APPENDIX A

Greenhouse Gas Accounting Methods, Business-as-Usual Forecast, and Emission Reduction Targets

Purpose

This Appendix describes the greenhouse gas (GHG) accounting and projections methods for calendar year 2015 and 2018 for unincorporated Los Angeles County (henceforth referred to as "the County" unless otherwise specified). It also presents methods for the 1990 and 2010 emissions backcasts; the BAU forecasts for 2030, 2035, and 2045; and the derivation of the 2045 CAP's emission reduction targets for 2030, 2035, and 2045. The document is organized into four sections corresponding with the following objectives:

Section A.1: Greenhouse Gas Emissions Inventory: 2015 and 2018

This section describes the methods for estimating baseline 2015 GHG emissions from community-induced activities and sources along with updated emission for the year 2018. The community-scale inventory includes emissions from transportation; stationary energy; industrial processes and product use (IPPU); waste and wastewater; and agriculture, forestry, and other land use (AFOLU) emissions.

Section A.2: 1990 and 2010 Greenhouse Gas Inventory and Backcasting Methods

This section describes the approach for estimating the County's GHG emissions in the year 2010 and 1990. The backcast aligns the 2010 inventory with the updated methods and emission factors used in

the 2015 and 2018 inventory updates, and projects emissions back to 1990 for purposes of aligning the 2045 CAP's target with the statewide target for 2030.

Section A.3: 2018 to 2045 Business-as-Usual Forecasts

This section describes the approach for modeling business-as-usual (BAU) scenario which projects future emissions based on current population and regional growth trends, land use growth patterns, and regulations or policies introduced before the 2018 inventory year. The BAU scenario demonstrates the growth in GHG emissions that would occur if no further action were to be taken by the County of Los Angeles (LA County) or the State of California after 2018.

Section A.4: Derivation of the 2045 CAP's Emission Reduction Targets

This section describes the approach taken to derive the 2045 CAP's GHG emission reduction targets for 2030, 2035, and 2045, and how these targets align with the statewide targets codified in SB 32 for 2030 and EO B-55-18 for 2045. This section provides substantial evidence for CEQA purposes that the 2045 CAP's targets represent levels of significance for the cumulative impact of the County's GHG emissions.

A.1 Greenhouse Gas Emissions Inventory: 2015 and 2018

2015 & 2018 GHG Emissions Inventories

Introduction

The 2015 and 2018 Community-scale GHG emissions inventories for the County was developed using the Global Protocol for Community-scale GHG Emission Inventories (GPC).[1] This protocol is used for calculating and reporting emissions from community activities and sources from seven gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs),s hexafluoride (SF_6) and nitrous trifluoride (NF_3). GHG emissions from these activities are organized into five sectors: transportation, stationary energy, waste (including wastewater), industrial processes and product use (IPPU) and agriculture, forestry and other land use (AFOLU). The protocol further offers two related frameworks—the Scopes Framework and the City-induced Framework—for reporting emissions from each sector:

[1] World Resources Institute, C40 Cities Climate Leadership Group, and ICLEI - Local Governments for Sustainability. *Global Protocol for Community-scale GHG Emission Inventories*, Version 1.1. December, 2014. Available at: https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities. Accessed January 2021.

Scopes Framework: This framework captures GHG emissions produced within a geographic boundary by categorizing emissions as scope 1, 2, and 3 emissions in each Sector:

- **Scope 1:** Emissions produced from activities and sources within the County boundaries.
- **Scope 2:** Emissions generated from the use of grid-supplied electricity, heat, steam and/or cooling within the County boundaries; and
- **Scope 3:** Emissions occurring outside the County boundaries due to activities taking place within the County boundaries.

City-induced Framework: This framework measures GHG emissions attributable to activities and sources within a geographic boundary and covers selected scope 1, 2 and 3 emissions from each sector. This framework offers two reporting levels:

- **BASIC:** Includes emissions from transportation, stationary energy, and waste Sectors.
- **BASIC+**: Includes all BASIC requirements as well as emissions from transmission and distribution grid losses, transboundary transportation, In-boundary generated waste emission sources, IPPU and AFOLU.

The 2015 and 2018 GHG emissions inventories for the County use the City-induced BASIC+ Framework with global warming potential (GWP) values from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5)[2], unless otherwise specified. The inventory is prepared using sector-specific generation and resource consumption data for relevant sub-sectors included in the BASIC+ protocol. The accounting methods, data sources and emission factors used for accounting 2015 and 2018 emissions are detailed in the subsequent sections.

The general methods used for the 2015 and 2018 inventories are the same and the descriptions herein apply to both of the inventory years.

Stationary Energy

This sector includes emissions from energy use (natural gas and electricity) in residential, commercial/ institutional/agricultural, and manufacturing/industrial buildings, energy generation facilities owned by LA County, off-road equipment, and fugitive emissions from oil and natural gas systems. **Table A-1** presents scopes, activity data, and emissions for the stationary energy sector. **Figure A-1** compares 2015 and 2018 GHG emissions from energy use by sub-sector.

[2] IPCC, Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. 2014. Available at: https://archive.ipcc.ch/report/ar5/syr/. Accessed January 2021

Table A-1: Stationary Energy Scope, Activity, and GHG Emissions by Sub-Sector

		2015 INVENTORY		2018 INVENTORY	
CATEGORY	SCOPE	ACTIVITY	EMISSIONS (MTCO2E)	ACTIVITY	EMISSIONS (MTCO2E)
Stationary Energy					
Residential Buildings	All	Natural Gas: 99,802,009 therms Electricity: 2,032,945,391 kWh	1,030,285	Natural Gas: 100,918,233 therms Electricity: 1,855,862,580 kWh	962,743
Commercial, Institutional, and Agricultural Buildings	All	Natural Gas: 16,206,038 therms Electricity: 725,042,157 kWh	386,753	Natural Gas: 35,862,112 therms Electricity: 1,225,283,901 kWh	349,373
Manufacturing and Construction Buildings	All	Natural Gas: 17,177,369 therms Electricity: 686,002,430 kWh	309,449	Natural Gas: 13,143,126 therms Electricity: 1,025,769,024 kWh	244,417
Energy Industries	1 & 3	2 CHP and District Energy facilities 1 Waste to Energy facility [a] 3 Biomass and Auxiliary Power facilities [a]	121,252	2 CHP and District Energy facilities 1 Waste to Energy facility [a] 3 Biomass and Auxiliary Power facilities [a]	98,554
Fugitive Emissions from Oil and Natural Gas Systems	1	1 Natural Gas Distribution and Transportation facility 1 Crude Petroleum & Natural Gas Extraction site	58,222	1 Natural Gas Distribution and Transportation facility 1 Crude Petroleum & Natural Gas Extraction site	41,066
Agriculture, Forestry and Other Fishing Activities	1	Off-road agricultural vehicles using diesel or gasoline	2,675	Off-road agricultural vehicles using diesel or gasoline	2,658
TOTAL			**1,908,637**		**1,698,809**

NOTES:

[a] *Biogenic emissions from these facilities are not included in the inventory; only non-biogenic CH_4 and N_2O emissions are included, consistent with the GPC Protocol.*

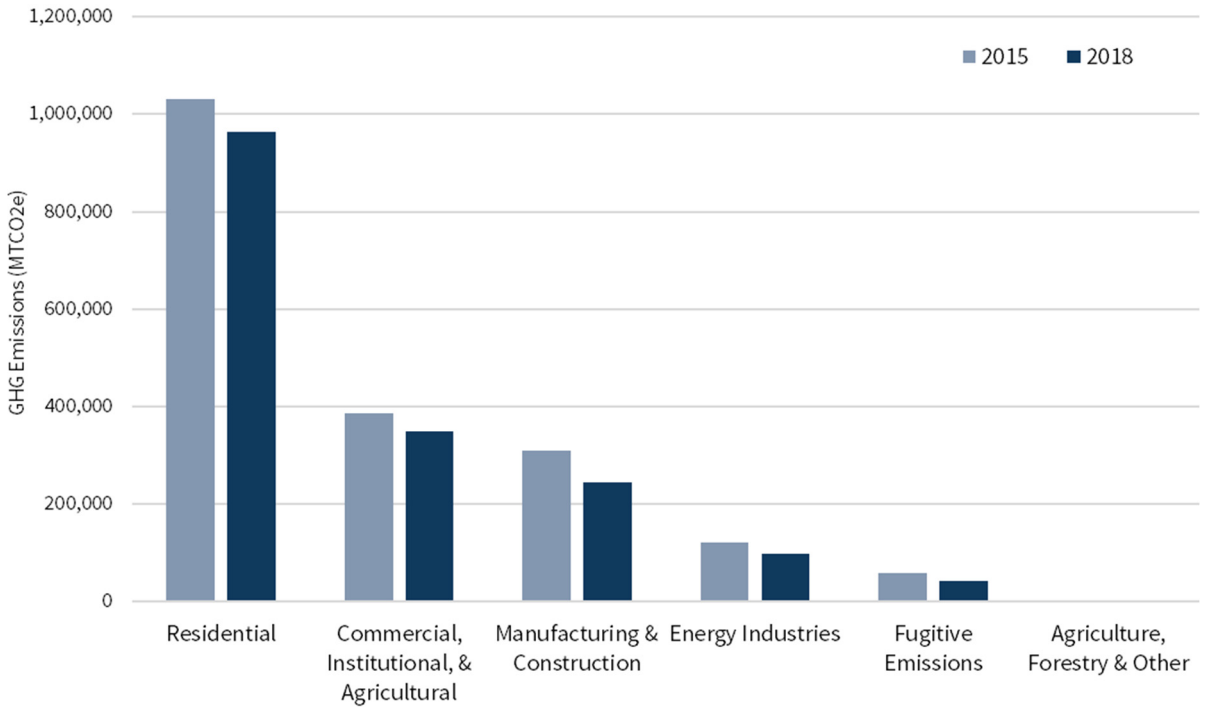

Figure A-1: 2015 & 2018 Energy Emissions by Sub-Sector

RESIDENTIAL BUILDINGS

This category includes direct emissions from the consumption of natural gas and indirect emissions from grid-supplied electricity by residential buildings in unincorporated areas. Direct GHG emissions from natural gas consumption in residential buildings are calculated using SoCalGas natural gas consumption data and emission factors from the Climate Registry[3]. Indirect GHG emissions from electricity consumption in residential buildings are calculated using data from SCE including electricity consumption, emission factors, and power mix. In 2018, SCE's power mix was 36% eligible renewable, 10% hydropower and nuclear (carbon-free), 17% natural gas, and 37% unspecified fossil-fuel sources. SCE's emission rate for 2018 electricity was 513 pounds per MWh.[4] Emissions associated with transmission and distribution losses are accounted using a loss factor of 4.8% for California from EPA eGRID.[5]

Data Sources:

- SCE Consumption Data
  Provided by SoCal Edison via LA County DRP (2021)
- SoCalGas Consumption Data
  Provided by SoCalGas via LA County DRP (2021)

[3] The Climate Registry, Default Emission Factors. May 1, 2018. Available at: https://www.theclimateregistry.org/wp-content/uploads/2018/06/The-Climate-Registry-2018-Default-Emission-Factor-Document.pdf. Accessed January 2021.
[4] California Energy Commission (CEC), 2018 Power Content Label. July 2019. Available at: https://www.energy.ca.gov/sites/default/files/2020-01/2018_PCL_Southern_California_Edison.pdf. Accessed January 2021.
[5] EPA, eGRID. 2018. Available at: https://www.epa.gov/egrid. Accessed January 2021.

- SCE Emission Factor
  Link: https://www.edison.com/content/dam/eix/documents/sustainability/eix-esg-pilot-quantitative-section-sce.pdf
- Climate Registry
  Link: https://www.theclimateregistry.org/wp-content/uploads/2018/06/The-Climate-Registry-2018-Default-Emission-Factor-Document.pdf (the 2018 document was the latest available at the time the inventories were prepared)
- EPA eGRID
  Link: https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid

COMMERCIAL AND INSTITUTIONAL BUILDINGS

This category includes direct emissions from the consumption of natural gas and indirect emissions from grid-supplied electricity by non-residential buildings including commercial, municipal, institutional (such as schools, hospitals, and other public facilities) and agricultural buildings. Direct GHG emissions from natural gas consumption in non-residential buildings are calculated using SoCalGas natural gas consumption data and emission factors from The Climate Registry[6]

In June 2018, non-residential customers in the County were automatically enrolled in the Clean Power Alliance's (CPA) "Clean" rate option. While participation data for 2018 were unavailable when the 2018 inventory was developed, a July 2021 member status report indicated a 98% participation rate for all non-residential customers in the County in 2021.[7] For purposes of the 2018 GHG inventory, it is conservatively assumed that half the annual electricity consumption is attributed to SCE and half to CPA because full CPA enrollment for non-residential customers was not completely in effect until 2019. Under the Clean rate option in 2018, non-residential customers received 61 percent of their electricity from eligible renewable sources via the CPA, 26 percent from carbon-free sources like hydropower, and 13 percent from unspecified fossil-fuel sources like natural gas and coal. GHG emissions from CPA-provided electricity are calculated using CPA data including electricity consumption, emission factors, and power mix.[8] CPA's emission rates for 2018 were 10.6 pounds per MWh for the "Lean" rate and 9.8 pounds per MWh for the Clean rate.[9] GHG emissions from SCE-provided electricity are calculated using SCE data including electricity consumption, emission factors, and power mix. SCE's emission rate for 2018 electricity was 513 pounds per MWh.[10] Emissions associated with transmission and distribution losses are accounted using a loss factor of 4.8% for California from the U.S. EPA's eGRID2018 Summary Table (WECC California subregion).[11]

[6] The Climate Registry, Default Emission Factors. May 1, 2018. Available at: https://www.theclimateregistry.org/wp-content/uploads/2018/06/The-Climate-Registry-2018-Default-Emission-Factor-Document.pdf. Accessed January 2021.
[7] CPA, Member Status Report: Los Angeles County. July 28, 2021.
[8] CEC, 2018 CPA Power Content Label. July 2019. Available at: https://www.energy.ca.gov/sites/default/files/2020-01/2018_PCL_Clean_Power_Alliance.pdf. Accessed January 2021.
[9] The Climate Registry, Utility-Specific Emission Factors. 2020. Available at: https://www.theclimateregistry.org/our-members/cris-public-reports/. Accessed January 2021.
[10] Edison International, 2020 Sustainability Report. 2021. Available at: https://www.edison.com/content/dam/eix/documents/sustainability/eix-2020-sustainability-report.pdf. Accessed January 2021.
[11] EPA, eGRID. 2018. Available at: https://www.epa.gov/egrid. Accessed January 2021.

Data Sources:

- SCE Consumption Data
  Provided by SoCal Edison via LA County DRP (2021)
- SoCalGas Consumption Data
  Provided by SoCalGas via LA County DRP (2021)
- CPA Member Status Report (July 28, 2021)
  Provided by CPA via LA County CSO (July 28, 2021)
- SCE Emission Factor
  Link: https://www.edison.com/content/dam/eix/documents/sustainability/eix-esg-pilot-quantitative-section-sce.pdf
- CPA Emission Factor
  Link: https://www.theclimateregistry.org/our-members/cris-public-reports/
- Climate Registry
  Link: https://www.theclimateregistry.org/wp-content/uploads/2018/06/The-Climate-Registry-2018-Default-Emission-Factor-Document.pdf
- Climate Registry Information System (CRIS)
  Link: https://cris4.org/(S(zr3twbbnour5a5jfb1iykcxa))/frmLILogin.aspx
- EPA eGRID
  Link: https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid

MANUFACTURING AND INDUSTRIAL BUILDINGS

This category includes direct emissions from the consumption of natural gas and indirect emissions from grid-supplied electricity consumption in manufacturing and industrial buildings. This category also includes direct emissions from fossil fuel combustion for electricity and heat generation by stationary equipment (such as boilers, furnaces, burners, turbines, heaters, incinerators, engines and flares) and off-road equipment (such as vehicle and mobile machinery) that are used inside building property premises.

GHG emissions from natural gas and electricity consumption are estimated using the same assumptions and methods stated under Commercial and Institutional Buildings above.

Emissions from fuel combustion of other energy sources in manufacturing facilities are documented using the California Air Resource Board's (CARB) Pollution Mapping Tool.[12] This tool provides CH_4, CO_2 and N_2O from on-site combustion and industrial processes for each facility location. CARB's OFFROAD2017 ORION[13] tool is used to estimate emissions from fuel consumption by industrial and construction equipment used inside building premises. This tool provides daily CO_2 emissions and annual fuel consumption of diesel, gasoline and natural gas by manufacturing and construction sectors for Los Angeles County as a whole, including cities. (This area is referred to herein as "Countywide.") Emissions from unincorporated Los Angeles County are estimated by scaling countywide GHG emissions based on the number of jobs in manufacturing and construction sectors in unincorporated areas in 2017.

[12] CARB, Pollution Mapping Tool. 2018. Available: https://ww3.arb.ca.gov/ei/tools/pollution_map/. Accessed January 2021.
[13] CARB, OFFROAD ORION. 2018. Available at: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools. Accessed January 2021.

Note: This category only reports fossil fuel combustion-related emissions from CARB's Pollution Mapping Tool. These emissions do not include fugitive process emissions from manufacturing facilities since they are reported under the IPPU category. Emissions reported in CARB's Pollution Mapping tool are largely informed by emissions reported under the CARB's Mandatory GHG Reporting Regulations (MRR).[14] The MRR only requires facilities emitting more than 10,000 $MTCO_2e$ to report their emissions. Emissions from facilities emitting under 10,000 $MTCO_2e$ are not available and have therefore not been accounted in this inventory.

Data Sources:

- SCE Consumption Data
  Provided by SoCal Edison via LA County DRP (2021)
- SoCal Gas Data
  Provided by SoCal Gas via LA County DRP (2021)
- CPA Membership Report
  Provided by CPA via LA County CSO (July 28, 2021)
- SCE Emission Factor
  Link: https://www.edison.com/content/dam/eix/documents/sustainability/eix-esg-pilot-quantitative-section-sce.pdf
- EPA eGRID
  Link: https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid
- CARB OFFROAD2017 ORION
  Link: https://www.arb.ca.gov/orion/
- CARB Pollution Mapping Tool
  Link: https://www.arb.ca.gov/ei/tools/pollution_map/
- Jobs in Manufacturing and Construction
  Link: https://scag.ca.gov/sites/main/files/file-attachments/losangelescountylp.pdf?1605653130

ENERGY INDUSTRIES

The Energy Industries category includes emissions from primary fuel production (such as coal mining and oil and gas extraction), fuel processing and conversion (such as coal to coke in coke ovens) and on-site fuel combustion for auxiliary energy production (such as electricity generation and district heating).

Emissions from fuel and energy production in combined heat and power (CHP) plants, biomass power stations, and waste to energy facilities in unincorporated areas are documented using CARB's Pollution Mapping Tool.[15] For CHP and district energy source, the inventory includes direct natural gas combustion emissions from the Pitchess Cogeneration Station in Saugus and the Olive View Medical Center Cogeneration Station in Sylmar. Pitchess Cogeneration Station and the Olive View Medical Center Cogeneration Station were included because these facilities are both within the County and

[14] CARB, Mandatory GHG Reporting Regulations. April 1, 2019. Available at: https://ww2.arb.ca.gov/mrr-regulation. Accessed January 2021.
Emissions reported under CARB's Pollution Mapping Tool are largely informed by emissions reported under CARB's Mandatory GHG Reporting Regulations (MRR). The MRR only requires facilities emitting more than 10,000 MTCO2e to report their emissions. Emissions from facilities emitting under 10,000 MTCO2e are not available and have therefore not been accounted in this inventory.

owned and operated by LA County. Emissions data for all three facilities were obtained from CARB's 2021 MRR database.

Waste-to-Energy facilities include Bradley Landfill in Sun Valley and the Calabasas Landfill in Agoura. These facilities convert landfill methane to energy. Only non-biogenic CH_4 and N_2O emissions from these facilities were included in the inventory because the CO_2 emissions from landfill gas combustion are considered biogenic (not anthropogenic) emissions sources by the GPC and should therefore be excluded.[16] Biomass and auxiliary power facilities include Ameresco Chiquita Energy LLC in Castaic, Calabasas Landfill in Agoura, MM Lopez Energy LLC in Lake View Terrace, and Sunshine Gas Producers LLC in Sylmar. Similar to the waste to energy facilities above, only non-biogenic CH_4 and N_2O emissions from these facilities were included in the inventory.

Data Sources:

- CARB Pollution Mapping Tool
  Link: https://www.arb.ca.gov/ei/tools/pollution_map/
- CARB MRR Database
  Link: https://ww2.arb.ca.gov/mrr-data

AGRICULTURE, FORESTRY AND OTHER FISHING ACTIVITIES

Emissions from direct fuel combustion associated with agricultural activities typically result from the operation of farm vehicles and machinery (stationary and mobile) and generators to power lights, pumps, heaters, coolers and other equipment. CARB's OFFROAD2017 ORION[17] tool was used to estimate Countywide emissions from direct fuel consumption by agricultural equipment (including plant and animal cultivation, afforestation and reforestation activities, and fishery activities). GHG emissions from the unincorporated County areas were estimated by scaling countywide GHG emissions using the cropland acres in unincorporated areas in 2016.

Note: For the agricultural sector, this category only reports emissions associated with off-road vehicles and equipment. Emissions from agricultural buildings (natural gas and electricity consumption) are reported under the commercial and institutional buildings category.

Data Sources:

- CARB OFFROAD ORION
  Link: https://www.arb.ca.gov/orion/
- NASS CropScape
  Link: https://nassgeodata.gmu.edu/CropScape/

[16] According to the GPC, "Biogenic emissions are those that result from the combustion of biomass materials that store and sequester CO_2, including materials used to make biofuels (e.g. trees, crops, vegetable oils, or animal fats)."
[17] CARB, OFFROAD ORION. 2018. Available at: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools. Accessed January 2021.

FUGITIVE EMISSIONS FROM OIL AND NATURAL GAS SYSTEMS

Fugitive emissions include all intentional and unintentional emissions from the extraction, processing, storage and transport of oil and natural gas to the point of final use. The primary sources of fugitive emissions from oil and natural gas systems include equipment leaks, evaporation and flashing losses, venting, flaring, incineration, and accidental releases. GHG emissions from oil and natural gas systems in unincorporated areas are documented using CARB's Pollution mapping tool.[18]

Data Sources:

- CARB Pollution Mapping Tool
  Link: https://www.arb.ca.gov/ei/tools/pollution_map/

Transportation

The transportation sector includes emissions from fuel (gasoline, diesel, and natural gas) and electricity consumption in on-road passenger vehicles (cars, light-, medium-, and heavy-duty trucks), buses, and rail systems. Note that while Metro and Metrolink have GHG inventories for the transportation services provided by the respective agencies, they do not estimate emissions by local jurisdiction. Therefore, bus and railway emissions are independently estimated for the County. **Table A-2** presents scopes, activity data, and emissions for the transportation sector. **Figure A-2** shows the contribution of each subsector to the Transportation sector for both the 2015 and 2018 inventories.

Table A-2: Transportation Scope, Activity, and GHG Emissions by Sub-Sector

		2015 INVENTORY		2018 INVENTORY	
CATEGORY	SCOPE	ACTIVITY	EMISSIONS (MTCO2E)	ACTIVITY	EMISSIONS (MTCO2E)
Transportation					
Passenger Vehicles	1 & 3	18,982,668 miles/day	2,797,360	19,074,692 miles/day	2,665,824
Buses	1 & 3	1,392,461,970 miles/year	31,360	1,143,144,015 miles/year	29,371
Railway	1 & 3	Metro: 634,484,952 miles/year Metrolink: 24,798 riders/day	9,413	Metro: 689,995,896 miles/year Metrolink: 25,690 riders/day	9,490
TOTAL			**2,838,133**		**2,704,685**

[18] CARB, Pollution Mapping Tool. 2018. Available: https://ww3.arb.ca.gov/ei/tools/pollution_map/. Accessed January 2021.

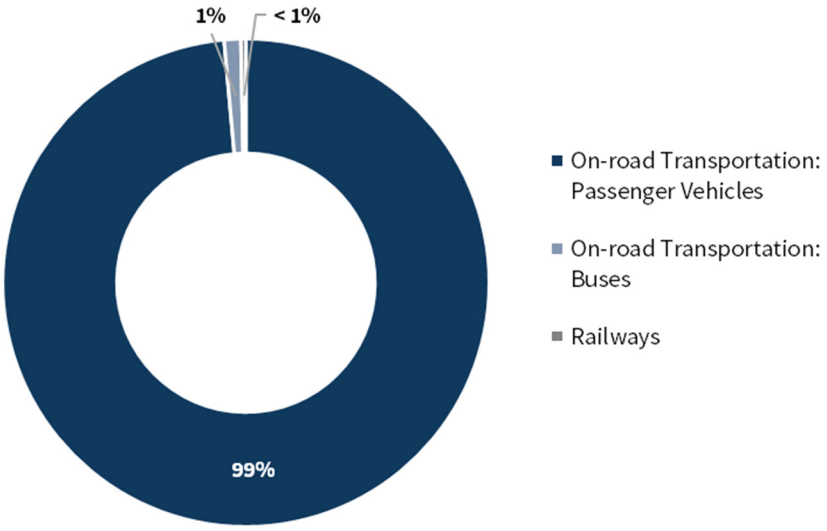

Figure A-2: 2015 & 2018 Transportation Emissions by Sub-Sector

ON ROAD TRANSPORTATION: PASSENGER VEHICLES AND TRUCKS

Emissions from passenger vehicles and trucks are estimated based on daily vehicle trips and vehicle miles traveled (VMT) by each vehicle type. VMT for the County is estimated using a trip-based travel forecasting model developed by Southern California Association of Governments (SCAG). SCAG's 2016 Regional Travel Demand Model, the version for which a complete dataset was available at the time of modeling, was used by Fehr and Peers (F&P) to analyze the transportation network and socioeconomic data such as population, household, and employment, to forecast daily vehicle trips and VMT for each traffic analysis zone (TAZ) within the County.[19]

The 2016 SCAG model has a base year of 2012 and horizon year of 2040. VMT for the inventory years, including 2015 and 2016, was linearly interpolated from the 2012 and 2040 model values. Daily VMT are estimated using the origin-destination analysis approach (full accounting method). The Full Accounting Method accounts for VMT depending on where the trip is starting and ending. This method tracks (and "fully accounts" for) all the vehicle trips being generated by a geographic area (i.e., a city) across the entire regional network, and allows for the isolation of different types of VMT as follows.

- Internal-internal (II) VMT: Includes all trips that begin and end entirely within the geographic area of study.
- One-half of internal-external (IX) VMT: Includes one-half of trips with an origin within the geographic area of study and a destination outside of this area. This assumes that the geographic area under study shares half the responsibility for trips traveling to other areas.

[19] VMT estimates for large urban areas are commonly developed using regional travel demand models. These models are developed and periodically updated, calibrated, and validated for use in long range infrastructure planning, environmental impact assessments, and air quality conformity analyses by local and regional agencies. Trip-based travel forecasting models generate (output) daily vehicle trips for each TAZ across various trip purposes based on inputs such as the transportation network and socioeconomic data such as population, household, and employment. SCAG staff maintain a regional travel demand model that uses a four-step model process to arrive at a set of forecast vehicle trips based on the data described above.

- One-half of external-internal (XI) VMT: Includes one-half of trips with an origin outside of the geographic area of study and a destination within this area. Similar to the IX trips, the geographic area of study shares the responsibility of trips traveling from other areas.
- External-external (XX) VMT: Trips through the geographic area of study are not included. This approach is consistent with the concept used for the IX and XI trips. Therefore, the XX VMT would be assigned to other areas that are generating the trips.

The Full Accounting Method was utilized to develop the VMT estimates for the County because it more fully accounts for the length of regional travel generated in the County, not just the travel occurring on the County's in-boundary roadways. As noted above, the inventory includes emissions from trips that begin and/or end within the County. It does not include through trips that neither begin nor end within the unincorporated areas. Daily VMT is then multiplied by 347 to calculate annual VMT.[20] VMT was estimated for passenger vehicles (light-duty cars and trucks) and trucks (medium- and heavy-duty trucks).

Emissions were calculated using CARB's EMission FACtors 2021 model (EMFAC2021).[21] EMFAC2021 generates vehicle emission rates by area, year, vehicle type, fuel type, speed, and other parameters. EMFAC2021 was run for Los Angeles County for 2015 and 2018 in "emission rate" mode to generate vehicle travel emission factors for all vehicle types and fuel types for aggregated (average) speeds. The EMFAC vehicle type categories were aligned with the two categories of VMT provided by Fehr & Peers (passenger and truck).[22] The EMFAC emission factors by vehicle type and fuel assigned to passenger VMT and truck VMT were then weighted using Countywide VMT and trip generation profiles for each vehicle type modeled in EMFAC2011.[23] GHG emissions were then calculated by multiplying the weighted emission factors for passenger vehicles and trucks by the origin-destination VMT for passenger vehicles and trucks supplied by Fehr & Peers.

Data Sources:

- 2016 SCAG Regional Travel Demand Model
  Provided by SCAG
- Fehr & Peers Modeling Analysis (July 29, 2019; December 2021; January 2022)
- EMFAC2021 Model
  Link: https://arb.ca.gov/emfac/emissions-inventory/4c9f04282a1f85d62a27721058b5a3bb6fd22fb9

[20] The annualization factor of 347 was provided by Fehr & Peers to estimate annual vehicle activity based on daily vehicle activity generated by SCAG's 2016 Regional Travel Demand Model.
[21] CARB, EMFAC2021 Model. 2021. Available at: https://arb.ca.gov/emfac/emissions-inventory/4c9f04282a1f85d62a27721058b5a3bb6fd22fb9. Accessed October 2021.
[22] The "passenger vehicle" category corresponds to EMFAC vehicle categories LDA, LDT1, LDT2, MCY, and MD. The "trucks" category corresponds to EMFAC vehicle categories LHDT1, LHDT2, MHDT, HHDT, and MH.
[23] For example, if the LDA vehicle type represents 70% of VMT at an emission rate of 300 grams CO2 per mile and the LDT1 vehicle type represents 30% of VMT at an emission rate of 350 grams CO2 per mile, the VMT-weighted emission rate for LDA and LDT1 vehicles combined is calculated as follows: 70% * 300 + 30% * 350 = 315 grams CO2 per mile.

ON ROAD TRANSPORTATION: BUSES

GHG emissions from fuel and energy consumption by bus transit systems and paratransit agencies are accounted from Federal Transit Administration's (FTA) National Transit database at the Countywide level (not for unincorporated County areas separately).[24] The agency included in the GHG inventory includes the Los Angeles County Metropolitan Transportation Authority (Metro). Electricity consumption was not available from the National Transit database. To account for electricity consumption and associated indirect GHG emissions, the total gasoline and diesel fuel use from the National Transit database was reapportioned based on the percentage of VMT by fuel type (diesel, gasoline, natural gas, electricity) from EMFAC2021 for the aggregated OBUS, SBUS, and UBUS categories in EMFAC. The CPA Clean emission factor is applied to all electricity consumption by electric buses serving unincorporated County areas. Emission factors for gasoline, diesel, and compressed natural (CNG) gas-powered buses are taken from EMFAC2021 to calculate CO_2 and N_2O emissions. Total estimated Countywide GHG emissions were then scaled by Metro ridership forecasts for unincorporated county areas to estimate GHG emissions for the unincorporated County areas.[25]

Data Sources:

- FTA National Transit Database
  Link: https://www.transit.dot.gov/ntd/ntd-data
- EMFAC2021 Model
  Link: https://arb.ca.gov/emfac/emissions-inventory/4c9f04282a1f85d62a27721058b5a3bb6fd22fb9
- Metro Bus Ridership
  Link: https://isotp.metro.net/MetroRidership/Index.aspx

RAILWAY

Diesel fuel and electricity consumed by commuter rail systems are obtained from FTA's NTD.[26] The database reports diesel fuel consumption by Southern California Regional Rail Authority (Metrolink) and electricity consumption by Metro Rail. GHG emission factors for diesel locomotives were obtained from the EPA national GHG inventory and emission factors for electric propulsion were obtained from the EPA's Emissions & Generation Resource Integrated Database (eGRID).[27] These emission factors were multiplied by the diesel fuel and electricity consumption values obtained from NTD to generate GHG emissions for Los Angeles County as a whole. Total Countywide GHG emissions were then scaled based on Metro and Metrolink ridership forecasts for unincorporated county areas to estimate GHG emissions for the unincorporated County areas.

Data Sources:

- FTA National Transit Database
  Link: https://www.transit.dot.gov/ntd/ntd-data

[24] FTA, National Transit Database. 2018. Available at: https://www.transit.dot.gov/ntd/ntd-data. Accessed January 2021.
[25] Metro, Interactive Estimated Ridership Stats. 2021. Available at: https://isotp.metro.net/MetroRidership/Index.aspx. Accessed January 2021.
[26] FTA, National Transit Database. 2018. Available at: https://www.transit.dot.gov/ntd/ntd-data. Accessed January 2021.
[27] EPA, eGRID. 2018. Available at: https://www.epa.gov/egrid. Accessed January 2021.

- EPA National GHG Inventory Emission Factors
  Link: https://www.epa.gov/sites/production/files/2015-12/documents/emission-factors_nov_2015.pdf
- EPA eGRID Database
  Link: https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid
- Metro Ridership
  Link: http://media.metro.net/projects_studies/union_station/images/LAUSMP_Presentation_2013_0315.pdf

Waste and Wastewater

Emissions generated at landfills, biological treatment (composting and anaerobic digestion) and incineration facilities, and wastewater treatment plants are reported under the waste sector. These subsectors are discussed in more detail below. **Table A-3** presents scopes, activity data, and emissions for the water and wastewater sector. **Figure A-3** compares 2015 and 2018 GHG emissions from waste and wastewater by sub-sector.

Table A-3: Waste and Wastewater Scope, Activity, and GHG Emissions by Sub-Sector

		2015 INVENTORY		2018 INVENTORY	
CATEGORY	SCOPE	ACTIVITY	EMISSIONS (MTCO2E)	ACTIVITY	EMISSIONS (MTCO2E)
Waste and Wastewater					
Solid Waste Disposal	1 & 3	Disposal Tonnage: 721,493 tons	404,604	Disposal Tonnage: 935,512 tons	407,578
Biological Treatment of Solid Waste	1 & 3	Composting Tonnage: 51,111 tons	10,214	Composting Tonnage: 27,182 tons	5,309
Waste Incineration*	1 & 3	Incineration Tonnage: 3,303 tons	1,184	Incineration Tonnage: 1,876 tons	547
Wastewater Treatment	All	Population: 1,058,871	55,179	Population: 1,082,365	56,495
TOTAL			**469,997**		**469,382**

Note: Totals exclude Waste Incineration which is accounted for under Stationary Energy

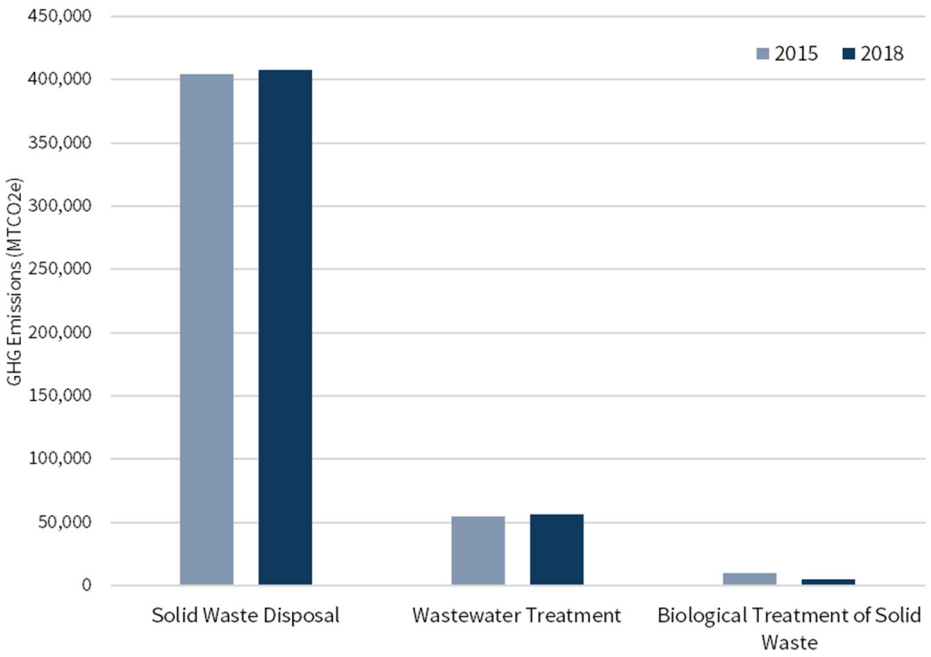

Figure A-3: 2015 & 2018 Waste and Wastewater Emissions by Sub-Sector

SOLID WASTE DISPOSAL

Landfill-related emissions are estimated using CARB's first order of decay (FOD) model,[28] based on waste disposal tonnage and composition data from CalRecycle's Solid Waste Integrated System (SWIS)[29] and LA County Public Works Solid Waste Information Management System (SWIMS) reports.[30] Using these reports, County disposal tonnage data were obtained for 62 open and closed landfills where County residents and businesses disposed their municipal solid waste prior to 2018.

Most of the 62 in- and out-of-county landfills used by County residents and businesses have landfill gas collection (LFG) systems with combustion control. These systems collect LFG for flaring, energy production, or for producing liquified natural gas (LNG), CNG and producer gas. GHG emissions from landfill gas collection are estimated based on LFG collection rate, LFG flow to energy, and methane content from CalRecycle's 2010 Landfill Gas Master.[31] To determine Los Angeles County's share of methane removal at these landfills (since many other jurisdictions contribute waste to these same landfills), total emissions from these landfills were apportioned based on waste disposed in the landfills by Los Angeles County versus California. California's disposal tonnage data are obtained using

[28] CARB, Landfill Gas Tool. 2021. Available at: https://ww2.arb.ca.gov/resources/documents/carbs-landfill-gas-tool. Accessed January 2021.
[29] CalRecycle, SWIS Facility/Site Search. 2021. Available at: https://www2.calrecycle.ca.gov/SolidWaste/Site/Search. Accessed January 2021.
[30] LADPW, Solid Waste Information Management System (SWIMS). 2021. Available at: https://dpw.lacounty.gov/epd/swims/OnlineServices/reports.aspx. Accessed January 2021.
[31] CalRecycle, Landfill Gas Master. Available at: https://www2.calrecycle.ca.gov/PublicNotices/Documents/1642. Accessed January 2021.

CalRecycle's SWIS reports for statewide disposal at the same facilities, where County residents and businesses deposited municipal solid waste between 1998 and 2018. The same was done to estimate the County's share of emissions at these landfills.

GHG emissions from landfills and landfill gas flaring for the County are scaled based on waste volume directed to in- and out-of-county landfills between 1998 and 2018. Emissions associated with methane flaring and recovery from landfills are reported under the waste sector. However, if the methane is recovered (via biogas or digester gas) and used for electricity generation, then the emissions are reported under the stationary energy sector as waste-to-energy facilities or biomass and auxiliary power facilities.

Data Sources:

- CARB FOD Model
  Link: https://ww2.arb.ca.gov/resources/documents/landfill-methane-emissions-tool
- CalRecycle SWIS Reports
  Link: https://www2.calrecycle.ca.gov/SolidWaste/Site/Search
- LADPW SWIMS Reports
  Link: https://dpw.lacounty.gov/epd/swims/OnlineServices/reports.aspx
- CalRecycle Landfill Gas Master
  Link: https://www2.calrecycle.ca.gov/PublicNotices/Documents/1642

BIOLOGICAL TREATMENT OF SOLID WASTE

Biological treatment of solid waste refers to the composting and anaerobic digestion of organic waste (such as food waste, garden and park waste, sludge, and other organic waste sources).

Composting:

In 2018, LA County diverted waste to eight in-county and over 50 out-of-county composting facilities. Waste volume diverted by unincorporated County areas for composting was obtained from LA County Public Works SWIMS reports for transfer stations and non-disposal facilities.[32] Waste composted at in-county facilities is assumed to be equivalent to annual waste processing capacity of in-county facilities. These data are obtained from 2019 Organics Waste Management Reports by the LA County Department of Public Works. Waste composted at out-of-county facilities is considered to be the difference between total waste diverted and capacity of in-county facilities. GHG emissions are calculated using wet and dry waste parameters based on waste composition disposed at in and out-of-county recycling or diversion facilities. These data are obtained from Public Works Organics Waste Management Reports.[33] GHG emissions from composting for the County are scaled based on waste volume directed to in- and out-of-county facilities in 2018.

[32] LADPW, Solid Waste Information Management System (SWIMS). 2021. Available at: https://dpw.lacounty.gov/epd/swims/OnlineServices/reports.aspx. Accessed January 2021.
[33] Ibid

Anaerobic Digestion:

The Joint Water Pollution Control Plant (JWPCP) serves 78 Cities as well as many unincorporated communities, also manages sewage sludge using Anaerobic Digester Units. Annual waste volume processed at these facilities is obtained from 2019 Organics Waste Management Reports by Public Works.[34] GHG emissions produced by this facility are estimated based on content of volatile solids in food waste and sewage sludge processed in respective facilities.

GHG emissions from anaerobic digestion facilities for the County are scaled based on population of unincorporated areas in 2018 compared to the total Countywide population. Since the JWPCP facility uses biogas or digester gas for energy production, emissions from anaerobic digestion are included under the waste sector for informational purposes, but they are reported under stationary energy (energy industries).

Data Sources:

- LADPW SWIMS Reports
  Link: https://dpw.lacounty.gov/epd/swims/
- Public Works 2019 Organics Waste Management Reports
  Link: https://dpw.lacounty.gov/epd/swims/News/swims-more-links.aspx?id=4

WASTE INCINERATION

Incineration is a controlled industrial process which is often paired with energy recovery. In 2018, LA County diverted waste to three waste incineration facilities. Two of the facilities – the Commerce Refuse-to-Energy Facility (discontinued in June 2018) and the Southeast Resource Recovery Facility – are located in the county. Additionally, waste was diverted to Covanta Stanislaus Inc., which is an out-of-county facility. GHG emissions from these facilities are obtained from CARB's MRR GHG database.[35]

To estimate the County's emissions, total countywide GHG emissions from waste incineration facilities are scaled based on waste diverted by unincorporated communities to these facilities in 2018. CalRecycle's 2018 SWIS reports are used to determine the waste volume diverted to these facilities.[36] Since these facilities are used for energy production, emissions are reported under stationary energy (energy industries).

Data Sources:

- CARB MRR Database
  Link: https://ww2.arb.ca.gov/mrr-data
- CalRecycle SWIS Reports
  Link: https://www2.calrecycle.ca.gov/swfacilities/Directory/

[34] Ibid
[35] CARB, Mandatory GHG Reporting Regulations. April 1, 2019. Available at: https://ww2.arb.ca.gov/mrr-regulation. Accessed January 2021
[36] CalRecycle, SWIS Facility/Site Search. 2021. Available at: https://www2.calrecycle.ca.gov/SolidWaste/Site/Search. Accessed January 2021.

WASTEWATER TREATMENT

Emissions from wastewater treatment are estimated based on population served by sewer and septic systems in unincorporated areas. GHG emissions from wastewater treatment are estimated based on 2018 population data from the SCAG Growth and Forecast report.[37] Parameters and constants such as total organic carbon and protein consumption in wastewater are obtained from California GHG inventory documentation[38] and IPCC default parameters.[39]

Data Sources:

- SCAG Growth and Forecast Report
  Link: http://gisdata.scag.ca.gov/Pages/SocioEconomicLibrary.aspx?keyword=Forecasting
- California GHG Inventory
  Link: https://www.arb.ca.gov/cc/inventory/pubs/pubs.htm
- IPCC Default Parameters
  Link: https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf

Industrial Processes and Product Use

Emissions from the industrial processes and product use (IPPU) sector include HFC and PFC emissions from products such as refrigerants, foams, aerosols and fossil fuel-based lubricants and solvents are estimated by scaling statewide emissions from the product use category. Statewide GHG emissions from product use in residential, commercial, and transportation sectors are scaled based on the County's population.[40] State-level HFC and PFC emissions from product use in industries including electronics, food processing, metal and machinery manufacturing, and others, are scaled based on state and County industry output from respective industries and the County's population.[41] GHG emissions are further adjusted based on HFC prohibitions for both Senate Bill 1013 and the CARB HFC Regulation by assuming that the use of prohibited HFCs are phase out over 30 years from prohibition date for all HFC policies before 2018.[42] **Table A-4** presents scopes, activity data, and emissions for the IPPU sector.

[37] SCAG, Growth Forecasting. 2018. Available at: https://scag.ca.gov/data-tools-geographic-information-systems. Accessed January 2021.
[38] CARB, GHG Inventory Data Archive. 2021. Available at: https://scag.ca.gov/data-tools-geographic-information-systems. Accessed January 2021.
[39] IPCC, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 2: Waste Generation, Composition and Management Data. 2006. Available at: https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_2_Ch2_Waste_Data.pdf. Accessed March 2022.
[40] CARB, GHG Inventory Data Archive. 2021. Available at: https://scag.ca.gov/data-tools-geographic-information-systems. Accessed January 2021.
[41] SCAG, Growth Forecasting. 2018. Available at: https://scag.ca.gov/data-tools-geographic-information-systems. Accessed January 2021.
[42] CARB, HFC Prohibitions in California. November 29, 2018. Available at: https://ww2.arb.ca.gov/resources/fact-sheets/hydrofluorocarbon-hfc-prohibitions-california. Accessed January 2021.

Table A-4: IPPU Scope, Activity, and GHG Emissions

CATEGORY	SCOPE	2015 INVENTORY ACTIVITY	2015 INVENTORY EMISSIONS (MTCO2E)	2018 INVENTORY ACTIVITY	2018 INVENTORY EMISSIONS (MTCO2E)
IPPU					
Product Use	1	Aerosols & fire retardants, residential & transportation refrigeration and air conditioning, foam use, industrial refrigeration and air conditioning, and non-aerosol solvents Population: 1,114,808	253,529	Aerosols & fire retardants, residential & transportation refrigeration and air conditioning, foam use, industrial refrigeration and air conditioning, and non-aerosol solvents Population: 1,082,365	239,505
TOTAL			**253,529**		**239,505**

Data Sources:

- California GHG Inventory
  Link: https://www.arb.ca.gov/cc/inventory/pubs/pubs.htm
- HFC Prohibitions
  Link: https://ww2.arb.ca.gov/resources/fact-sheets/hydrofluorocarbon-hfc-prohibitions-california
- SCAG Growth and Forecast Report
  Link: http://gisdata.scag.ca.gov/Pages/SocioEconomicLibrary.aspx?keyword=Forecasting
- IMPLAN Data (proprietary)[43]

Agriculture, Forestry, and Other Land Use

The AFOLU sector accounts for emissions from land-related changes and includes agriculture, forestry and aggregate sources (including wildfires, biomass burning, and fertilizer use). This sector also includes emissions from forest land conversion. Based on historic land conversion data from 2007-2016, approximately 212 hectares of forest land is converted to urban land each year in unincorporated county areas. The conversion of a single hectare results in a one-time emission of 169 $MTCO_2e$; this value was multiplied by 212 to estimate total annual land conversion emissions.[44]

[43] Impact Analysis For Planning (IMPLAN) data contains 546 sectors representing all private industries in the United States (anything from grain farming to surgical appliance manufacturing) as defined by the North American Industry Classification System (NAICS) codes. Employment, employee compensation, industry expenditures, commodity demands, relationships between industries, and more are collected to form IMPLAN's ever-growing database. For more information, see: https://www.implan.com/data/.

[44] NASS, CropScape. 2021. Available at: https://nassgeodata.gmu.edu/CropScape/. Accessed January 2021.

This sector does not include natural carbon sequestration and storage in the County's natural lands, working lands, and urban forests because these sinks are part of the natural carbon cycle and are not anthropogenic emissions sources. Further, forest sinks are not currently included in CARB's statewide inventory or SB 32's statewide GHG emission reduction target for 2030.[45]

Emissions from wildfire and biomass burning generated (post-harvest agricultural burning) and fertilizer use (including liming, urea, organic and synthetic fertilizer) are reported under aggregate sources. Emissions from post-harvest biomass burning (barley, corn, wheat and almond) in unincorporated areas are estimated using 2016 cropland area from NASS CropScape[46] and relevant emission factors from the CARB 2000-2019 California GHG inventory.[47]

Emissions from fertilizer use for agriculture in Los Angeles County are estimated based on California Department of Food and Agriculture (CDFA) annual reports and scaled for unincorporated areas using 2016 cropland area from NASS CropScape.[48] **Table A-5** presents scopes, activity data, and emissions for the AFOLU sector. **Figure A-4** shows the contribution of each subsector to the AFOLU sector for both the 2015 and 2018 inventories.

Table A-5: AFOLU Scope, Activity, and GHG Emissions by Sub-Sector

		2015 INVENTORY		2018 INVENTORY	
CATEGORY	SCOPE	ACTIVITY	EMISSIONS (MTCO2E)	ACTIVITY	EMISSIONS (MTCO2E)
AFOLU					
Land Use Change	1	Total Forest Land Area: 52,498 acres [a] Forest Land Conversion: -212 hectares/year Urban Tree Canopy: 11,938 hectares [a]	35,811	Total Forest Land Area: 52,498 acres [a] Forest Land Conversion: -212 hectares/year Urban Tree Canopy: 11,938 hectares [a]	35,811
Aggregate Sources and Non-CO2 Emissions Sources	1	Biomass Burning (Crops): 61 acres Liming: 152 tons Urea Application: 1,026 tons Managed Soils: 5,374 tons	25,048	Biomass Burning (Crops): 61 acres Liming: 152 tons Urea Application: 1,026 tons Managed Soils: 5,374 tons	25,048
TOTAL			**60,860**		**60,860**

NOTES:

[a] *Forest land area and urban tree canopy cover data are reported for informational purposes only. These data are not used to generate emissions sinks for inclusion in the GHG inventories.*

[45] Moreno, Adam. Lead Natural and Working Lands Climate Scientist. California Air Resources Board. Email correspondence with ESA on November 15, 2021.
[46] NASS, CropScape. 2021. Available at: https://nassgeodata.gmu.edu/CropScape/. Accessed January 2021.
[47] CARB, GHG Inventory Data Archive. 2021. Available at: https://scag.ca.gov/data-tools-geographic-information-systems. Accessed January 2021
[48] CDFA, California Agricultural Statistics Review 2015-2016. 2016. Available at: https://www.cdfa.ca.gov/statistics/PDFs/2016Report.pdf. Accessed January 2021.

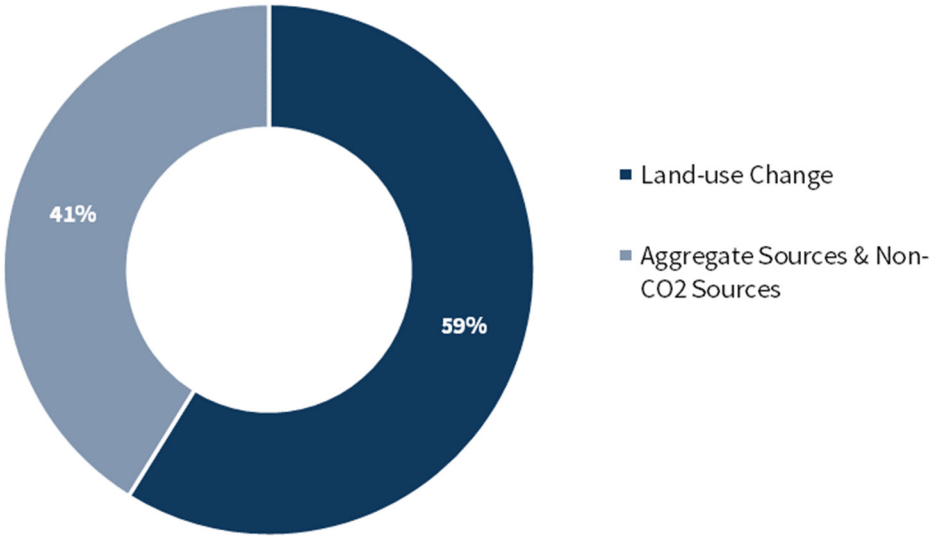

Figure A-4: 2015 & 2018 AFOLU Emissions by Sub-Sector

Data Sources:

- NASS CropScape
  Link: https://nassgeodata.gmu.edu/CropScape/
- CDFA, California Agricultural Statistics Review 2015-2016
  Link: https://www.cdfa.ca.gov/statistics/PDFs/2016Report.pdf
- TreePeople, Los Angeles County Tree Canopy Map Viewer
  Link: https://www.treepeople.org/los-angeles-county-tree-canopy-map-viewer/
- California GHG Inventory
  Link: https://www.arb.ca.gov/cc/inventory/pubs/pubs.htm
- GIS analysis by UCLA Institute of Environmental Studies

Summary Emissions

Table A-6 presents total GHG emissions for all sectors and subsectors in the 2015 and 2018 GHG inventories. **Figure A-5** compares the 2015 and 2018 inventories with a sector breakdown.

Table A-6: GHG Emissions by Sector and Sub-Sector

CATEGORY	2015 EMISSIONS (MTCO2E)	2018 EMISSIONS (MTCO2E)
Transportation	**2,838,133**	**2,704,685**
Passenger Vehicles	2,797,360	2,665,824
Buses	31,360	29,371
Railway	9,413	9,490
Stationary Energy	**1,908,637**	**1,698,809**
Residential Buildings	1,030,285	962,743
Commercial, Institutional, and Agricultural Buildings	386,753	349,373
Manufacturing and Construction Buildings	309,449	244,417
Energy Industries	121,252	98,554
Fugitive Emissions from Oil and Natural Gas Systems	58,222	41,066
Agriculture, Forestry and Other Fishing Activities	2,675	2,658
Waste and Wastewater	**469,997**	**469,382**
Solid Waste Disposal	404,604	407,578
Biological Treatment of Solid Waste	10,214	5,309
Waste Incineration*	1,184	547
Wastewater Treatment	55,179	56,495
IPPU	**253,529**	**239,505**
Product Use	253,529	239,505
AFOLU	**60,860**	**60,860**
Land Use Change	35,811	35,811
Aggregate Sources and Non-CO2 Emissions Sources	25,048	25,048
TOTAL	**5,531,155**	**5,173,240**

Note: Waste and Wastewater totals exclude Waste Incineration which is accounted for under Stationary Energy

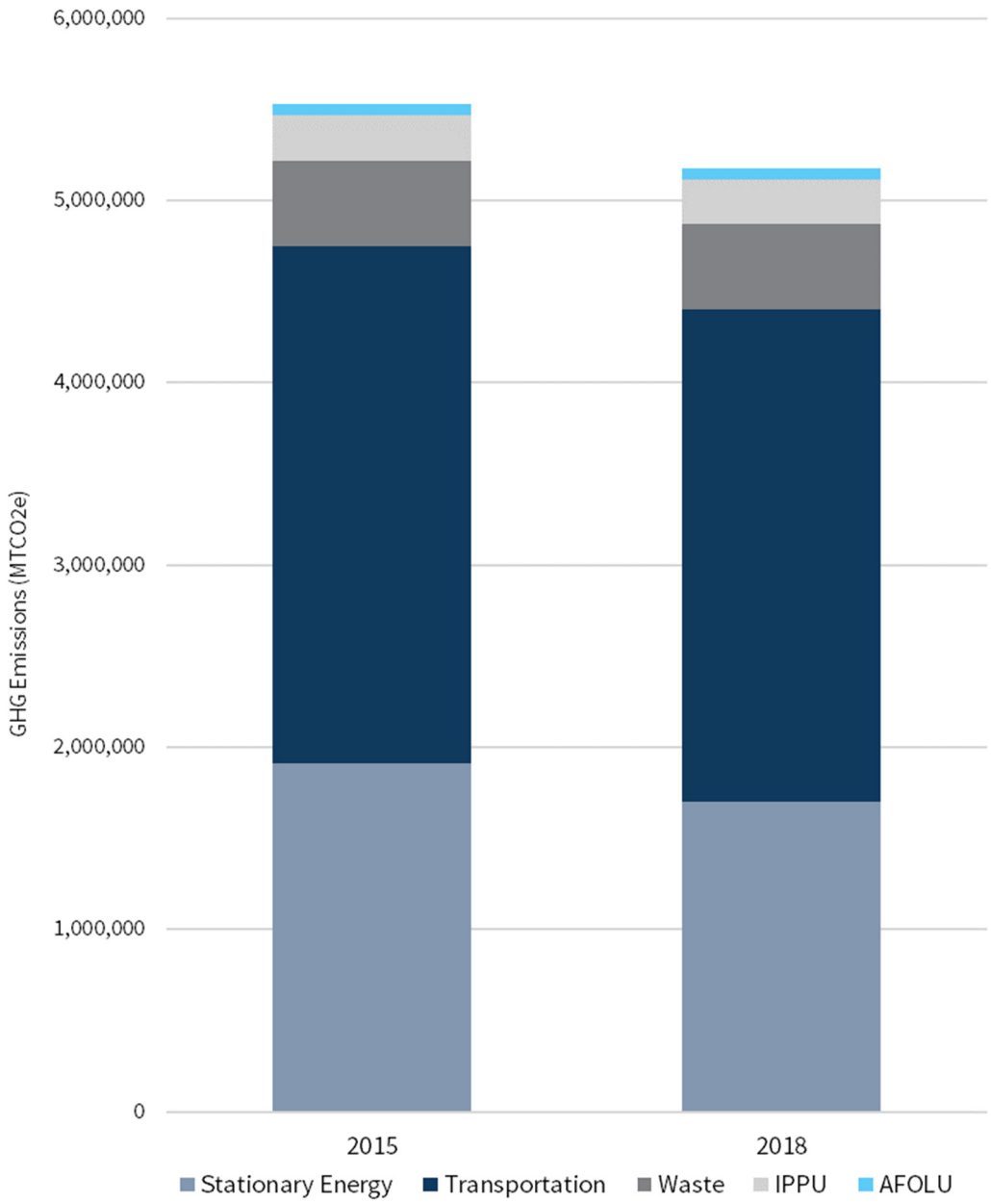

Figure A-5: 2015 and 2018 Emissions Inventory Comparison by Sector

A.2 1990 and 2010 Greenhouse Gas Inventory and Backcasting Methods

In 2015, the Los Angeles Regional Collaborative (LARC) and ICF International created a GHG emissions inventory for the County using the 2013 ICLEI U.S. Community Protocol.[49] The 2010 inventory accounted for Scope 1 and 2 emissions using AR4 GWP values. Additionally, Scope 3 emissions were estimated for additional sub-categories—including water conveyance, and water supply, treatment and distribution—that are not accounted for in the 2015 and 2018 GHG inventories. The 2015 and 2018 GHG emissions inventory methods follow the GPC protocol, as discussed above. The 2015 and 2018 inventories include GHG emissions from industrial processes, product use, fugitive emissions from oil and natural gas systems, and other aggregate carbon dioxide sources that were not included in the 2010 inventory. **Table A-7** shows the differences in sub-sectors included in the two protocols and respective inventories.

Table A-7: Sectors and sub-sectors in ICLEI and GPC Protocol

2013 ICLEI US COMMUNITY PROTOCOL USED FOR 2010 INVENTORY	2019 GPC PROTOCOL USED FOR 2015 AND 2018 INVENTORY

• Transportation
  ○ On-Road Transportation
  ○ Off-Road Transportation and Equipment
	• Transportation
	  ○ On-Road Transportation
	  ○ Off-Road Transportation
	  ○ Railways

• Building Energy
• Stationary Sources
	• Stationary Energy
	  ○ Buildings
	  ○ Energy Industries
	  ○ Agriculture, Forestry and Other Fishing Activities
	  ○ Fugitive Emissions from Oil and Natural Gas Systems

• Solid Waste
• Wastewater Treatment
	• Waste
	  ○ Solid Waste
	  ○ Biological Treatment of Solid Waste
	  ○ Waste Incineration
	  ○ Wastewater Treatment

• Agriculture (including livestock management)
• Urban and Natural Forests (for informational purposes only)
	• AFOLU
	  ○ Land and Land-use Change (including Urban and Natural Forests)
	  ○ Aggregate sources and non-CO2 emission sources

• Water Conveyance • Water Supply, Distribution and Treatment (for informational purposes only)	• IPPU ○ Product use

Due to differences in the two GHG protocols and accounting methods used for the 2010 inventory and the 2015 and 2018 inventories, it is not possible to directly compare emissions from each sector and

[49] ICLEI – Local Governments for Sustainability USA, *U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions*, Version 1.1, July 2013.

sub-sector. To monitor emissions reduction between 2010 and 2015/2018 and to ensure consistency with previous LA County commitments (dating back to 1990), the GPC protocol was used to develop a backcasting model for the County's emissions. GHG emissions from each sector and sub-sector were scaled from 2015 to 1990 by using LA County and state parameters and datasets discussed in **Table A-8** below. Using the backcasting model, it is estimated that GHG emissions in 2015 are eight percent lower than 2010 and 14 percent lower than 1990. However, per-capita GHG emissions in 2015 are nine percent lower than 2010 and 21 percent lower than 1990 despite the increase in population, as illustrated in **Figure A-6**. 2018 emissions are estimated to be 14 percent below 2010 emissions and 20 percent below 1990 emissions; per-capita GHG emissions in 2018 are estimated to be 16 percent below 2010 emissions and 28 percent below 1990 emissions, illustrating a substantial decline in total emissions both at the aggregate level and at the per-capita level.

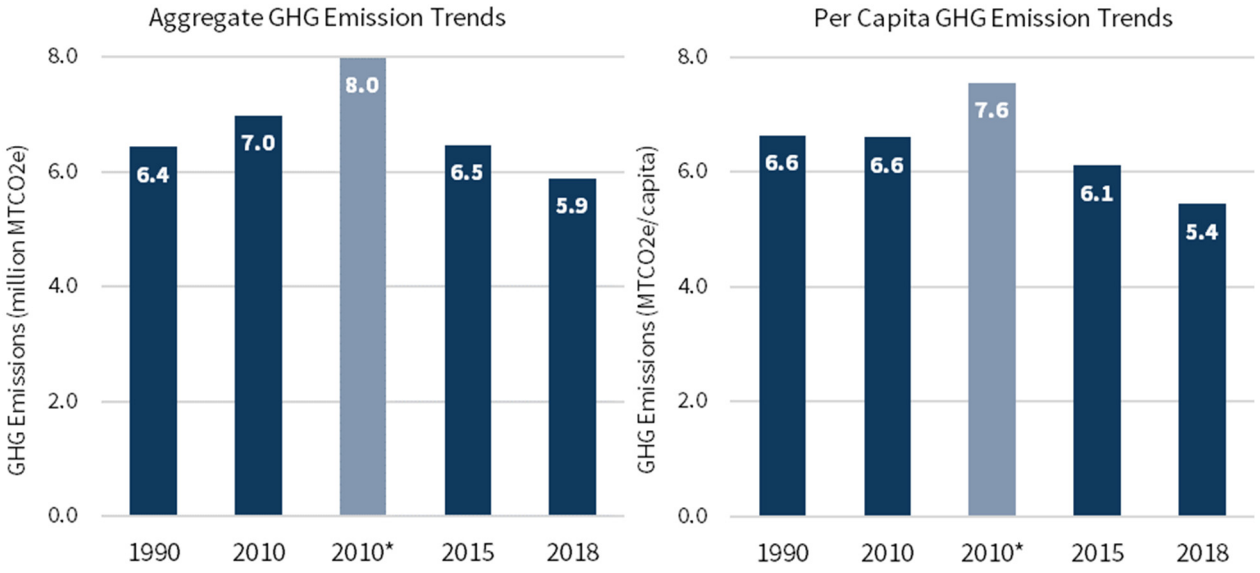

Figure A-6: 1990 to 2018 GHG Emissions Trends

** 2010 GHG emissions inventory reported in unincorporated Los Angeles County 2020 CCAP*

Table A-8: Assumptions for Backcasting GHG Emissions to 2010 and 1990

SECTOR/SUB-SECTOR	BACKCASTING PARAMETERS
Transportation	**3,450,566 (1990); 3,015,442 (2010)**
On-Road Transportation	• VMT from on-road vehicles are estimated by interpolating VMT in the County for the years 2016 and 2040 as reported by Fehr & Peers using SCAG's 2016 regional travel demand model. • Emission factors for on-road vehicles (including passenger vehicles, trucks, and buses) are estimated by linearly interpolating EMFAC2021 emission rates from 2000-2020 to extrapolate emission rates to 1990.
Railways	GHG emissions are assumed to be constant from 1990 to 2015.
Stationary Energy	**2,226,141 (1990); 2,146,743 (2010)**
Residential Buildings	Emissions from energy use in residential buildings are backcasted based on Countywide residential natural gas and electricity consumption as reported by CEC from 1990 to 2014.
Commercial and Institutional Buildings	Emissions from energy use in commercial buildings are backcasted based on Countywide non-residential natural gas and electricity consumption as reported by CEC from 1990 to 2014.
Manufacturing and Construction: Buildings	Emissions from energy use in commercial buildings are backcasted based on Countywide non-residential natural gas and electricity consumption as reported by CEC from 1990 to 2014.
Manufacturing and Construction: Equipment	• 2015 emissions from stationary equipment are scaled down using countywide GHG emissions based on construction and manufacturing jobs in the County. • GHG emissions are assumed to be constant from 1990 to 2015.
Energy Industries	GHG emissions for 1990-2010 are estimated as the average of reported emissions from 2011-2017.
Agriculture, Forestry and Other Fishing Activities	GHG emissions are assumed to be constant from 1990 to 2015.
Fugitive Emissions from Oil and Natural Gas Systems	GHG emissions are assumed to be constant from 1990 to 2015.
Waste	**511,965 (1990); 564,503 (2010)**
Solid Waste Disposal	• Emissions from organic waste disposal between 2010 and 2014 are scaled based on waste disposal tonnage reported by PW's SWIMS database. • GHG emissions from 1990 to 2009 are backcasted based on population.
Biological Treatment of Solid Waste	• Emissions from biological treatment between 2010 and 2014 are scaled based on waste disposal tonnage reported by PW's SWIMS database. • GHG emissions from 1990 to 2009 are backcasted based on population.
Waste Incineration	GHG emissions are assumed to be constant from 1990 to 2015.
IPPU	**173,534 (1990); 243,456 (2010)**
Product Use*	GHG emissions from 1990 to 2014 are backcasted based on population.
AFOLU	**25,048 (1990); 60,860 (2010)**
Land-use Change	Average land conversion rates from 2006-2015 were used to estimate emissions back to 2006. Emissions were assumed to be zero from 1990-2006.
Aggregate Sources and Non-CO_2 Emissions Sources	GHG emissions are assumed to be constant from 1990 to 2015.

A.3 2018 to 2045 Business-as-Usual Forecasts

This section describes the approach for modeling business-as-usual (BAU) emissions, which represents future emissions based on current population and regional growth trends, land use growth patterns, and regulations or policies introduced before the 2018 baseline year. The BAU scenario demonstrates the growth in GHG emissions that would occur if no further action were to be taken by LA County, the State of California, or the federal government after 2018.

The BAU forecast serves as a reference point for other forecasting scenarios, which include the Adjusted BAU that incorporates federal, state, and local actions (see CAP Appendix B: Adjusted Business-as-Usual Forecast and Emission Reduction Methods) and the GHG reductions from CAP implementation (see CAP Appendix B: GHG Reduction Measures and Actions). This section describes the BAU projections by sector, which are based on growth trends including current population and regional economic growth projections.

Additional details on the assumptions for each sector are included in the sections below. **Figure A-7** presents population and employment projections for the County from 2015 to 2045.

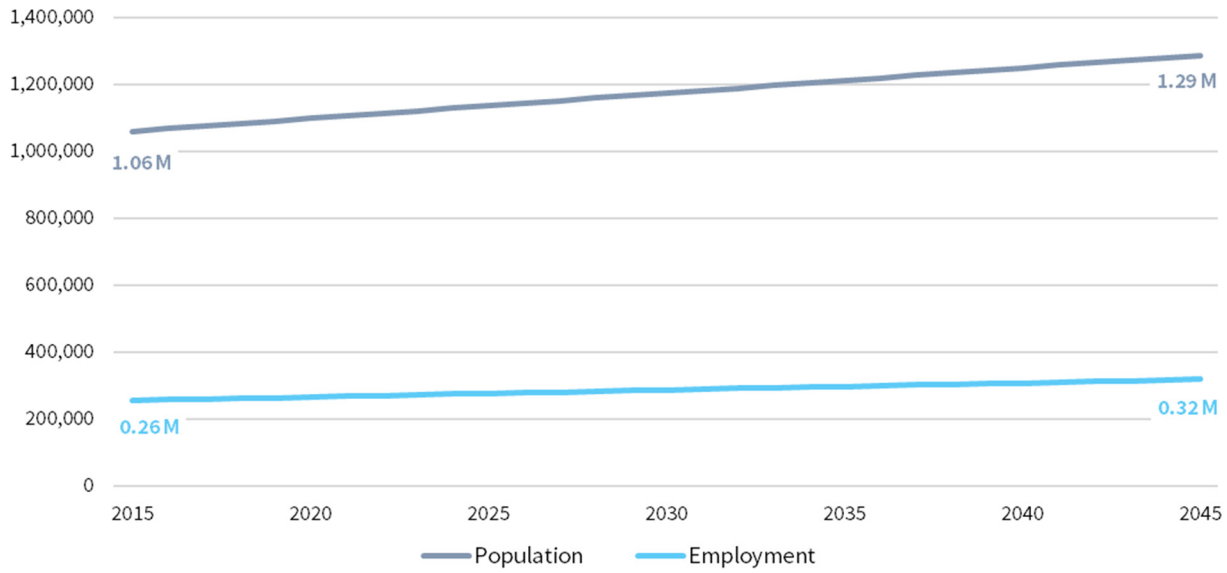

Figure A-7: Unincorporated Los Angeles County Population and Employment Projections

Stationary Energy

Table A-9 presents emissions for 2018 along with the BAU forecast for 2030, 2035, and 2045 for the stationary energy sector.

Table A-9: Stationary Energy GHG Emissions – 2018 Inventory and BAU Forecasts

STATIONARY ENERGY SUBSECTOR	ANNUAL GHG EMISSIONS (MTCO2E)			
	2018	2030	2035	2045
Residential Buildings	962,743	869,099	889,314	944,823
Commercial, Institutional, and Agricultural Buildings	349,373	429,107	441,191	469,816
Manufacturing and Construction Buildings	244,417	301,729	309,350	324,331
Energy Industries	98,554	29,495	29,526	29,587
Fugitive Emissions from Oil and Natural Gas Systems	41,066	49,130	49,251	49,493
Agriculture, Forestry and Other Fishing Activities	2,658	2,600	2,580	2,562
TOTAL	**1,698,809**	**1,681,160**	**1,721,212**	**1,820,612**

Residential Buildings

Energy consumption (electricity and natural gas) in residential buildings is forecasted based on building footprint projections for residential building stock in the County. Building footprint projections are based on historical trends from the LA County Assessor Parcel Database (2006-2018).[50] In 2019, residential customers in the County were enrolled in CPA's Clean Power rate option (50% eligible renewable), leading to an initial decline in residential building emissions through 2025, before they rise in 2030, 2035, and 2045 alongside population and economic growth. For purposes of the BAU projections it is assumed that CPA customers in unincorporated areas continue to receive 50 percent eligible renewable electricity until 2045 and the remaining customers continue to receive electricity from SCE with the emissions factors and participation rates held constant. GHG emissions in 2019 are calculated using 2018 natural gas and electricity emission factors with 2019 CPA participation rates. GHG emissions between 2020-2045 are calculated using 2020 electricity emission factors.

Data Sources:

- SCE Emission Factor
  Link: https://www.edison.com/content/dam/eix/documents/sustainability/eix-esg-pilot-quantitative-section-sce.pdf
- CPA Emission Factor
  Link: https://www.theclimateregistry.org/our-members/cris-public-reports/
- CPA Member Status Report (July 28, 2021)
  Provided by CPA via LA County CSO
- Climate Registry Information System (CRIS)
  Link: https://cris4.org/(S(zr3twbbnour5a5jfb1iykcxa))/frmLILogin.aspx
- UCLA analysis of LA County Parcel Assessor's Data
  Provided by UCLA Institute of Environmental Studies

[50] UCLA Institute of Environmental Studies, Analysis of LA County Parcel Assessor's Data. 2018.

Commercial and Institutional Buildings

Energy consumption in commercial, institutional, and agricultural buildings is forecasted based on building footprint projections for non-residential building stock in the County. Commercial and Institutional building footprint projections are based on historical trends from the LA County Assessor Parcel Database (2006-2018). In June 2018, non-residential customers in the County were enrolled in CPA's Clean Power option. Under this program, over 95% of non-residential customers started receiving 50 percent eligible renewable electricity from CPA. For purposes of the BAU projections it is assumed that CPA customers in unincorporated areas continue to receive 50 percent eligible renewable electricity until 2045 and the remaining customers continue to receive electricity from SCE with the emissions factors and participation rates held constant. GHG emissions in 2019 are calculated using 2018 natural gas and electricity emission factors with 2019 CPA participation rates. GHG emissions between 2020-2045 are calculated using 2020 electricity emission factors. GHG emissions from agricultural buildings are assumed to remain constant.

Data Sources:

- SCE Emission Factor
  Link: https://www.edison.com/content/dam/eix/documents/sustainability/eix-esg-pilot-quantitative-section-sce.pdf
- CPA Emission Factor
  Link: https://www.theclimateregistry.org/our-members/cris-public-reports/
- UCLA analysis of LA County Parcel Assessor's Data
  Provided by UCLA Institute of Environmental Studies

Manufacturing and Construction Buildings

ELECTRICITY AND NATURAL GAS

Energy consumption (electricity and natural gas) in manufacturing and industrial buildings is forecasted based on building footprint projections for non-residential building stock in the County. Building footprint projections are based on historical trends from the LA County Assessor Parcel Database (2006-2018).[51] In June 2018, non-residential customers in the County were enrolled in CPA's Clean Power option. Under this program, over 95% of non-residential customers started receiving 50 percent eligible renewable electricity from CPA. For purposes of the BAU projections it is assumed that CPA customers in unincorporated areas continue to receive 50 percent eligible renewable electricity until 2045 and the remaining customers continue to receive electricity from SCE with the emissions factors and participation rates held constant. GHG emissions in 2019 are calculated using 2018 natural gas and electricity emission factors with 2019 CPA participation rates. GHG emissions between 2020-2045 are calculated using 2020 electricity emission factors.

[51] UCLA Institute of Environmental Studies, Analysis of Los Angeles County Parcel Assessor's Data. 2018.

OFF-ROAD EQUIPMENT

Countywide GHG emissions from off-road equipment used in the manufacturing and construction sector are obtained from CARB's OFFROAD2017 ORION tool.[52] The tool provides countywide carbon dioxide emissions and annual gasoline and diesel consumption by off-road equipment to 2045. Emission projections for the County are estimated by scaling Countywide emissions using construction and manufacturing jobs in 2017 for unincorporated County areas.

Data Sources:

- CARB OFFROAD2017 ORION
  Link: https://www.arb.ca.gov/orion/
- Jobs in Manufacturing and Construction
  Link: https://scag.ca.gov/sites/main/files/file-attachments/losangelescountylp.pdf?1605653130
- UCLA analysis of LA County Parcel Assessor's Data
  Provided by UCLA Institute of Environmental Studies

Energy Industries

Emission projections from energy production at CHP plants, district cooling facilities, biomass power stations, and waste-to-energy facilities, are extrapolated based on 2008 to 2020 GHG emissions reported by the CARB Pollution Mapping Tool and the CARB 2021 MRR Database.[53] For CHP facilities, emissions for Pitchess cogeneration station were assumed to remain constant (the facility was decommissioned in 2018); emissions for Olive View cogeneration station were forecasted using a linear trend in emissions from reported 2012-2020. Waste-to-energy facility biogenic emissions for 2019-2029 were forecasted using a linear trend in emissions reported from 2011-2018 and emission for 2030-2045 were forecasted assuming the Calabasas landfill shuts down and the remaining emissions decline following the trend from 2011 through the forecasting year. Biomass and auxiliary power facility biogenic emissions were forecasted using a linear trend in emissions reported from 2011-2018.

Data Sources:

- CARB Pollution Mapping Tool
  Link: https://www.arb.ca.gov/ei/tools/pollution_map/
- CARB MRR Database
  Link: https://ww2.arb.ca.gov/mrr-data

Agriculture, Forestry and Other Fishing Activities

Countywide GHG emissions from agricultural equipment are obtained from CARB's OFFROAD2017 ORION tool. The tool provides countywide carbon dioxide emissions and annual gasoline and diesel

[52] CARB, OFFROAD ORION. 2018. Available at: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools. Accessed January 2021.
[53] CARB, Mandatory GHG Reporting Regulations. April 1, 2019. Available at: https://ww2.arb.ca.gov/mrr-regulation. Accessed January 2021.

consumption by off-road equipment to 2045. Emission projections for the County are estimated by scaling Countywide emissions using 2016 crop acreage for the County from USDA's NASS Cropscape database.[54]

Data Sources:

- CARB OFFROAD2017 ORION
  Link: https://www.arb.ca.gov/orion/
- USDA NASS Cropscape
  Link: https://nassgeodata.gmu.edu/CropScape/

Fugitive Emissions from Oil and Natural Gas Systems

Emissions from extraction, processing, and distribution of crude oil and natural gas, are extrapolated based on 2008 to 2018 GHG emissions reported by the CARB Pollution Mapping Tool.[55]

Data Sources:

- CARB Pollution Mapping Tool
  Link: https://www.arb.ca.gov/ei/tools/pollution_map/

Transportation

Table A-10 presents emissions for 2018 along with the BAU forecast for 2030, 2035, and 2045 for the transportation sector.

Table A-10: Transportation GHG Emissions – 2018 Inventory and BAU Forecasts

	ANNUAL GHG EMISSIONS (MTCO2E)			
TRANSPORTATION SUBSECTOR	2018	2030	2035	2045
Passenger Vehicles	2,665,824	2,738,675	2,769,029	2,829,737
Buses	29,371	35,589	35,676	35,852
Railways	9,490	10,255	10,389	10,658
TOTAL	**2,704,685**	**2,784,518**	**2,815,094**	**2,876,247**

On-road Transportation: Passenger Vehicles and Trucks

VMT from passenger vehicles and trucks were estimated using SCAG's 2016 Regional Travel Demand Model, which forecasts VMT for the year 2040. This model is a trip-based travel forecasting model that generates daily vehicle trips for each TAZ across various trip purposes based on inputs such as the transportation network and socioeconomic data such as population, household, and employment. VMT

[54] NASS, CropScape. 2021. Available at: https://nassgeodata.gmu.edu/CropScape/. Accessed January 2021.
[55] CARB, Pollution Mapping Tool. 2018. Available: https://ww3.arb.ca.gov/ei/tools/pollution_map/. Accessed January 2021.

was provided by F&P for years 2016 and 2040 and was linearly interpolated for 2030 and 2035. VMT for years 2041 through 2045 were linearly extrapolated based on the 2016 to 2040 VMT projection.

GHG emissions from unincorporated areas are calculated using VMT and the weighted emission factors for 2018 by vehicle type (passenger vehicles and trucks)[56] from the EMFAC2021 model (see transportation section of A.1 above for discussion).[57] The 2018 emission factor was applied to every year from 2018 through 2045 to represent no changes in the vehicle fleet due to federal, state, or local action.

It should be noted that the transportation modeling for the 2045 CAP shows a five percent decrease in transportation emissions between 2015 and 2018. This decrease is due to declining emission factors from the EMFAC2021 model, which outpace the increase in total VMT as modeled with SCAG's 2016 Regional Travel Demand Model. The California Department of Tax and Fee Administration reports that statewide taxable sales of gasoline and diesel fuel increased by two percent from 2015 to 2018.[58] This increase is also consistent with the statewide GHG inventory prepared by CARB, which also shows a two percent increase in total on-road transportation emissions from 2015 to 2018.[59] Statewide gasoline and diesel fuel sales may not trend precisely with County gasoline and diesel fuel sales, and VMT apportioned to County areas may not correlate perfectly with gasoline sales, which could explain the difference. In addition, the VMT used in the inventory is based on the SCAG model, not actual reported VMT or fuel sales data, consistent with the GPC Protocol.

Data Sources:

- EMFAC2021 Model
  Link: https://arb.ca.gov/emfac/emissions-inventory/4c9f04282a1f85d62a27721058b5a3bb6fd22fb9
- SCAG Regional Travel Demand Model
  Provided by SCAG
- Fehr & Peers Modeling Analysis (July 29, 2019; December 2021; January 2022)

[56] Passenger vehicles correspond to EMFAC categories LDA, LDT1, LDT2, MCY, and MD. Trucks correspond to EMFAC categories LHDT1, LHDT2, MHDT, HHDT, and MH.
[57] CARB, EMFAC2021 Model. 2021. Available at: https://arb.ca.gov/emfac/emissions-inventory/4c9f04282a1f85d62a27721058b5a3bb6fd22fb9. Accessed October 2021.
[58] California Energy Commission, California Retail Fuel Outlet Annual Reporting (CEC-A15) Results. 2022. Available at: California Retail Fuel Outlet Annual Reporting (CEC-A15) Results. Accessed April 2022.
[59] California Air Resources Board, Data used to generate figures in the California Greenhouse Gas Emissions for 2000 to 2019-Trends of Emissions and Other Indicators report. Figure 3. 2022. Available at: https://ww2.arb.ca.gov/ghg-inventory-data. Accessed April 2022.

On-road Transportation: Buses

Emissions for 2015 and 2018 were calculated using fuel consumption data from FTA's NTD[60] and standard emission factors for diesel, gasoline, and compressed natural gas from EMFAC2021.[61] Emissions from Metro buses are extrapolated from 2018 through 2045 based on Metro's bus miles and ridership statistics between 2010 and 2017.[62]

Data Sources:

- EMFAC2021 Model
  Link: https://arb.ca.gov/emfac/emissions-inventory/4c9f04282a1f85d62a27721058b5a3bb6fd22fb9
- Metro Bus Ridership
  Link: https://isotp.metro.net/MetroRidership/Index.aspx
- FTA National Transit Database
  Link: https://www.transit.dot.gov/ntd/ntd-data

Railways

Emissions by Southern California Regional Rail Authority (SCRRA or Metrolink) are forecasted based on projected weekday ridership until 2025 as documented in Metrolink's 10 Year Strategic Plan. Emissions from 2025 to 2045 are extrapolated based ridership estimates between 2014 and 2025. Emissions from Metro Rail are extrapolated based on Metro rail miles and ridership statistics between 2010 and 2017.[63]

Data Sources:

- Metrolink Strategic Plan
  Link: https://www.metrolinktrains.com/globalassets/about/metrolink_10-year_strategic_plan_2015-2025.pdf
- Metro Ridership
  Link: http://isotp.metro.net/MetroRidership/Index.aspx

Waste and Wastewater

BAU emissions are forecasted for years 2018 through 2045 for emissions generated at landfills, biological treatment (composting and anaerobic digestion) and incineration facilities, and wastewater treatment plants are reported under the waste sector. **Table A-11** presents emissions for 2018 along with the BAU forecast for 2030, 2035, and 2045 for the waste and wastewater sector.

[60] FTA, National Transit Database. 2018. Available at: https://www.transit.dot.gov/ntd/ntd-data. Accessed January 2021.
[61] CARB, EMFAC2021 Model. 2021. Available at: https://arb.ca.gov/emfac/emissions-inventory/4c9f04282a1f85d62a27721058b5a3bb6fd22fb9. Accessed October 2021.
[62] Metro, Interactive Estimated Ridership Stats. 2021. Available at: https://isotp.metro.net/MetroRidership/Index.aspx. Accessed January 2021.
[63] FTA, National Transit Database. 2018. Available at: https://www.transit.dot.gov/ntd/ntd-data. Accessed January 2021.

Table A-11: Waste and Wastewater GHG Emissions – 2018 Inventory and BAU Forecast

WASTE & WASTEWATER SUBSECTOR	ANNUAL GHG EMISSIONS (MTCO2E) 2018	2030	2035	2045
Solid Waste Disposal	407,578	386,285	386,541	410,702
Biological Treatment of Solid Waste	5,309	6,180	6,184	6,579
Waste Incineration*	547	647	687	711
Wastewater Treatment	56,495	59,454	61,372	65,208
TOTAL	**469,382**	**451,919**	**454,097**	**482,489**

Note: *Totals exclude Waste Incineration which is accounted for under Stationary Energy*

Solid Waste Disposal

Emissions from landfills are determined by extrapolating the 2018 GHG emissions intensity ($MTCO_2e$/person) based on solid waste and organic waste disposal projections from the Public Works SWIMS database[64] and population projections by SCAG[65] and Caltrans.[66] Solid waste diversion rate and organics diversion rate are assumed to remain constant at 70% and 38% respectively, as is the future methane capture rates at all landfills.

Data Sources:

- LADPW SWIMS Database
  Link: https://dpw.lacounty.gov/epd/swims/OnlineServices/reports.aspx
- SCAG Population Projections
  Link: http://gisdata.scag.ca.gov/Pages/SocioEconomicLibrary.aspx?keyword=Forecasting
- Caltrans Population Projections
  Link: https://www.shastaedc.org/wp-content/uploads/2018/07/CalTrans-2017-2050.pdf

Biological Treatment of Solid Waste

Emissions from composting and anaerobic digestion are estimated by extrapolating the 2018 GHG emissions intensity ($MTCO_2e$/person) based on solid waste and organic waste disposal projections from Public Works SWIMS database.[67] Solid waste diversion rate and proportion of organic waste diverted from landfills to composting and grinding/mulching facilities remains constant.

[64] LADPW, Solid Waste Information Management System (SWIMS). 2021. Available at: https://dpw.lacounty.gov/epd/swims/OnlineServices/reports.aspx. Accessed January 2021.
[65] SCAG, Growth Forecasting. 2018. Available at: https://scag.ca.gov/data-tools-geographic-information-systems. Accessed January 2021.
[66] Caltrans, California County-Level Economic Forecast 2017-2050. September 2017. Available at: https://www.shastaedc.org/wp-content/uploads/2018/07/CalTrans-2017-2050.pdf. Accessed January 2021.
[67] LADPW, Solid Waste Information Management System (SWIMS). 2021. Available at: https://dpw.lacounty.gov/epd/swims/OnlineServices/reports.aspx. Accessed January 2021.

GHG emissions from Anaerobic Digestion at JWPCP are scaled based on population growth from 2018 to 2045. These emission projections are reported under Energy Industries.

Data Sources:

- LADPW SWIMS Database
  Link: https://dpw.lacounty.gov/epd/swims/OnlineServices/reports.aspx

Waste Incineration

See Energy Industries.

Wastewater Treatment

Emissions from wastewater treatment are determined by extrapolating the 2018 GHG emissions intensity ($MTCO_2e$/person) based on population projections by SCAG[68] and Caltrans.[69]

Data Sources:

- SCAG Population Projections
  Link: http://gisdata.scag.ca.gov/Pages/SocioEconomicLibrary.aspx?keyword=Forecasting
- Caltrans Population Projections
  Link: https://www.shastaedc.org/wp-content/uploads/2018/07/CalTrans-2017-2050.pdf

Industrial Processes and Product Use

HFC and PFC emissions from the use of foam, solvents and industrial refrigerants, aerosols, fire retardants and refrigerants in residential and transportation sectors are extrapolated based on population projections by SCAG[70] and Caltrans.[71] It is assumed that per capita emissions from products remain constant between 2018 to 2045. **Table A-12** presents emissions for 2018 along with the BAU forecast for 2030, 2035, and 2045 for the IPPU sector.

Table A-12: IPPU GHG Emissions – 2018 Inventory and BAU Forecast

	ANNUAL GHG EMISSIONS (MTCO2E)			
SECTOR	2018	2030	2035	2045
IPPU	239,505	259,605	267,981	284,731
TOTAL	**239,505**	**259,605**	**267,981**	**284,731**

[68] SCAG, Growth Forecasting. 2018. Available at: https://scag.ca.gov/data-tools-geographic-information-systems. Accessed January 2021.
[69] Caltrans, California County-Level Economic Forecast 2017-2050. September 2017. Available at: https://www.shastaedc.org/wp-content/uploads/2018/07/CalTrans-2017-2050.pdf. Accessed January 2021.
[70] SCAG, Growth Forecasting. 2018. Available at: https://scag.ca.gov/data-tools-geographic-information-systems. Accessed January 2021.
[71] Caltrans, California County-Level Economic Forecast 2017-2050. September 2017. Available at: https://www.shastaedc.org/wp-content/uploads/2018/07/CalTrans-2017-2050.pdf. Accessed January 2021.

Data Sources:

- SCAG Population Projections
  Link: http://gisdata.scag.ca.gov/Pages/SocioEconomicLibrary.aspx?keyword=Forecasting
- Caltrans Population Projections
  Link: https://www.shastaedc.org/wp-content/uploads/2018/07/CalTrans-2017-2050.pdf

AFOLU

GHG Emissions are assumed to be constant between 2018 to 2045. **Table A-13** presents emissions for 2018 along with the BAU forecast for 2030, 2035, and 2045 for the AFOLU sector.

Table A-13: AFOLU GHG Emissions – 2018 Inventory and BAU Forecast

	ANNUAL GHG EMISSIONS (MTCO2E)			
SECTOR	2018	2030	2035	2045
AFOLU	60,860	60,860	60,860	60,860
TOTAL	**60,860**	**60,860**	**60,860**	**60,860**

Summary Emissions

Table A-14 and **Figure A-8** present GHG emissions for all sectors for the 2018 GHG inventory and the 2030, 2035, and 2045 BAU forecasts.

Table A-14: GHG Emissions by Sector – 2018 Inventory and BAU Forecast

	ANNUAL GHG EMISSIONS (MTCO2E)			
SECTOR	2018	2030	2035	2045
Stationary Energy	1,698,809	1,681,160	1,721,212	1,820,612
Transportation	2,704,685	2,784,518	2,815,094	2,876,247
Waste	469,382	451,919	454,097	482,489
IPPU	239,505	259,605	267,981	284,731
AFOLU	60,860	60,860	60,860	60,860
TOTAL	**5,173,240**	**5,238,062**	**5,319,243**	**5,524,939**

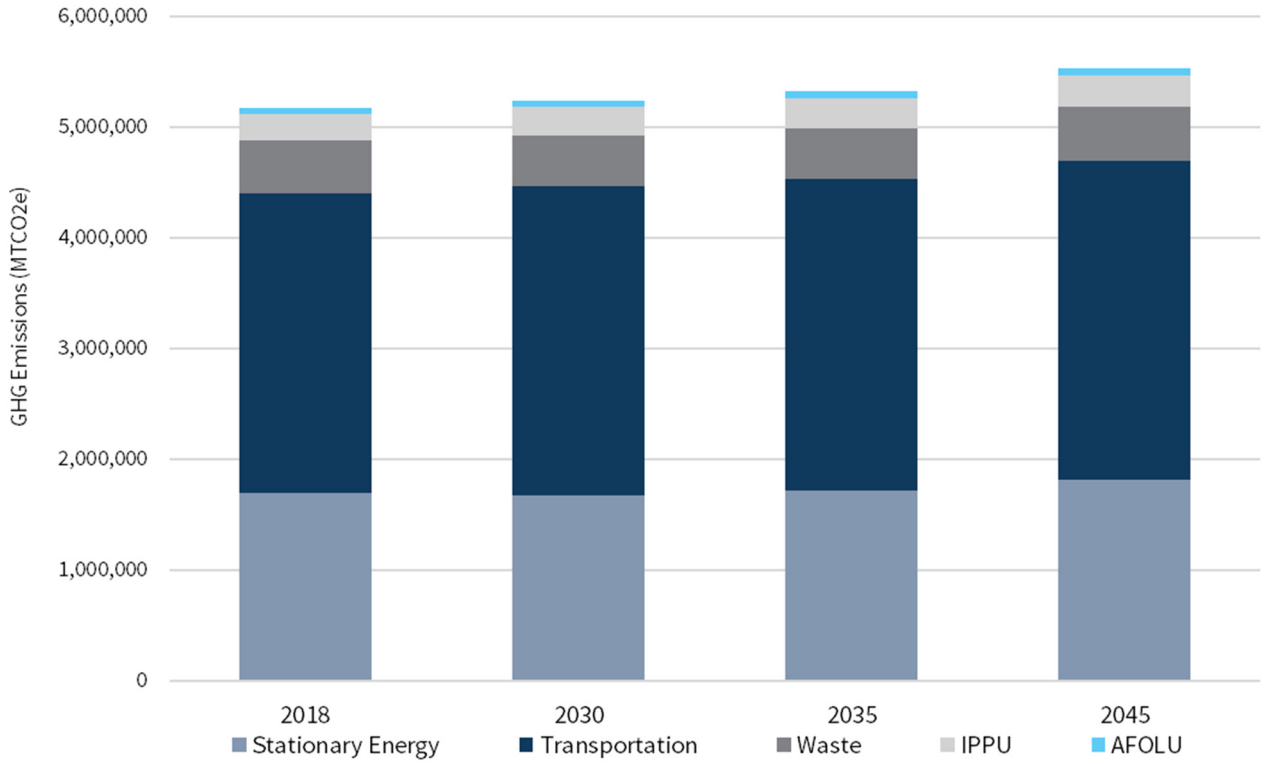

Figure A-8: GHG Emissions by Sector – 2018 Inventory and BAU Forecast

A.4 Derivation of the 2045 CAP's Emission Reduction Targets

Origin of Emission Reduction Targets

The 2045 CAP includes three separate targets for three future milestone years:

- By 2030, reduce County GHG emissions 40 percent below 2015 baseline levels;
- by 2035, reduce County GHG emissions 50 percent below 2015 baseline levels; and
- by 2045, achieve carbon neutrality in the County (long-term aspirational target).

The 2045 CAP's targets are based on the OurCounty Sustainability Plan; this is a primary objective of the 2045 CAP (to align with the OurCounty Sustainability Plan targets). The OurCounty Sustainability Plan conducted a community-wide, Countywide greenhouse gas emissions inventory. That process resulted in individual greenhouse gas inventories for all 88 cities and the unincorporated areas of Los Angeles County. At the time of the OurCounty Plan's preparation, 2015 was the year with the most up-to-date data for all 88 cities and the unincorporated areas, including account-level energy consumption data from the UCLA Energy Atlas. Thus, the OurCounty Plan used 2015 as the baseline year against which to set the Plan's greenhouse gas related targets. During the development of the OurCounty Plan, LA County evaluated a series of GHG reduction target options. The targets selected represent LA County's commitment to doing its fair share to help California achieve its ambitious statewide GHG targets.

In 2005, Governor Arnold Schwarzenegger's Executive Order (EO) S-3-05 established the 2050 statewide GHG reduction target of 80 percent below 1990 levels, expressing the intent of the State of California to address the issue of climate change by reducing GHGs. Following EO S-3-05, the California legislature passed Assembly Bill 32 (AB 32, Health and Safety Code § 38500, et seq.) in 2006. AB 32 requires the CARB to design and implement feasible and cost-effective emissions limits, regulations, and other measures, such that statewide GHG emissions are reduced to 1990 levels by 2020 (representing a 25 percent reduction in emissions). In 2015, Governor Edmund G. Brown, Jr.'s EO B-30-15 established the 2030 statewide GHG reduction target of 40 percent below 1990 levels. In 2016, Senate Bill (SB) 32 and its companion bill AB 197 amended the Health and Safety Code by establishing a new climate pollution reduction target of 40 percent below 1990 levels by 2030 and included provisions to ensure the benefits of state climate policies accrue to disadvantaged communities. Further, in 2018, Governor Brown signed EO B-55-18, committing California to total, economy-wide carbon neutrality by 2045. In December 2017, CARB approved the 2017 Climate Change Scoping Plan Update (2017 Scoping Plan), which outlines the proposed framework of action for achieving the 2030 GHG target of 40 percent reduction in GHG emissions relative to 1990 levels as codified by SB 32 (CARB 2017).

Table A-15 outlines the state's GHG reduction targets.

Table A-15: State of California Greenhouse Gas Emission Reduction Targets

TARGET YEAR	STATE GHG TARGET	CORRESPONDING STATE LEGISLATION
2020	1990 levels	Assembly Bill 32, the California Global Warming Solutions Act (2006)
2030	40% below 1990 levels	Senate Bill 32, the Global Warming Solutions Act (2006)
2045	Carbon neutrality [a]	Executive Order B-55-18 (2018)
2050	80% below 1990 levels	Executive Order S-3-05 (2005)

NOTES:

[a.] Carbon neutrality means "net zero" emissions of GHGs. In other words, it means that GHG emissions generated by sources such as transportation, power plants, and industrial processes must be less than or equal to the amount of carbon dioxide that is sequestered in natural sinks and through mechanical means of the same time period.

The 2045 CAP retains OurCounty's target for 2035 and identifies OurCounty's 2045 carbon neutrality target as a long-term aspirational goal. The 2045 CAP also adds a new GHG emission reduction target for 2030 to align with SB 32.[72] The Draft 2045 CAP's 2030 target was selected based on guidance provided in the 2017 Scoping Plan and was developed to demonstrate consistency with the statewide 2030 target shown in Table A-15, above. The Draft 2045 CAP's 2030 target is established based on a reduction from 2015 baseline levels (just like the OurCounty targets for 2025 and 2035) and is equal to 40% below 2015 emissions or 4.9 million $MTCO_2e$. This compares to the County's 2030 BAU forecast of 5.2 million $MTCO_2e$, as presented in Table A-14 above. A 40% reduction below 2015 levels is also equivalent to a 48% reduction below the County's 1990 GHG emissions levels, which is more stringent than the state target of a 40% reduction below 1990 levels by 2030 (for additional discussion, see section below).

The Draft 2045 CAP's 2035 target was selected based on guidance provided in the 2017 Scoping Plan and was chosen as a milestone target to put the County on the trend to achieve a long-term aspirational goal of carbon neutrality by 2045. This 2035 target was developed to demonstrate consistency with the pathway needed to achieve the statewide 2045 target shown in Table 2-4, above. The Draft 2045 CAP's 2035 target is established based on a reduction from 2015 baseline levels and is equal to 50% below 2015 emissions (2.8 million $MTCO_2e$). This compares to the County's 2035 BAU forecast of 5.3 million $MTCO_2e$. A 50% reduction below 2015 levels is also equivalent to a 57% reduction below the County's 1990 GHG emissions levels.

Table A-16 presents a comparison between the 2045 CAP's targets for 2030 and 2035, along with its aspirational 2045 goal, and the OurCounty Sustainability Plan targets for each future milestone year.

[72] The 2045 CAP excludes OurCounty's 2025 target because implementation of the CAP will barely be underway by 2025. Instead, the 2045 CAP focuses on the closest reasonable target timeframes of 2030 and 2035, and also to align with state planning for 2030 (SB 32 does not stipulate an interim target for 2025).

Table A-16: GHG Emissions Targets and Goals for the Draft 2045 Cap and OurCounty Sustainability Plan

YEAR	2045 CAP (UNINCORPORATED COUNTY ONLY)	OURCOUNTY SUSTAINABILITY PLAN (UNINCORPORATED COUNTY AND CITIES)	GHG EMISSIONS ($MTCO_2E$) (UNINCORPORATED COUNTY)
2025	n/a	25% below 2015 baseline levels	4,148,366
2030	40% below 2015 levels	n/a	3,318,693
2035	50% below 2015 levels	50% below 2015 levels	2,765,578
2045	Carbon neutrality [a]	Carbon neutrality by 2045 for county operations (by 2050 countywide)	0

NOTE:
a. The Draft 2045 CAP includes an aspirational goal, rather than a target, of carbon neutrality by 2045.

The Targets as Levels of Significance for GHG Impacts under CEQA

CEQA Guidelines Section 15183.5(b) stipulates that project-specific environmental documents can find that project-level GHG emissions are not cumulatively considerable if the project complies with the requirements of a qualified GHG emissions reduction plan. As discussed in the Draft Environmental Impact Report for the 2045 CAP, upon certification of the EIR and approval of the 2045 CAP, the 2045 CAP would meet the requirements of a qualified GHG emission reduction plan per CEQA Guidelines Section 15183.5(b)(1) for projects through 2035.

To meet the requirements of CEQA Guidelines Section 15183.5(b), a qualified GHG emissions reduction plan must include several important elements, and must:

> Establish a level, based on substantial evidence, below which the contribution to GHG emissions from activities covered by the plan would not be cumulatively considerable (§ 15183.5(b)(1)(B)).

The Draft 2045 CAP identifies a GHG emissions reductions target for the year 2030 that is 40% below baseline 2015 levels, which is equivalent to 47% below 1990 levels. This 2030 target for the County is more stringent than the statewide target of 40% below 1990 levels by 2030 pursuant to SB 32. The Draft 2045 CAP's 2035 target of 50% below 2015 levels puts the County on a pathway to achieve the statewide 2045 target as stipulated in EO B-55-18. The 2045 CAP's long-term aspirational goal of carbon neutrality by 2045 is also consistent with EO B-55-20, and the 2035 target puts the County on a path to achieve carbon neutrality.

Consistency with State Target as a Threshold of Significance

While several state-level initiatives will help reduce GHG emissions, they alone will not be sufficient to meet the 2030 target mandated by SB 32. This is one of the many reasons why LA County has prepared the 2045 CAP: so it can contribute its fair share of emission reductions to achieve the statewide targets for 2030 and beyond.

As discussed above, the Draft 2045 CAP's 2030 target of 40% below 2015 levels (a gross emissions target) exceeds the statewide 2030 target as codified in SB 32 and the 2017 Scoping Plan. The County's emissions in 2015 are estimated to be 12% lower than 1990 emissions;[73] this compares to statewide emissions that were 2.3% higher in 2015 compared to 1990.[74] Additionally, the County's emissions in 2018 are estimated to be 20% lower than 1990 emissions; this compares to statewide emissions that were 1.3% lower in 2018 compared to 1990.[75] In other words, the County has been more successful than the state as a whole in reducing gross emissions since 1990. Consequently, the Draft 2045 CAP's gross emissions target is *more* stringent than the corresponding state target when comparing to 1990 levels and approximately equivalent when using a per-capita metric.[76] The Draft 2045 CAP's 2030 target also sets the County on a path to achieve California's 2045 and 2050 GHG emission reduction targets in EO B-55-18 and EO S-3-05. There is currently no state plan to achieve state GHG reduction targets beyond 2030.

Consistency with the 2017 Scoping Plan and SB 32 is an appropriate metric by which to determine the significance of the Draft 2045 CAP's GHG emissions. CEQA Guidelines Section 15064.4(b)(3) states that a lead agency "may consider a project's consistency with the state's long-term climate goals or strategies" when determining the significance of a project's impacts. Additionally, in *Center for Biological Diversity v. Department of Fish and Wildlife* (2015) 62 Cal.4th 204 (Newhall), the California Supreme Court sanctioned the use of such a threshold by stating that assessing a project's GHG impacts based on a "consistency with a GHG emission reduction plan" threshold of significance is legally permissible under CEQA. The 2030 unincorporated County target above is derived using the 2017 Scoping Plan's recommendations for local land use development to contribute their "fair share" of emission reductions to the statewide GHG target for 2030. This is also consistent with the Association of

[73] To demonstrate consistency with statewide targets, to assess the County's progress since 1990, and to ensure that interim emissions reduction targets align with commitments prior to 2015, a backcasting model was developed (see section A.2 of this appendix).
[74] California Air Resources Board, *California's Greenhouse Gas Inventory by Scoping Plan Category*, Fourteenth Edition: 2000 to 2019, Last updated on 6/1/2021. Available at: https://ww2.arb.ca.gov/ghg-inventory-data. Accessed January 2022.
[75] Ibid.
[76] Per-capita emissions for the County are 19 percent lower in 2015 (6.1 $MTCO_2e$/capita) compared to 1990 (7.6 $MTCO_2e$/capita) and 28 percent lower in 2018 (5.4 $MTCO_2e$/capita) compared to 1990. This compares to total statewide per-capita emissions that were 22 percent lower in 2015 (11.3 $MTCO_2e$/capita) compared to 1990 (14.5 $MTCO_2e$/capita) and 26 percent lower in 2018 (10.8 $MTCO_2e$/capita) compared to 1990. The 2030 statewide target of 6.2 $MTCO_2e$/capita is 57 percent below 1990 statewide levels, whereas the 2045 CAP's 2030 target of 3.3 $MTCO_2e$/capita is 56 percent below 1990 County levels.

Environmental Professionals (AEP) 2016 white paper recommendation for "Substantial Progress" thresholds for land use development to show consistency with statewide targets.[77]

Therefore, the Draft 2045 CAP's 2030 target represents the level below which GHG emissions would not be cumulatively considerable in the year 2030.

The Draft 2045 CAP's 2035 target of 50% below 2015 levels puts the County on a pathway to achieve the statewide 2045 carbon neutrality target in EO B-55-18. Although the state does not have a target for 2035, the 2045 CAP's target for 2035 of 50% below 2015 levels is equivalent to a 57% reduction below 1990 levels, which puts the County on a path to achieve carbon neutrality by 2045. Consequently, pursuant to CEQA Guidelines section 15064.4(b)(3), the Draft 2045 CAP's 2035 target represents the level below which GHG emissions would not be cumulatively considerable in the year 2035.

GHG emissions and global climate change represent cumulative impacts of human activities and development projects locally, regionally, statewide, nationally, and worldwide. GHG emissions from all these sources cumulatively contribute to the significant adverse environmental impacts of global climate change. No single project could generate enough GHG emissions to noticeably change the global average temperature; instead, the combination of GHG emissions from past, present, and future projects around the world have contributed and will continue to contribute to global climate change and its associated environmental impacts. Given that analysis of GHG emissions is cumulative in context, the emissions targets discussed above represent the level by which the 2045 CAP's emissions are not cumulatively considerable.

[77] Association of Environmental Professionals (AEP). 2016, *Final White Paper - Beyond 2020 and Newhall: A Field Guide to New CEQA Greenhouse Gas Thresholds and Climate Action Plan Targets for California*, October 18. Available at: https://califaep.org/docs/AEP-2016_Final_White_Paper.pdf. Accessed December 2021.

A.5 Attachment A: Fehr & Peers Modeling Analysis

Municipality	Population	Employment	Households	VMT			VMT/Pop
				Passenger Vehicles	Trucks	Total	
Agoura Hills	17,213	8,583	6,123	442,037	21,155	463,192	26.9
Alhambra	84,588	29,241	29,811	1,426,758	49,235	1,475,992	17.4
Arcadia	60,011	28,122	20,762	1,402,860	33,072	1,435,932	23.9
Artesia	16,729	5,135	4,594	278,165	7,187	285,352	17.1
Azusa	50,536	12,779	13,821	844,038	33,752	877,790	17.4
Baldwin Park	75,978	16,374	17,326	1,161,967	47,226	1,209,193	15.9
Bell	35,813	12,572	8,890	519,548	26,990	546,538	15.3
Bell Gardens	42,365	9,644	9,672	594,605	15,347	609,953	14.4
Bellflower	77,365	13,823	23,731	1,025,913	25,807	1,051,720	13.6
Beverly Hills	35,009	60,367	15,197	1,408,370	43,550	1,451,920	41.5
Bradbury	1,340	264	534	25,624	780	26,404	19.7
Burbank	105,798	112,893	43,456	3,024,950	158,610	3,183,560	30.1
Calabasas	19,438	16,703	7,149	694,145	38,848	732,992	37.7
Carson	94,163	64,283	26,404	2,243,675	173,475	2,417,150	25.7
Cerritos	49,668	31,305	15,613	1,385,832	67,064	1,452,896	29.3
Claremont	38,437	18,921	12,926	957,338	20,186	977,524	25.4
Commerce	12,999	46,091	3,420	1,009,740	136,907	1,146,646	88.2
Compton	98,037	21,398	23,320	1,314,122	67,404	1,381,526	14.1
Covina	52,044	25,978	17,142	1,254,739	32,648	1,287,387	24.7
Cudahy	23,574	2,880	5,563	249,191	7,918	257,109	10.9
Culver City	39,391	46,575	16,951	1,171,591	56,886	1,228,477	31.2
Diamond Bar	44,876	12,008	14,852	988,779	18,857	1,007,636	22.5
Downey	113,486	48,785	34,487	2,404,101	72,267	2,476,368	21.8
Duarte	21,762	11,892	7,207	553,303	28,342	581,646	26.7
El Monte	115,290	31,093	28,721	1,724,627	81,481	1,806,108	15.7
El Segundo	16,714	40,257	7,115	917,870	68,257	986,128	59.0
Gardena	59,723	30,506	20,847	1,150,528	63,005	1,213,533	20.3
Glendale	195,438	115,331	73,419	3,769,789	187,585	3,957,374	20.2
Glendora	55,823	22,939	18,613	1,371,729	43,717	1,415,446	25.4
Hawaiian Gardens	15,319	5,021	3,862	286,801	4,449	291,251	19.0
Hawthorne	86,630	26,850	29,138	1,252,872	70,820	1,323,692	15.3
Hermosa Beach	19,599	7,737	9,538	366,447	10,878	377,325	19.3
Hidden Hills	2,015	3,012	639	87,928	7,884	95,812	47.5
Huntington Park	61,885	17,136	15,618	812,802	23,786	836,589	13.5
Industry	12,229	68,185	3,211	1,721,946	208,909	1,930,855	157.9
Inglewood	118,098	32,553	38,962	1,595,692	72,742	1,668,433	14.1
Irwindale	1,518	18,305	400	501,332	57,613	558,946	368.2
La Canada Flintridge	19,483	6,657	6,543	546,334	10,877	557,211	28.6
La Habra Heights	7,620	451	2,543	109,265	3,851	113,117	14.8
La Mirada	49,130	18,358	14,825	934,397	57,470	991,867	20.2
La Puente	41,688	5,760	9,954	630,580	11,044	641,624	15.4
La Verne	32,173	12,765	11,563	745,285	44,406	789,691	24.5
Lakewood	79,392	19,324	26,346	1,430,271	34,439	1,464,710	18.4
Lancaster	165,579	48,901	51,326	2,516,475	123,799	2,640,274	15.9
Lawndale	32,928	7,122	9,705	402,349	10,931	413,280	12.6
Lomita	19,964	4,748	7,915	276,042	8,123	284,165	14.2
Long Beach	474,501	158,383	168,033	7,723,426	315,613	8,039,039	16.9
Los Angeles	3,928,799	1,799,541	1,382,291	66,561,023	2,774,878	69,335,901	17.6
Lynwood	71,809	9,528	15,134	827,176	20,887	848,063	11.8
Malibu	9,057	6,529	3,611	363,285	14,317	377,602	41.7
Manhattan Beach	35,369	18,614	14,066	844,760	23,203	867,963	24.5
Maywood	27,592	3,446	6,581	276,006	10,740	286,747	10.4
Monrovia	37,757	19,704	14,130	865,370	35,419	900,788	23.9
Montebello	66,151	29,107	20,270	1,439,492	67,803	1,507,295	22.8
Monterey Park	62,408	33,848	20,660	1,274,432	44,961	1,319,393	21.1
Norwalk	106,788	25,151	27,320	1,631,482	42,400	1,673,881	15.7

Municipality	Population	Employment	Households	VMT			VMT/Pop
				Passenger Vehicles	Trucks	Total	
Palmdale	160,985	30,420	45,569	3,006,155	95,785	3,101,940	19.3
Palos Verdes Estates	13,535	2,450	5,066	258,942	4,833	263,776	19.5
Paramount	54,752	20,332	14,020	914,234	50,357	964,590	17.6
Pasadena	142,823	115,730	59,821	3,799,017	131,670	3,930,688	27.5
Pico Rivera	65,424	19,572	17,208	1,138,261	52,840	1,191,102	18.2
Pomona	153,433	55,752	40,206	3,034,480	111,384	3,145,864	20.5
Rancho Palos Verdes	44,215	10,971	16,501	914,209	20,610	934,820	21.1
Redondo Beach	68,254	25,808	29,818	1,221,602	52,735	1,274,337	18.7
Rolling Hills	1,955	102	695	28,278	354	28,632	14.6
Rolling Hills Estates	8,559	1,402	3,173	145,855	2,584	148,439	17.3
Rosemead	52,104	12,011	13,715	761,520	22,643	784,164	15.0
San Dimas	35,199	13,274	12,545	798,683	25,934	824,618	23.4
San Fernando	24,431	11,381	6,233	427,654	27,562	455,216	18.6
San Gabriel	40,632	13,909	13,024	704,116	20,459	724,575	17.8
San Marino	13,256	3,752	4,343	217,640	4,489	222,129	16.8
Santa Clarita	204,149	76,637	68,935	4,661,848	231,945	4,893,793	24.0
Santa Fe Springs	18,679	54,591	5,420	1,269,807	166,229	1,436,036	76.9
Santa Monica	93,016	92,329	48,049	2,496,620	98,913	2,595,533	27.9
Sierra Madre	11,021	1,934	4,865	185,011	4,835	189,846	17.2
Signal Hill	11,515	15,283	4,330	375,094	41,156	416,249	36.1
South El Monte	18,290	12,629	4,061	414,962	33,469	448,432	24.5
South Gate	97,521	21,195	24,333	1,227,316	60,921	1,288,237	13.2
South Pasadena	25,892	9,576	10,549	429,625	9,620	439,244	17.0
Temple City	35,924	7,482	11,805	551,337	21,440	572,777	15.9
Torrance	147,860	106,177	56,970	3,525,612	179,104	3,704,715	25.1
Unincorporated Areas	1,067,225	257,395	313,836	18,343,532	669,811	19,013,343	17.8
Vernon	188	43,802	52	704,600	165,303	869,903	4627.1
Walnut	30,770	8,792	9,197	756,304	17,412	773,716	25.1
West Covina	110,059	29,982	32,602	2,075,474	50,668	2,126,142	19.3
West Hollywood	36,432	30,913	23,705	847,730	42,279	890,009	24.4
Westlake Village	8,079	14,679	3,206	431,439	13,208	444,647	55.0
Whittier	84,869	26,964	28,043	1,622,868	36,012	1,658,880	19.5

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Municipality	Population	Employment	Households	VMT			VMT/Pop
				Passenger Vehicles	Trucks	Total	
Agoura Hills	18,843	10,013	6,789	429,483	23,487	452,970	24.0
Alhambra	94,325	34,862	34,157	1,424,403	59,301	1,483,704	15.7
Arcadia	67,702	34,344	24,029	1,412,733	44,908	1,457,641	21.5
Artesia	17,821	6,319	4,949	279,054	8,562	287,616	16.1
Azusa	56,782	14,927	15,975	865,832	35,691	901,523	15.9
Baldwin Park	81,870	18,967	18,896	1,145,143	51,499	1,196,643	14.6
Bell	36,809	14,741	9,158	510,334	28,844	539,178	14.6
Bell Gardens	43,798	11,199	10,017	572,591	17,617	590,207	13.5
Bellflower	86,035	16,906	25,901	1,046,489	30,143	1,076,633	12.5
Beverly Hills	36,311	74,000	15,922	1,448,679	55,655	1,504,333	41.4
Bradbury	1,497	291	603	24,093	810	24,903	16.6
Burbank	113,792	134,327	48,403	3,128,603	186,001	3,314,603	29.1
Calabasas	21,158	19,993	7,922	731,012	49,170	780,182	36.9
Carson	106,492	71,299	30,522	2,233,679	189,257	2,422,936	22.8
Cerritos	51,192	35,991	16,154	1,367,772	61,584	1,429,356	27.9
Claremont	41,944	22,818	14,258	939,103	25,745	964,848	23.0
Commerce	13,661	51,552	3,619	1,037,368	154,751	1,192,119	87.3
Compton	101,341	24,190	24,221	1,256,123	73,458	1,329,581	13.1
Covina	55,197	31,016	18,435	1,222,380	39,356	1,261,735	22.9
Cudahy	26,820	3,492	6,550	262,905	8,966	271,871	10.1
Culver City	41,053	55,554	17,808	1,177,622	64,155	1,241,776	30.2
Diamond Bar	50,660	14,181	17,148	1,002,761	23,436	1,026,197	20.3
Downey	120,828	59,487	37,050	2,417,421	85,711	2,503,132	20.7
Duarte	24,184	13,470	8,155	534,578	32,058	566,636	23.4
El Monte	132,546	35,233	33,703	1,782,138	89,121	1,871,259	14.1
El Segundo	17,192	49,472	7,336	992,571	76,739	1,069,311	62.2
Gardena	67,655	35,057	23,977	1,147,827	69,044	1,216,871	18.0
Glendale	209,362	135,952	80,175	3,769,993	210,872	3,980,865	19.0
Glendora	59,158	27,152	19,823	1,320,622	59,191	1,379,813	23.3
Hawaiian Gardens	16,545	6,189	4,230	286,079	5,859	291,938	17.6
Hawthorne	93,487	30,084	31,758	1,208,701	74,447	1,283,148	13.7
Hermosa Beach	20,404	8,989	9,950	349,857	12,960	362,817	17.8
Hidden Hills	2,168	3,092	704	79,683	8,629	88,312	40.7
Huntington Park	69,079	19,619	17,799	812,763	27,022	839,785	12.2
Industry	13,602	76,254	3,732	1,749,048	221,271	1,970,318	144.9
Inglewood	120,634	38,332	40,299	1,484,140	82,883	1,567,023	13.0
Irwindale	1,971	22,724	526	536,551	62,930	599,481	304.2
La Canada Flintridge	20,471	8,854	6,912	554,504	15,083	569,588	27.8
La Habra Heights	8,601	509	3,001	113,163	4,438	117,601	13.7
La Mirada	51,814	20,961	15,703	929,420	62,036	991,456	19.1
La Puente	49,420	6,378	12,120	660,968	12,978	673,946	13.6
La Verne	36,233	14,172	13,396	733,777	47,338	781,115	21.6
Lakewood	82,578	22,202	27,587	1,359,133	39,313	1,398,447	16.9
Lancaster	208,045	57,752	65,854	2,873,028	152,213	3,025,241	14.5
Lawndale	36,366	8,243	10,914	399,012	12,371	411,383	11.3
Lomita	20,619	5,747	8,179	258,723	9,227	267,951	13.0
Long Beach	535,550	190,416	194,849	7,808,613	368,333	8,176,945	15.3
Los Angeles	4,597,446	2,100,234	1,671,186	68,033,029	3,399,642	71,432,671	15.5
Lynwood	76,393	11,092	16,273	816,634	22,762	839,396	11.0
Malibu	10,271	7,843	4,256	353,888	19,257	373,144	36.3
Manhattan Beach	36,913	22,048	14,711	824,883	28,341	853,224	23.1
Maywood	28,706	3,877	6,873	261,738	11,983	273,721	9.5
Monrovia	40,645	23,092	15,405	835,732	39,339	875,071	21.5
Montebello	69,172	33,753	21,485	1,404,288	74,113	1,478,401	21.4
Monterey Park	67,655	38,758	22,557	1,284,047	51,171	1,335,218	19.7
Norwalk	110,999	29,974	28,545	1,585,666	49,402	1,635,068	14.7

Municipality	Population	Employment	Households	VMT			VMT/Pop
				Passenger Vehicles	Trucks	Total	
Palmdale	207,911	34,650	62,801	3,331,137	108,917	3,440,054	16.5
Palos Verdes Estates	13,853	2,819	5,198	241,274	5,564	246,839	17.8
Paramount	57,745	23,852	14,798	914,646	53,564	968,209	16.8
Pasadena	157,196	139,727	67,219	3,842,814	158,076	4,000,890	25.5
Pico Rivera	72,430	21,658	19,540	1,130,890	56,745	1,187,635	16.4
Pomona	184,131	67,208	49,459	3,218,313	130,687	3,349,000	18.2
Rancho Palos Verdes	45,485	12,962	17,022	857,399	24,300	881,699	19.4
Redondo Beach	73,692	29,604	32,712	1,151,727	62,629	1,214,356	16.5
Rolling Hills	2,063	120	740	26,716	404	27,120	13.1
Rolling Hills Estates	9,209	1,985	3,478	146,428	3,522	149,949	16.3
Rosemead	56,890	14,158	15,231	761,958	25,191	787,149	13.8
San Dimas	37,753	15,707	13,701	787,368	28,997	816,365	21.6
San Fernando	26,550	13,042	6,838	414,108	29,461	443,570	16.7
San Gabriel	45,687	16,717	15,030	708,603	25,418	734,021	16.1
San Marino	13,606	4,594	4,469	214,251	5,627	219,878	16.2
Santa Clarita	249,170	87,689	89,029	4,848,490	251,588	5,100,078	20.5
Santa Fe Springs	20,637	60,974	6,179	1,346,679	173,328	1,520,006	73.7
Santa Monica	99,526	114,949	53,124	2,556,388	136,817	2,693,204	27.1
Sierra Madre	11,664	2,396	5,199	181,576	5,660	187,237	16.1
Signal Hill	13,219	18,018	5,045	380,367	44,870	425,237	32.2
South El Monte	20,021	13,924	4,525	418,029	35,018	453,048	22.6
South Gate	106,328	23,278	26,790	1,219,112	64,414	1,283,526	12.1
South Pasadena	27,002	11,748	11,054	431,178	12,360	443,538	16.4
Temple City	39,587	8,911	13,263	551,512	24,082	575,593	14.5
Torrance	158,574	124,986	61,692	3,508,458	200,960	3,709,419	23.4
Unincorporated Areas	1,248,903	307,997	385,786	18,914,519	835,013	19,749,532	17.8
Vernon	117	46,752	30	805,092	165,918	971,010	8299.2
Walnut	33,428	10,293	10,252	751,165	19,760	770,925	23.1
West Covina	118,074	36,540	35,292	2,031,260	61,598	2,092,858	17.7
West Hollywood	37,697	35,544	24,496	774,107	49,523	823,629	21.8
Westlake Village	8,550	17,563	3,410	440,548	17,183	457,732	53.5
Whittier	90,350	33,390	30,175	1,631,644	45,619	1,677,263	18.6