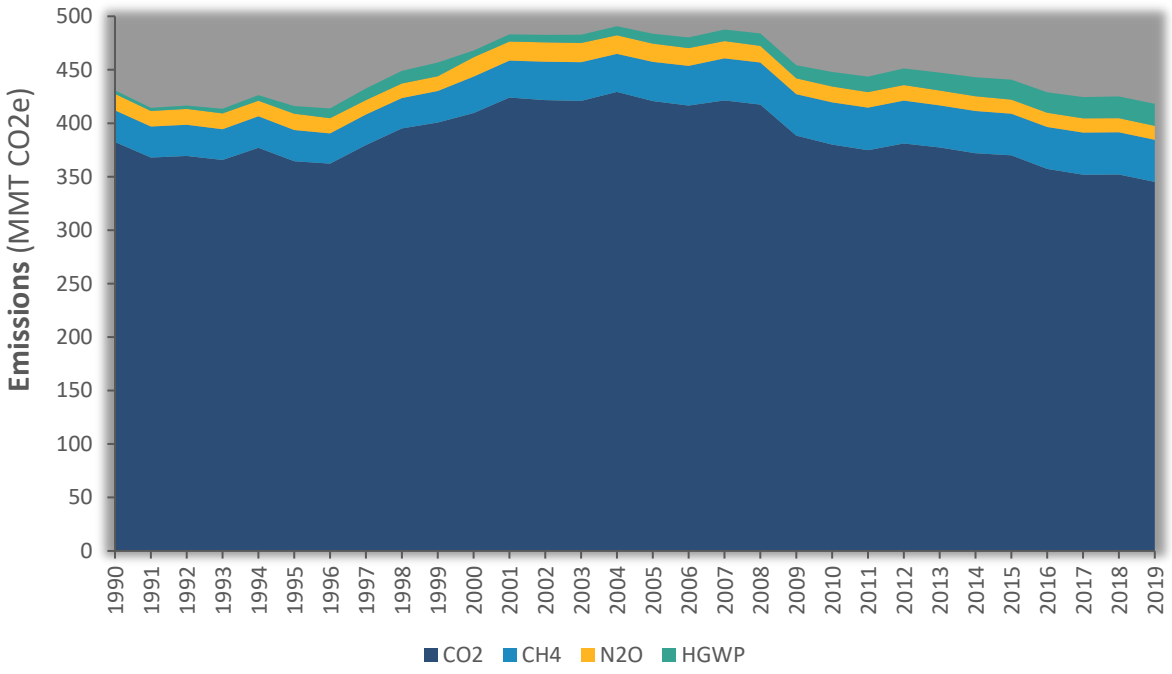
GREENHOUSE GAS EMISSIONS

Statewide greenhouse gas (GHG) emissions peaked in 2004, but have since been on an overall downward trajectory. Emissions have remained below California's GHG emissions reduction goal (431 million metric tons of carbon dioxide equivalent) since 2016. Similarly, GHG emissions have steadily decreased on a per capita and gross state product basis.

Figure 1. Greenhouse gas emissions in California 1990 - 2019, disaggregated by pollutant*



Source: CARB, 2007; CARB, 2021a

**Based on IPCC Fourth Assessment Report 100-year global warming potentials*
MMTCO$_2$e = million metric tons of carbon dioxide equivalents

What does the indicator show?

California's combined emissions of the greenhouse gases (GHG) carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and high global warming potential (high-GWP) gases reached peak levels in 2004, but have since decreased and remained below the 1990 emissions levels since 2016 (CARB, 2021a). GHG emissions are expressed in million metric tons (MMT) of carbon dioxide equivalents (CO_2e) based on

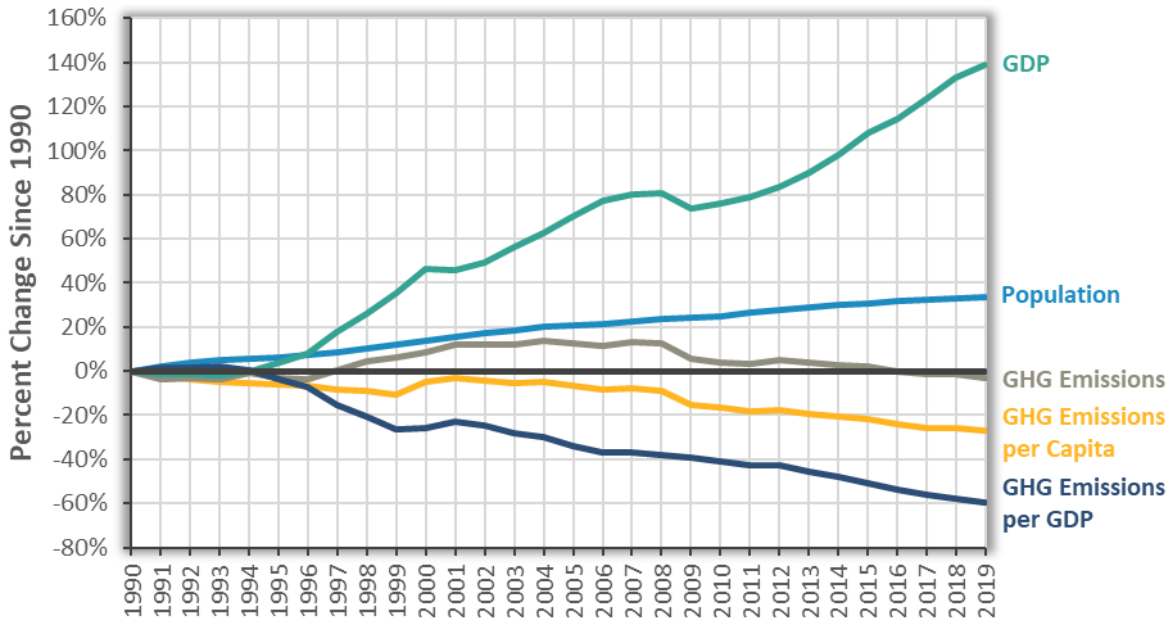
What are "CO_2 equivalents"?

Emissions of greenhouse gases other than carbon dioxide (CO_2) are converted to **carbon dioxide equivalents,** or **CO_2e,** based on their global warming potential (GWP). GWP represents the warming influence of different greenhouse gases relative to CO_2 over a given time period and allows the calculation of a single consistent emission unit, CO_2e.

100-year global warming potential values as specified in the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (IPCC, 2006).

CO_2 accounts for the largest proportion of GHG emissions, making up 83 percent of total emissions in 2019. In comparison, CH_4 and N_2O account for 9 percent and 3 percent of total GHG emissions, respectively. The remaining 5 percent of GHG emissions consist of high-GWP gases including hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). Among these GHGs, methane and a subset of HFCs[1] are also considered short-lived climate pollutants (SLCPs), which are powerful climate forcers that remain in the atmosphere for a much shorter period than longer-lived climate pollutants such as CO_2. SLCPs are discussed further below (see *Why is this indicator important?*).

Figure 2. Trends in California's population, economy and greenhouse gas (GHG) emissions since 1990



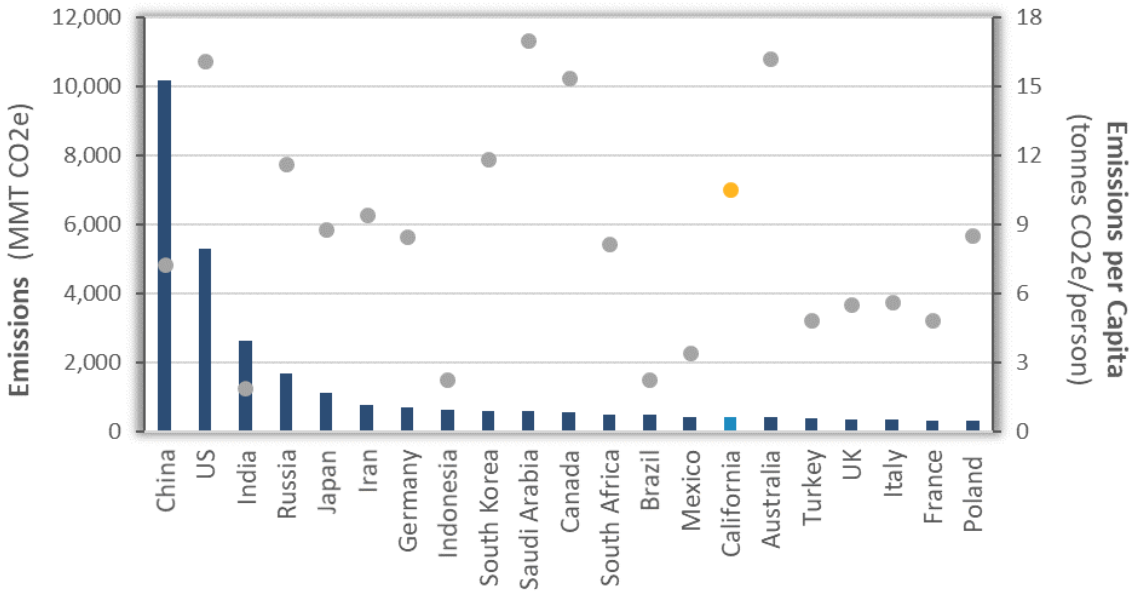
Source: CARB, 2007 and 2021a; Census, 2012; DOF, 2021

GHG emissions per person (per capita) and per dollar of gross domestic product (GDP, a measure of the state's economic output) show declining trends between 1990 and 2019 (Figure 2). During the same period, the state's population and GDP increased by 33 percent and 139 percent, respectively. California's 2019 GHG emissions are 3 percent lower than in 1990, but emissions per capita have declined by over 25 percent

[1] These include HFC-152a, HFC-32, HFC-245fa, HFC-365mfc, HFC-134a, HFC-43-10mee, HFC-125, HFC-227ea, and HFC-143a.

and emissions per dollar of GDP (carbon intensity) have declined by almost 60 percent. Total GHG emissions have also decreased from the peak in 2004 by 15 percent. A combination of factors contributed to this decrease in carbon intensity of the California economy. These factors include incrementally higher energy efficiency standards, growths in renewable energy sources, carbon pricing from the Cap-and-Trade Program, improved vehicle fuel efficiency, and other regulations.

Figure 3. 2019 Total (bars) and per capita (markers) California emissions as compared to the top 20 emitting nations



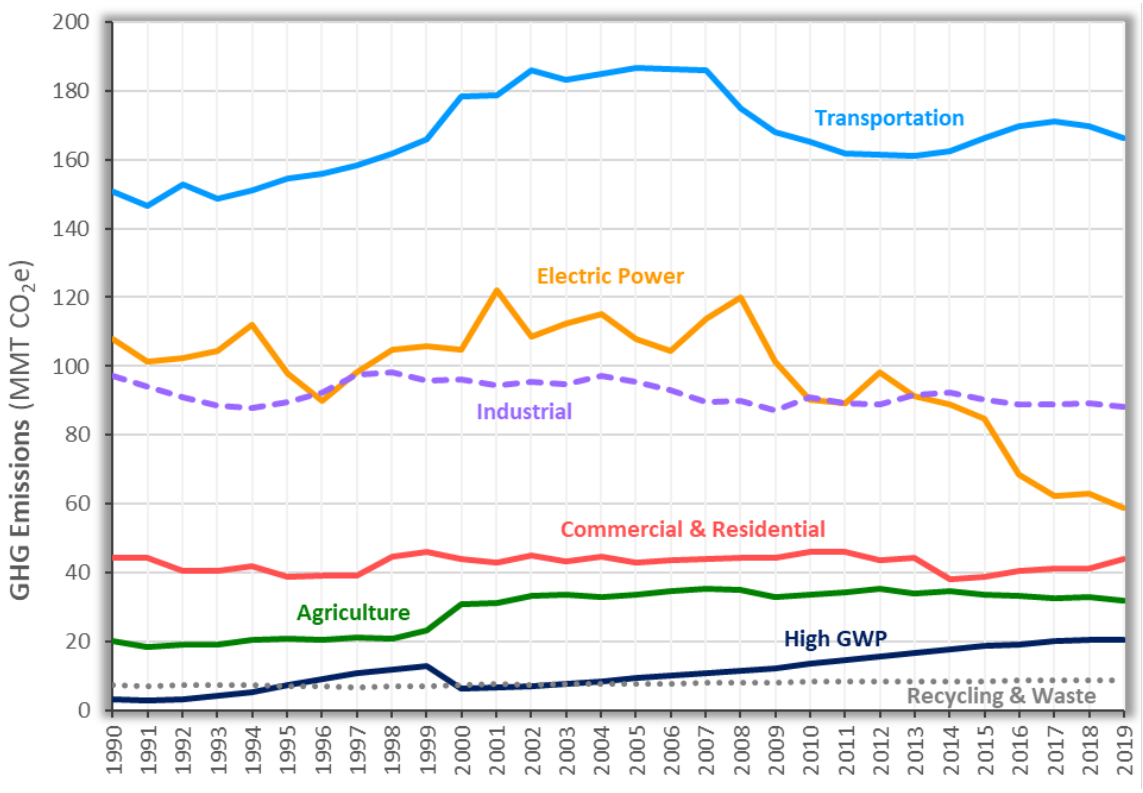
Sources: CARB, 2021a; DOF, 2020; Statista, 2021; World Bank, 2021

Figure 3 shows 2019 total emissions and emissions per capita for California compared to the top 20 emitting nations. If California were a country, it would be the fifth largest economy in the world. It would have the 15th highest total emissions, and the 7th highest per capita emissions. The state's 2019 per capita emissions are 35 percent lower than those of the United States (CARB, 2021a, Statista, 2021, World Bank 2021).

Figure 4 shows GHG emissions from 1990 to 2019, organized by categories as defined in the California Air Resources Board's (CARB) *Scoping Plan* (CARB, 2008). The transportation sector and the electric power sector are the primary drivers of year-to-year changes in statewide emissions. Transportation sector emissions increased between 1990 and 2007, followed by a period of steady decrease through 2013, and have followed a generally declining trend since. Most recently, total transportation emissions have steadily decreased from 2017 through 2019 due to a significant increase in biodiesel and renewable diesel use, which now accounts for 27 percent of total on-road diesel sold in California. Emissions from the electric power sector are variable over time but have decreased by more than 50 percent between 2008 and

2019 due to a continuing increase in renewable energy. High-GWP gases make up a small portion of total emissions but are steadily increasing as they replace ozone-depleting substances that are being phased out under international accord (UNEP, 2016). Emissions from the other sectors show some year-to-year variations, but their trends are relatively flat over time.

Figure 4. Greenhouse gas emissions in California from 1990 – 2019, disaggregated by sector*



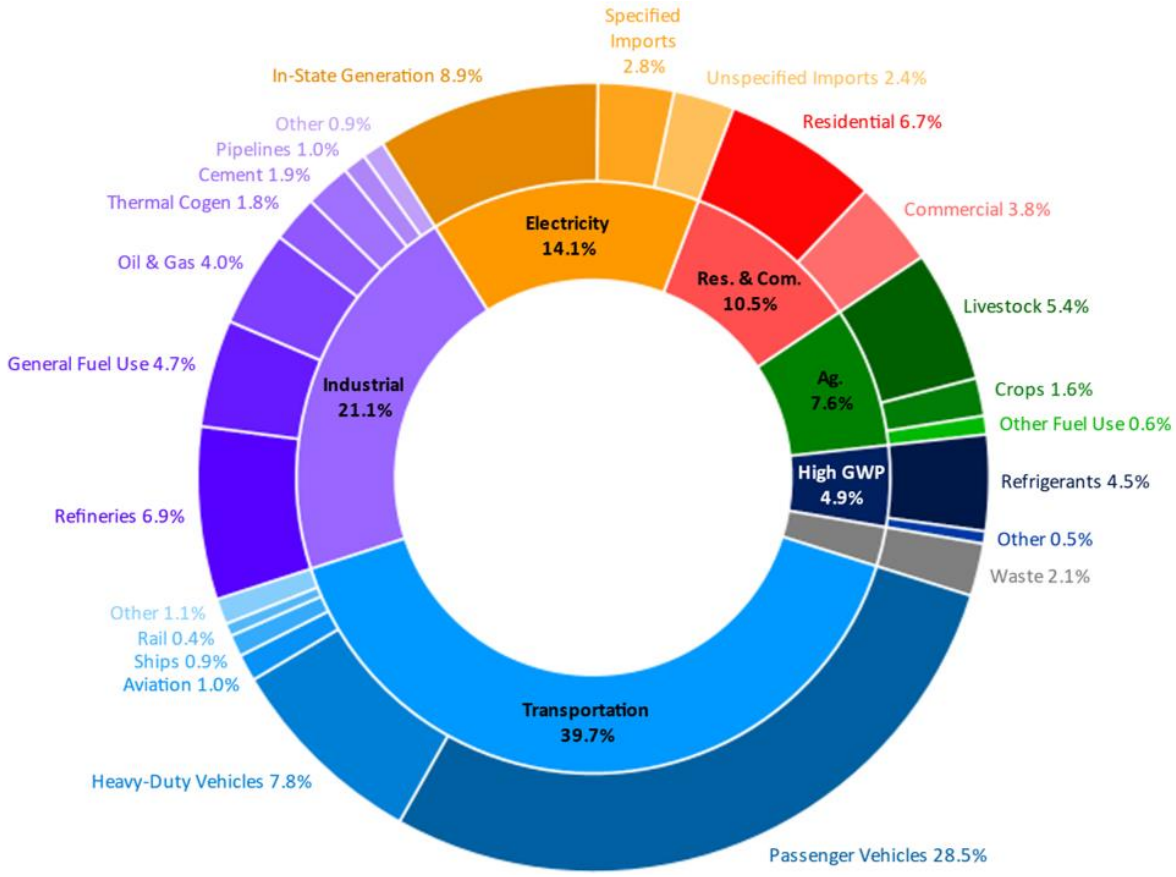
Source: CARB, 2021a

**Based on IPCC Fourth Assessment Report 100-year global warming potentials.*
Note: High-GWP gases do not represent an "economic sector," but are classified as such for purposes of organizing and tracking emissions, sources, and emissions reduction strategies.

Transportation is the largest source of GHGs, accounting for 39.7 percent of the total emissions in 2019 (Figure 5). Cars, light duty trucks, and sport utility vehicles constitute the highest contribution to transportation emissions. Industrial activities account for 21.1 percent of emissions and include fossil fuel combustion and fugitive emissions from a wide variety of activities such as manufacturing, oil and gas extraction, petroleum refining, and natural gas pipeline leaks. The electricity sector (in-state generation and electricity imports) accounts for 14.1 percent of emissions, followed by residential and commercial sources, which collectively account for 10.5 percent. The commercial sector, which includes schools, health care services, retail, and wholesale, accounts for

3.8 percent. The residential sector, where home natural gas use makes up the majority of emissions, accounts for 6.7 percent of statewide emissions. Emissions from the agricultural sector, which come from livestock, crop production, and fuel combustion, contributed 7.6 percent; these are mostly comprised of emissions from livestock. High-GWP gases are primarily used in refrigeration and air conditioning, as well as foams and consumer products and comprised 4.9 percent of 2019 emissions. Recycling and waste was the smallest contributor at 2.1 percent and includes emissions from landfills, wastewater treatment, and compost.

Figure 5. Greenhouse gas emissions by sector



Source: CARB, 2021a

Why is this indicator important?

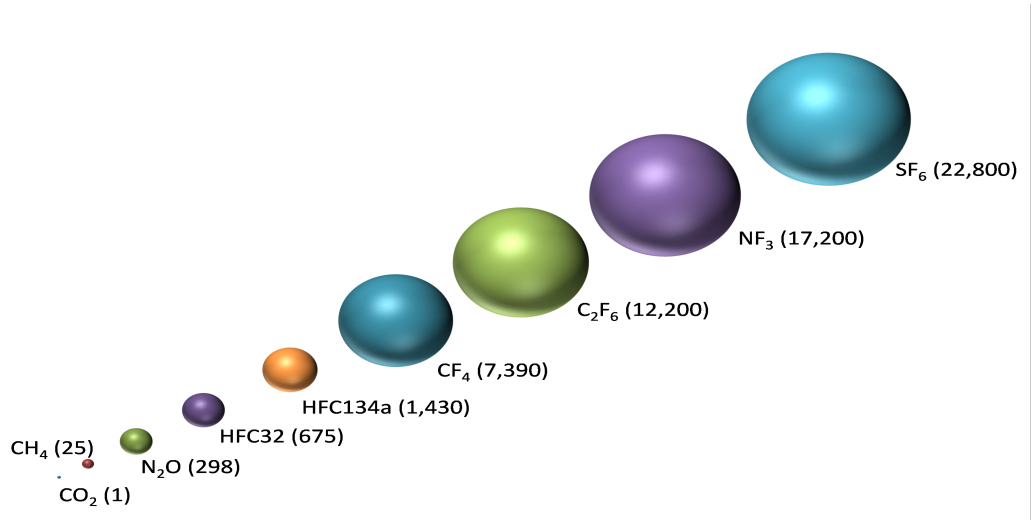
Atmospheric concentrations of GHGs have increased since the Industrial Revolution, enhancing the heat-trapping capacity of the earth's atmosphere. Accurately tracking GHG emissions trends in California provides critical information to policymakers as they assess climate change mitigation options and track the progress of GHG emissions reduction programs.

GHG emissions reduction targets are intended to prevent atmospheric concentrations from reaching levels at which catastrophic and irreversible impacts occur. The 2015 Paris Agreement aims to hold the increase in the global average temperature to well below 2 degrees Celsius (°C) above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C above pre-industrial levels (UNFCCC, 2016). These efforts would significantly reduce the risks and impacts of climate change (Xu and Ramanathan, 2017). However, if global emissions continue to increase at the current rate, global warming is likely to reach 1.5°C between 2030 and 2052 (IPCC, 2018).

Since each GHG absorbs energy and warms the atmosphere to a different degree, understanding the pollutants' relative effects on climate change is also important for setting priorities and meeting emission reduction goals. Current international and national GHG inventory practice, as defined by the IPCC Guidelines, uses 100 years as the standard timeframe for GHG inventories. (Other timeframes may be used for different purposes. For example, discussions related to SLCPs typically use the 20-year timeframe.)

As illustrated in Figure 6, in a 100-year timeframe, CO_2 has the lowest GWP of all GHGs reported in the statewide inventory on a per unit of mass basis. Non-CO_2 emissions are converted to CO_2 equivalents (CO_2e) using GWP. GWP is a measure of the extent to which a particular GHG can alter the heat balance of the earth relative to carbon dioxide over a specified timeframe. For example, the GWP of SF_6 is 22,800, meaning that one gram of SF_6 has the same warming effect as 22,800 grams of CO_2.

Figure 6. 100-Year global warming potential of greenhouse gases based on the IPCC Fourth Assessment Report

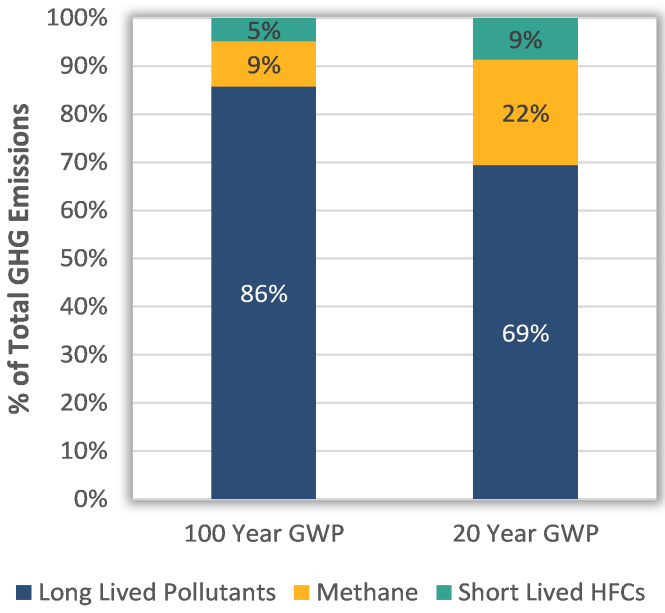


Source: IPCC, 2007

Emissions of CO_2, the main contributor to climate change, stay in the atmosphere for hundreds of years. Reducing CO_2 emissions is critically important but will not result in near-term cooling because of this long residence time. In contrast to CO_2, because SLCPs remain in the atmosphere from days to decades, a reduction in these emissions can have a more immediate impact, slowing the rate of warming.

Because SLCPs do not persist in the atmosphere for longer than decades, it is useful to consider a 20-year timeframe when discussing their impacts on climate change and planning for mitigation measures. Figure 7 shows the contribution of SLCP emissions to total GHG emissions in 2019. This contribution is based on their GWP and their atmospheric lifetime. Emissions of short-lived HFCs and methane in 2019 account for 14 percent of the total GHG emissions in a 100-year timeframe; however, when considering a 20-year timeframe, they account for 31 percent. In addition to methane and short-lived HFCs, black carbon, a class of particulate matter, is also considered an SLCP (see *Atmospheric black carbon concentrations* indicator).

Figure 7. SLCP contribution to total GHG emissions in 2019, over a 100 year and 20 year timeframe



Source: CARB, 2021a

What factors influence this indicator?

Statewide GHG emissions reflect activities across all major economic sectors, which are influenced by a variety of factors including population growth, vehicle miles traveled, economic conditions, energy prices, consumer behavior, technological changes, drought, and regulations, among other things.

Because GHG emissions from each sector are simultaneously influenced by multiple factors, one-to-one attribution between each factor and the magnitude of changes to sector emissions can be difficult to quantify. For example, improved economic conditions can result in an increased number of motor vehicles per household, and can boost vehicle miles traveled thus increasing GHG emissions, while using more fuel-efficient vehicles, public transportation, or driving less can reduce emissions.

GHGs are emitted from a variety of sources, but most notably from the combustion of fossil fuels used in the industrial, commercial, residential, and transportation sectors. GHG emissions also occur from non-combustion activities at landfills, wastewater treatment facilities, and certain agricultural operations. A discussion of trends in certain economic sectors, sources of SLCPs, and the influence of regulatory requirements is presented in the following sections. Further information is provided in CARB (2021b).

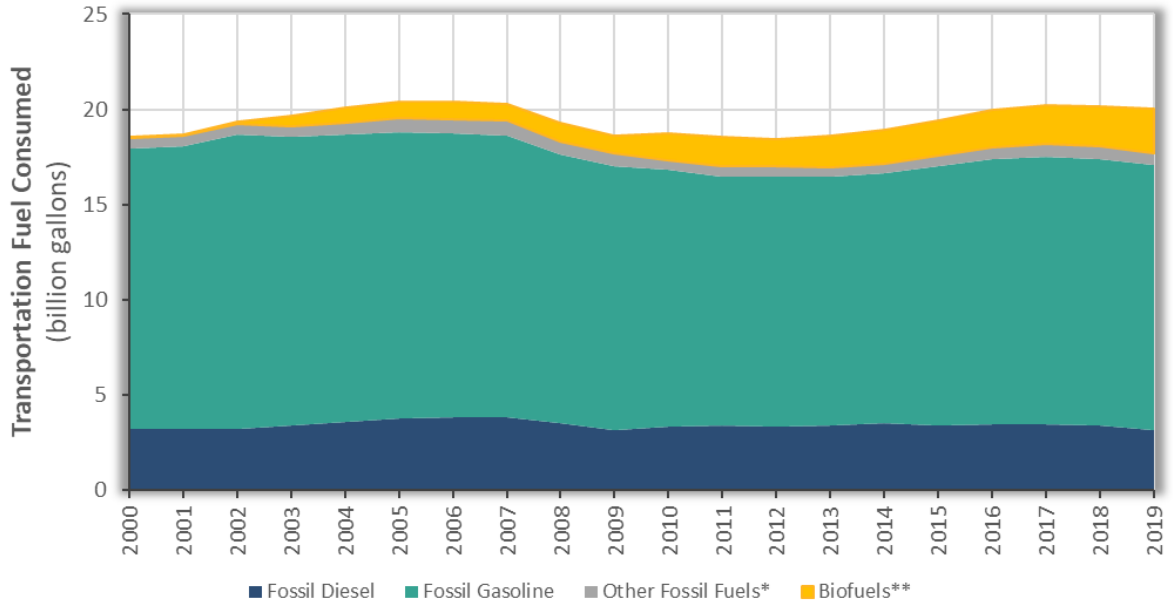
Transportation

Although California's population has grown by 33 percent since 1990 (Figure 2), GHG emissions from the transportation sector have increased by only 10 percent (Figure 4). Furthermore, transportation emissions in 2019 were 11 percent lower than the peak level in 2005. The decrease in transportation GHG intensity per capita is largely due to a significant increase in biodiesel and renewable diesel use, which is up 61 percent from 2018 and now accounts for 27 percent of total on-road diesel sold in California. California is also a world leader in the adoption of advanced alternative vehicles such as plug-in electric and hybrid vehicles. The state is the nation's largest market for zero-emission vehicles (ZEVs) due to California's regulation and vast portfolio of complementary policies. The state continues to lead in this area as recently shown by Governor Newsom's 100 percent ZEV sales for passenger vehicles target by 2035 (Newsom, 2020).

Transportation emissions are related to the amount of fuel burned. Combustion of fossil fuels such as gasoline and diesel produce GHGs that are counted towards California's inventory. On the other hand, emissions from the combustion of biofuels such as ethanol and biodiesel, which are derived from carbon that was recently absorbed from the atmosphere as a part of the global carbon cycle, are not counted pursuant to international GHG inventory practices (IPCC, 2006). Thus, displacing fossil fuels with biofuels can reduce the climate change impacts of the transportation sector.

The trends in the use of fossil fuels (blue, teal, and grey) and biofuels (yellow) are shown in Figure 8. Gasoline use is declining slightly, and biofuel use is increasing — trends contributing to the reduction in GHG emissions from transportation. Declining gasoline consumption is related to higher ethanol use, as well as to improved fuel economy and increased use of alternative fuel vehicles such as electric or hydrogen fueled vehicles. Biofuel diesel alternatives (i.e., biodiesel and renewable diesel) have been in use since 2010, and volumes are increasing rapidly. Between 2012 and 2019, biofuel diesel alternatives increased from 1 percent to 27 percent of the total transportation diesel use.

Figure 8. Trends in transportation fuel combustion from 2000 – 2019



Source: CARB, 2021a

**Other fossil fuels include: aviation gasoline, jet fuel, LPG, residual fuel oil, and natural gas.*
***Biofuels includes gallons of ethanol, biodiesel, and renewable diesel*

Residential and Commercial

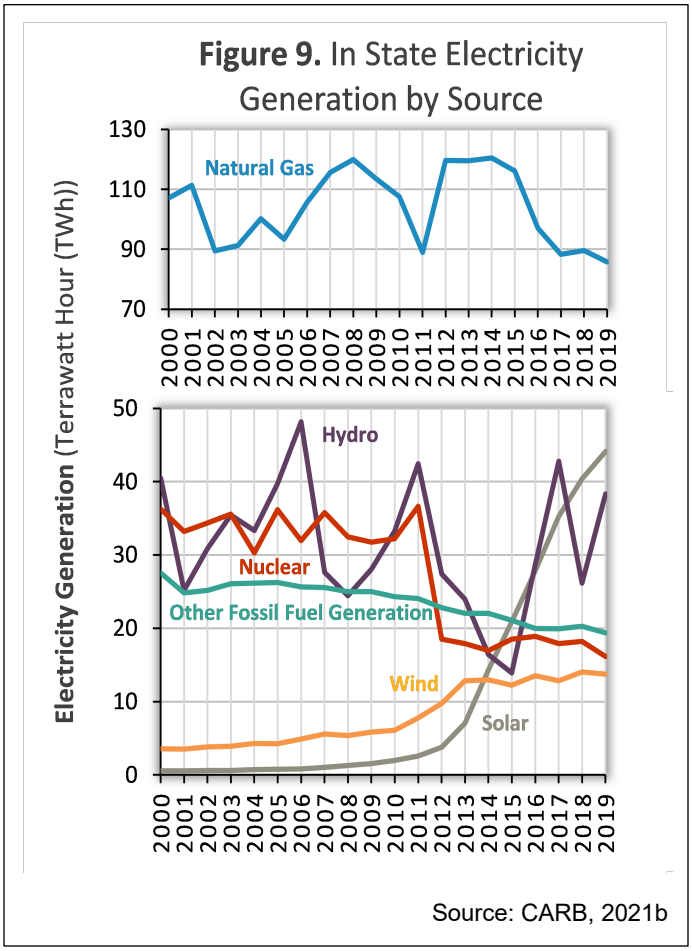
California's steady population growth from 1990 through 2019 has been accompanied by an increased demand for housing, among other things. More housing often means additional demand for residential energy and increased associated GHG emissions, yet emissions from the residential and commercial sector decreased over the same period. Residential and commercial building code standards are updated regularly to improve building efficiency (e.g., insulation thickness, window design, lighting systems, and heating/cooling equipment specification). These energy efficiency standards have saved Californians billions of dollars in reduced electricity bills (CEC, 2015), and have reduced the emissions of GHGs and criteria air pollutants. The per capita electricity consumption in California is near the lowest in the nation, primarily due to mild weather and energy efficiency programs (EIA, 2021). Still, emissions from residential and commercial buildings have continued to rise since 2014, due in part to increases in natural gas use.

Electric Power

The electric power sector includes two broad categories: in-state power generation (including the portion of industrial and commercial cogeneration emissions attributed to electricity generation) and imported electricity. Since the early 2000's, the deployment of renewable and less carbon-intensive resources have facilitated the continuing decline in fossil fuel electricity generation. The Renewables Portfolio Standard (RPS) Program and the Cap-and-Trade Program continue to incentivize the dispatch of renewables

over fossil generation to serve California load. Higher energy efficiency standards also reduce growth in electricity consumption driven by a growing population and economy.

California's in-state electricity is derived from a variety of sources (see Figure 9). Natural gas, which is used to produce the majority of in-state electricity, accounted for 39 percent of the electricity generation in 2019. Solar energy accounted for 20 percent, hydro accounted for 18 percent, and nuclear accounted for 7 percent of in-state generation. Nuclear power declined after the 2012 shutdown of the San Onofre Nuclear Generating Station. Hydro power reached historic lows in 2015 due to drought. An increase in solar and wind power has compensated for the decline in hydro power and nuclear generation in recent years. Wind, solar, hydro, and nuclear power are zero-emission sources. In 2019, California was the nation's top producer of electricity from solar, geothermal, and biomass energy, and the state was second in the nation in conventional hydroelectric power generation (EIA, 2021).



Emissions from imported electricity peaked in 2004 and have since dropped 67 percent by 2019. Compared to 2011 levels, imports of hydro, solar, wind, and nuclear energy nearly tripled, while imports of coal energy dropped by 67 percent. In 2019, imports of hydro, solar, wind, and nuclear energy grew nine percent in one year.

Weather can also have notable influences on GHG emissions from the electricity sector. A warmer summer increases electricity demand for air conditioning, and consequently increases the emissions from power plants that must ramp up to meet the additional demand.

Short-Lived Climate Pollutants

Sources of methane and short-lived HFCs in California are shown in Figure 10. Livestock represents the largest source of methane. Methane is produced from livestock manure management and from the guts of ruminant animals such as cows. Organic waste deposited in landfills or managed in wastewater treatment plants also produce

methane emissions. As the primary component of natural gas, methane is also emitted by oil and gas extraction and during its storage, processing, and transport. Natural gas is used for many purposes including electricity production and heating.

Figure 10. 2019 Sources of short-lived climate pollutants*

Source: CARB, 2021b

**Based on the 2019 edition of the GHG inventory and 100-year GWP*

Short-lived HFCs are used as replacements for ozone-depleting substances that are being phased out under the Montreal Protocol (UNEP, 2016). The majority of HFC emissions comes from refrigeration and air-conditioning systems used in the residential, commercial, industrial, and transportation sectors. Foams, aerosols, solvents, and fire protection are other sources of HFCs.

Climate Change Policies and Regulations

California's pioneering efforts in the adoption and implementation of policies are reducing GHG emissions. The California Global Warming Solutions Act of 2006 (Nuñez, Chapter 488, Statutes of 2006), also known as Assembly Bill (AB) 32, established the nation's first comprehensive program of regulatory and market mechanisms to achieve real, quantifiable, cost-effective GHG emissions reductions. AB 32 set a goal of reducing GHG emissions to the 1990 level by 2020 and requires the state to complete a Climate Change Scoping Plan that lays out the path to meet the emissions reduction target, and to update that plan at least every five years. The first Climate Change Scoping Plan was adopted by the Board in 2008 (CARB, 2008). Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016) codified in statute the goal of further reducing GHG emissions to 40 percent below the 1990 level by 2030. In 2017, the Board adopted the 2017 Climate Change Scoping Plan, which lays out the path to meet this target (CARB, 2017). Executive Order B-55-18 calls for achieving carbon neutrality no later than 2045, and to achieve and maintain net negative emissions thereafter. As of mid-2022, CARB is working with state agencies on the next Scoping Plan update, which will identify a technologically feasible and cost-effective path to achieve carbon neutrality by no later

than 2045 while also assessing the progress the state is making towards reducing its greenhouse gas emissions by at least 40 percent from 1990 levels by 2030. A complete list of climate change legislation and executive orders can be found in the appendix.

Technical considerations

Data characteristics

A GHG inventory is an estimate of GHG emissions over a specified area and period from known sources or categories of sources. Emission inventories generally use a combination of two basic approaches to estimate emissions. The top-down approach utilizes nationwide or statewide data from various federal and state government agencies to estimate emissions. The bottom-up approach utilizes activity data (e.g., fuel quantity, animal population, tons of waste deposited in the landfill) to compute unit level emissions that are then aggregated to the state level for a particular source category. In either approach, calculation assumptions are made to estimate statewide GHG emissions from different levels of activity data. These calculations typically reference the 2006 IPCC Guidelines for National Greenhouse Gas Inventories or the U.S. Environmental Protection Agency's national GHG emission inventory, but also incorporate California-specific methods and considerations to the extent possible.

Strengths and limitations of the data

The methods used to develop the California GHG emission inventory are consistent with international and national inventory guidelines to the greatest extent possible. Emission calculation methodologies are evaluated over time and refined by incorporating the latest scientific research and monitoring activities.

The California GHG inventory includes emissions from anthropogenic sources located within California's boundaries. Pursuant to AB 32, California's inventory also includes imported electricity. The inventory, however, excludes emissions that occur outside California during the manufacture and transport of products and services consumed within the state across all sectors. On the other hand, California is a net exporter of multiple products, especially agricultural commodities. California exported about a quarter of all agricultural products (CDFA, 2014). The state's GHG inventory includes the carbon sequestered in California-produced agricultural products that are exported and consumed outside the state. In addition, GHG mitigation effects may cross geographic borders as part of international and sub-national collaboration, or as a natural result of implementation of state programs. The state's GHG emission inventory does not account for emission reductions outside of its geographic border that may have resulted from California's adopted programs.

OEHHA acknowledges the expert contribution of the following to this report:

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References:

Brown EG (2012). Executive Order B-16-2012, March 23, 2012.

Brown EG (2018). Executive Order B-48-18, January 26, 2018.

CARB (2007). California Air Resources Board: 1990-2004 Inventory. Retrieved October 2017.

CARB (2008). *Climate Change Scoping Plan*. California Air Resources Board.

CARB (2016). California Air Resources Board: Low Carbon Fuel Standard. Retrieved October 2017.

CARB (2017). *California's 2017 Climate Change Scoping Plan*.

CARB (2021a). California Air Resources Board: Greenhouse Gas Inventory 2021 Edition, Years 2000-2019.

CARB (2021b). *California Greenhouse Gas Emissions from 2000 to 2019 – Trends of Emissions and Other Indicators (2019 Edition).* California Air Resources Board.

CDFA (2014). *California Agricultural Statistics Review: 2012 – 2013*. California Department of Food and Agriculture Sacramento, CA: Office of Public Affairs.

CEC (2015). California Energy Commission. California's Energy Efficiency Standards Have Saved Billions. Retrieved October 2017.

Census (2012). *2010 Census of Population and Housing, Population and Housing Unit Counts, United States* (2010 CPH-2-1). U.S. Department of Commerce, Bureau of the Census. US Government Printing Office. Washington DC.

DOF (2020). California Department of Finance. E-6 Population Estimates and Components of Change by County July 1, 2010-2020. Sacramento, CA.

DOF (2021). California Department of Finance. California Gross Domestic Product. Retrieved June 2021.

EIA (2021). US Energy Information Administration. California Quick Facts. Retrieved June 2021.

GIWG (2016). *2016 ZEV Action Plan – An Updated Roadmap Toward 1.5 Million Zero-Emission Vehicles in California Roadways by 2025*. Ava Governor's Interagency Working Group on Zero-emissions Vehicles, Governor Edmund G. Brown Jr.

IPCC (2006). *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme*. Eggleston HS, Buendia L, Miwa K, Ngara T, and Tanabe K (Eds.). Hayama, Kanagawa, Japan: Institute for Global Environmental Strategies.

IPCC (2007). *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II, and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Core Writing Team, Pachauri RK and Reisinger A (Eds.). Geneva, Switzerland: International Panel on Climate Change.

IPCC (2014). *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* [The Core Writing Team, Pachauri RK, and Meyer L (Eds.)]. Intergovernmental Panel on Climate Change, Geneva, Switzerland.

IPCC (2018). *Summary for Policymakers.* In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.* [Masson-Delmotte V, Zhai P, Pörtner H-O, Roberts D, Skea J, et al. (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

Newsom EG (2020). Executive Order N-79-20, September 23, 2020.

Statista (2021). Carbon Dioxide Emission in 2009 and 2019, by select country. Retrieved August 2021.

UNEP (2016). United Nations Environment Programme: The Montreal Protocol on Substances the Deplete the Ozone Layer. Retrieved October 2017.

UNFCCC (2016). *United Nations Framework Convention on Climate Change. Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015. Decision 1/CP.21: Adoption of the Paris Agreement.* Paris, France.

World Bank (2021). Population, total.

Xu Y and Ramanathan V (2017). Well- below 2° C: Mitigation strategies for avoiding dangerous to catastrophic climate changes. *Proceedings of the National Academy of Sciences* **114**(39): 10315-10323.

APPENDIX.
California's Climate Change Legislation, Executive Orders, and Other References

AB 32 (Nuñez and Pavley, Chapter 488, Statutes of 2006),
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=200520060AB32

AB 74 (Ting, Chapter 23, Statutes of 2019),
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB74

AB 398 (Garcia, E., Chapter 135, Statutes of 2017),
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB398

AB 617 (Garcia, C., Chapter 136, Statutes of 2017),
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB617

AB 1493 (Pavley, Chapter 200, Statutes 2002),
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=200120020AB1493

AB 1550 (Gomez, Chapter 369, Statutes of 2016),
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160AB1550

AB 3232 (Friedman, Chapter 373, Statutes of 2018),
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB3232

EO B-55-18, https://www.ca.gov/archive/gov39/wp-content/uploads/2018/09/9.10.18-Executive-Order.pdf

EO N-82-20, https://www.gov.ca.gov/wp-content/uploads/2020/10/10.07.2020-EO-N-82-20-signed.pdf

EO N-79-20, https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf

CARB Board Resolution 17-46, https://ww3.arb.ca.gov/board/res/2017/res17-46.pdf

CARB Board Resolution 20-5, https://ww3.arb.ca.gov/board/res/2020/res20-5.pdf

Governor's Energy Emergency Proclamation,
https://www.gov.ca.gov/2021/07/30/governor-newsom-signs-emergency-proclamation-to-expedite-clean-energy-projects-and-relieve-demand-on-the-electrical-grid-during-extreme-weather-events-this-summer-as-climate-crisis-threatens-western-s/

SB 32 (Pavley, Chapter 249, Statutes of 2016),
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB32

SB 44 (Skinner, Chapter 297, Statutes of 2019),
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB44

SB 84 (Committee on Budget and Fiscal Review, Chapter 50, Statutes of 2017), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB84

SB 100 (De León, Chapter 312, Statutes of 2018), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB100

SB 150 (Allen, Chapter 646, Statutes of 2017), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB150

SB 350 (De León, Chapter 547, Statutes of 2015), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB350

SB 375 (Steinberg, Chapter 728, Statutes of 2008), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=200720080SB375

SB 535 (De León, Chapter 830, Statutes of 2012), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201120120SB535

SB 605 (Lara, Chapter 523, Statutes of 2014), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201320140SB605

SB 743 (Steinberg, Chapter 386, Statutes of 2013), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201320140SB743

SB 1013 (Lara, Chapter 375, Statutes of 2018), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1013

SB 1018 (Committee on Budget and Fiscal Review, Chapter 39, Statutes of 2012), http://www.leginfo.ca.gov/pub/11-12/bill/sen/sb_1001-1050/sb_1018_bill_20120627_chaptered.html

SB 1275 (De León, Chapter 530, Statutes of 2014), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201320140SB1275

SB 1371 (Leno, Chapter 525, Statutes of 2014), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201320140SB1371

SB 1383 (Lara, Chapter 395, Statutes of 2016), https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1383