Solar Statistics" website (accessed on May 8, 2014). http://www.californiasolarstatistics.ca.gov/reports/locale_stats/ Additional source: Los Angeles Department of Water and Power, "Feed-in Tariff Program" presentation to the Board of Water and Power Commissioners meeting, May 6, 2014. According to UCLA Luskin Center's "Los Angeles Solar Atlas," LA County has 19,113 MW of rooftop solar potential. These sources indicate that two percent of LA County's solar capacity has been realized but this could be closer to three percent because solar installation data was not included for the smaller municipal owned utilities in the county and because some installations in Southern California Edison territory may not be reported to the State database. Page 10 provides more detail.

6. Job multiplier derived from the US Department of Energy (2012), "SunShot Vision Study." The numbers are used for discussion rather than policy purposes. This study estimated that job intensities for photovoltaics were roughly 25 jobs per megawatt in manufacturing/distribution and 25 jobs per megawatt in installation (direct and indirect jobs). These job intensity estimates, using data from 2010, are considerably higher than one would expect in a mature manufacturing/distribution supply chain and installation infrastructure. Future numbers could be lower. Additional source: U.S. Environmental Protection Agency, "Emissions & Generation Resource Integrated Database" (2012). http://www.epa.gov/cleanenergy/energy-resources/refs.html. This national calculator may overestimate the greenhouse gas reduction benefits for the LA region, where the electricity generation fuel mix is cleaner compared to the national average.

7. U.S. Department of Energy, "Database of State Incentives for Renewables & Efficiency" website (accessed May 14. 2014). http://www.dsireusa.org/incentives/index.cfm?state=us

8. California Energy Commission & California Public Utilities Commission, "California Solar Statistics" website (accessed on May 8, 2014). http://www.californiasolarstatistics.ca.gov/reports/locale_stats/ Additional source: Los Angeles Department of Water and Power, Feed-in Tariff Program presentation to the Board of Water and Power Commissioners meeting, May 6, 2014.

9. "California Solar Statistics" website, data exported from the California Solar Initiative (CSI) incentive solar project application database (accessed January 29, 2014), http://www.californiasolarstatistics.ca.gov/current_data_files/ Additional sources: California Environmental Protection Agency and the Office of Environmental Health Hazard Assessment, "California Communities Environmental Health Screening Tool," Version 1.1 (2013) http://oehha.ca.gov/ej/ces11.html and Version 2.0 (2014). http://oehha.ca.gov/ej/ces2.html.

References

10. California Independent System Operator, "2014 Local Capacity Technical Analysis," (accessed March 8, 2014). http://www.caiso.com/Documents/Final2014LocalCapacityTechnicalStudyReportApr30_2013.pdf. For a map, see California Energy Commission, "California Energy Maps," (accessed March 10, 2014). http://www.energy.ca.gov/maps/reliability/LCR_Southern.html, or see the "2012 Local Capacity Technical Analysis" http://www.caiso.com/Documents/2012FinalLCRManual.pdf

11. American Lung Association (2014), "State of the Air 2014." This report ranked Los Angeles-Long Beach as the most polluted in the nation for ozone (smog) and the third most polluted for year-round particulate matter 2.5, giving LA County a failing grade due to unhealthy pollution levels for at least part of year. The report uses recent quality-assured air pollution data, collected by federal, state and local governments and tribes in 2010, 2011 and 2012.

12. Resilient Communities for America, "Paths to Building Resilient Cities and Counties" website (accessed May, 2013). www.resilientamerica.org.

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