CHAPTER 3

Emissions Inventory

- **With currently adopted regulations in place, direct PM2.5 emissions are projected to decline 4 percent from 2018 to 2030 in the South Coast Air Basin.**

- **Emissions of NOx, a PM2.5 precursor, are projected to decline by 45 percent, while ammonia emissions are expected to rise by 6 percent from 2018 to 2030.**

- **Top sources of directly emitted PM2.5 are from area sources and include commercial cooking, paved road dust and residential fuel combustion.**

- **Mobile sources continue to be the largest contributor to NOx emissions in both 2018 and 2030.**

- **Ammonia emissions are forecasted to increase due to factors such as population growth and widespread use of selective catalytic reduction in heavy-duty vehicles and catalysts in light-duty vehicles.**

Introduction

The South Coast Air Basin (Basin) is classified as a "serious" nonattainment area for the 2012 Annual PM2.5 standard and needs to attain the standard no later than 2030. This chapter summarizes criteria pollutant emissions in the Basin for the 2018 base year as well as projected emissions for the 2030 attainment year. A more detailed description of emissions and methodologies is presented in Appendix I.

The inventory provided here is derived from the emissions inventory developed for the 2022 Air Quality Management Plan. Major updates were introduced in on-road emissions due to the transition from EMFAC2017 to EMFAC2021, along with a minor adjustment made to construction equipment within the off-road category. This Draft PM2.5 Plan also includes emission estimates for filterable and condensable PM2.5 emissions. The 2018 base year emissions inventory reflects reported emissions from large facilities and estimated emissions for all other sources. The future baseline emissions inventory is based on economic projections and implementation of adopted regulations with both current and future compliance dates. A list of the South Coast Air Quality Management District (South Coast AQMD) rules and regulations that are part of the base year and future year baseline emissions inventories is presented in Appendix I. The South Coast AQMD continues to implement rules that are incorporated into the Draft PM2.5 Plan future baseline emissions inventories.

The emissions inventory is divided into two major source classifications: stationary and mobile sources. Stationary sources include point sources and area sources. The 2018 base year point source emissions are based principally on reported data from facilities subject to the South Coast AQMD's Annual Emissions Reporting (AER) Program. Area source emissions are estimated jointly by CARB and the South Coast AQMD using established inventory methods. Mobile sources include on-road emissions and off-road emissions. On-road emissions are calculated using CARB's EMFAC2021 model and travel activity data provided by the Southern California Association of Governments (SCAG) from their adopted 2020 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). CARB provides emissions inventories for off-road sources, which include construction and mining equipment, industrial and commercial equipment, lawn and garden equipment, agricultural equipment, ocean-going vessels (OGV), commercial harbor craft, locomotives, cargo handling equipment, pleasure craft, recreational vehicles, and fuel storage and handling. Aircraft emissions are based on an updated analysis by the South Coast AQMD developed in conjunction with commercial airports in the region.

Future emissions forecasts are primarily based on demographic and economic growth projections provided by SCAG as well as the energy consumption projections by Southern California Gas Company (SoCalGas). In addition, emission reductions resulting from the South Coast AQMD's regulations amended or adopted by October 2020 and Rule 1109.1 and CARB regulations adopted by December 2021 are included in the future baseline projections. The South Coast AQMD's Rule 1109.1, Emissions of Oxides of Nitrogen from Petroleum Refineries and Related Operations, was adopted in November 2021. The cutoff dates for regulations included in the baseline emissions are the same as in the 2022 AQMP. Heavy-Duty Inspection and Maintenance (HD I/M) and Small Off-Road Engines (SORE) regulations were adopted by

CARB in December 2021[1,2] and are reflected in the baseline emissions as well. South Coast AQMD rules that have been adopted after the cutoff dates and have NOx and PM2.5 emission reductions by 2030 are provided in Table 3-1. While these reductions are not reflected in the baseline, the reductions are included in the attainment demonstration presented in this Plan.

TABLE 3-1
RULES ADOPTED AFTER THE CUT-OFF DATE OF THE DRAFT PM2.5 PLAN FOR NON-RECLAIM SOURCES AND NOT REFLECTED IN THE BASELINE EMISSIONS

Adoption Date	District Rule	Implementation Schedule		Net SIP Reduction by 2030* (tpd)
		Start Year	End Year	
9/1/2023	Rule 1111 – Reduction of NOx Emissions from Natural-Gas-Fired, Fan-Type Central Furnaces	2012	2050	-0.07**
5/6/2022	Rule 1147 – NOx Reductions from Miscellaneous Sources	2024	2059	0.28
8/6/2021	Rule 1147.1 - NOx Reductions from Aggregate Dryers	2025	2057	0.01
4/1/2022	Rule 1147.2 – NOx Reductions from Metal Melting and Heating Furnaces	2026	2057	0.06
2/5/2021	Rule 1150.3 – Emissions of Oxides of Nitrogen from Combustion Equipment at Landfills	2021	2031	0.04
8/4/2023	Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens	2024	2036	0.02
11/4/2022	Rule 1168 - VOC reductions from adhesive and sealant applications	2017	2028	-0.14**

*Reductions by 2030 for each rule are calculated with SIP baseline inventory and associated control factors based on rule-specific implementation schedules.

**The amendment allowed more time to comply with the rule requirements, which resulted in less reductions in 2030 than the earlier version. Negative values indicate the changes from the previous version reflected in the 2022 AQMP.

[1] Heavy-Duty Inspection and Maintenance Regulation. Information available at: https://ww2.arb.ca.gov/rulemaking/2021/hdim2021

[2] Small Off-Road Engines regulations. Information available at: https://ww2.arb.ca.gov/rulemaking/2021/sore2021

This chapter summarizes the major components of base year and future baseline inventories. More detailed information, such as growth factors, and demographic trends, are presented in Appendix I. In addition, the top source categories contributing to the 2030 emissions inventories are described in this chapter. Understanding the highest emitting source categories assists identifying potentially more effective control strategies for improving air quality in the basin.

Emission Inventory

The inventory presented here represents annual average day emissions for the base year and future milestone years. Detailed information regarding the emissions inventory development for base and future years and emissions by major source category for the base and future milestone years are presented in Appendix I. In an emissions inventory, base year is the year from which the future emissions are projected. Pollutants reported in the inventory include volatile organic compounds (VOCs), nitrogen oxides (NOx), carbon monoxide (CO), sulfur oxides (SOx), ammonia (NH3), total particulate matter (PM) and particulate matter with a diameter equal to or smaller than 2.5 microns (PM2.5). Attachments A and B to Appendix I list annual average and summer planning emissions by major source category for 2018, 2025, 2028, 2030, and 2031. Attachment C to Appendix I lists the top VOC, NOx, SOx, NH3 and PM2.5 point source facilities that emitted greater than or equal to 10 tons per year in 2018. Attachment D to Appendix I contains on-road emissions by vehicle class and pollutant. Attachment E to Appendix I shows emissions associated with diesel fuel internal combustion engines for various source categories. Attachment F to Appendix I provides a summary of road construction dust emissions in the South Coast Air Basin. Attachment G to Appendix I includes the contribution of condensable and filterable PM2.5 to total PM2.5 emissions.

Stationary Sources

Stationary sources are divided into two major subcategories: point sources and area sources. Point sources are permitted facilities with one or more emission sources at an identified location (e.g., power plants, refineries, and industrial processes factories) and subject to AER. These facilities generally have annual emissions of 4 tons or more of either VOCs, NOx, SOx, or PM, or annual emissions of over 100 tons of CO. Facilities are required to report their emissions of criteria pollutants and selected air toxics pursuant to Rule 301 to the South Coast AQMD on an annual basis, subject to audit, if any of these thresholds are exceeded. Point sources include emissions from the Regional Clean Air Incentives Market (RECLAIM) program, which mainly include fuel combustion emissions from power plants, oil and gas production, petroleum refining, and large facilities in manufacturing and industrial and service sectors. The 2018 annual reported emissions are used to update the stationary source inventory.

Area sources consist of many small emission sources (e.g., residential water heaters, architectural coatings, consumer products, and permitted sources that are smaller than the above thresholds) which are distributed across the basin and are not required to individually report their emissions. CARB and the South Coast AQMD jointly develop emission estimates for approximately 400 area source categories. Emissions from these sources are estimated using latest activity information and representative emission factors if available. Activity data are usually obtained from survey data or scientific reports, e.g., U.S. Energy Information Administration (EIA) reports for fuel consumption other than natural gas fuel, natural gas consumption data from Southern California Gas Company (SoCalGas), and solvent, sealant and architectural coatings sales reports required under the South Coast AQMD Rules 314, 1113 and 1168. Some activity data, such as population, housing, and vehicle miles travelled (VMT), as well as a large portion for area sources are from SCAG. Emission factors are based on rule compliance factors, source tests, manufacturer's product or technical specification data, default factors (mostly from AP-42, the U.S. EPA's published emission factor compilation), or weighted emission factors derived from point source facilities' annual emissions reports. Additionally, emissions over a given area may be calculated using socioeconomic data, such as population, number of households, or employment in different industry sectors.

Mobile Sources

Mobile sources consist of two subcategories: on-road sources and off-road sources. On-road vehicle emissions were calculated with CARB's EMFAC2021 model and travel activity data provided by SCAG from their adopted 2020 RTP/SCS. Off-road emissions were calculated using CARB's category-specific inventory models.

On-Road

CARB's EMFAC2021 model has undergone extensive revisions from the previous version (EMFAC2017). With EMFAC2021, CARB has completed the transition from Fortran to Python and MySQL with the aim of maximizing user-friendliness and flexibility, allowing incorporation of larger amounts of data demanded by current regulatory and planning processes. For end users, EMFAC2021 includes a new web-based platform that includes all the features of previous EMFAC databases alongside new Project Analysis and Scenario Analysis features.

The U.S. EPA approved the EMFAC2021 emissions model for SIP and conformity purposes in November 2022.[3] EMFAC2021 calculates exhaust and evaporative emission rates by vehicle type for different vehicle speeds and environmental conditions. Temperature and humidity profiles are used to produce monthly, annual, and episodic inventories. Emission rate data in EMFAC2021 is collected from various sources, such as individual vehicles in a laboratory setting, tunnel studies, and certification data. The EMFAC2021 model interface and overall design have not significantly changed as compared to EMFAC2017, however, EMFAC2021 includes more state-of-the-art information to better represent the real-world emissions from on-road sources. Major improvements include:

- New modules accounting for Plug-in Hybrid Electric Vehicles, vehicle energy consumption;

[3] https://www.federalregister.gov/documents/2022/11/15/2022-24790/official-release-of-emfac2021-motor-vehicle-emission-factor-model-for-use-in-the-state-of-california

- Emission factors for NH3;
- New methodologies for brake and tire wear and evaporative emissions;
- New data and significant methodology changes for motor vehicle emission calculations and revisions to implementation data for control measures;
- Updated emission factors and activity data for cars and trucks, including emission reductions associated with new regulations on heavy-heavy duty diesel trucks and buses. New emission factors were developed based on data from U.S. EPA's In-Use Vehicle Program, CARB's Vehicle and Truck and Bus Surveillance Programs, CARB's Portable Emissions Measurement Systems (PEMS) and Transit Bus testing, dynamometer and Portable Emission Measurement Systems Data;
- Expanded heavy-duty truck categories;
- New approaches to light-duty activity forecasting, using up-to-date modeling approaches from academic and government agencies to assess historic trends in multiple economic indicators to forecast future vehicle activity;
- Additional novel forecasting frameworks for heavy-duty VMT and light duty ZEV sales;
- Updated transit bus emission factors using additional data from CARB transit bus testing, and Integrated Bus Information Systems of West Virginia, and the Federal Transit Administration; and
- Updates to the motor vehicle fleet age, vehicle types, and vehicle population based on 2013-2019 California Department of Motor Vehicle (DMV) data, International Registration Plan (IRP) data, Truck Regulation Upload, Compliance, and Reporting System (TRUCRS) data, Port Vehicle Identification Number (VIN) data, California Highway Patrol School Bus Inspections, and National Transit Database information. Each of these changes affect emission factors for each area in California.

The updates in vehicle population, emission factors, and forecasting parameters included in EMFAC2021 affect the on-road emission estimates for both the 2018 base year and future years. The factors that have the greatest effect on emissions changes from EMFAC2017 to EMFAC2021 are the increase in in-use emission factors for some vehicle classes, the updated vehicle age distribution for medium-heavy duty trucks that estimates an older fleet mix with respect to EMFAC2017, and the update on brake wear emission factors based on updated measurements. More detailed information on the changes incorporated in EMFAC2021 can be found in EMFAC2021's technical documentation.[4] The EMFAC2021 model incorporates recently adopted regulations, such as Advanced Clean Trucks (ACT),[5] and Heavy-Duty Low NOx Omnibus Regulations.[6] EMFAC2021 does not incorporate Heavy-Duty Inspection and Maintenance (I/M) Regulation, because this regulation was approved after the development of EMFAC2021. However, the effect of Heavy Duty I/M is incorporated in this plan as an external adjustment to EMFAC2021 emissions.

---

[4] EMFAC2021 Volume III Technical Document Version 1.0.1, April 2021. Available at: https://ww2.arb.ca.gov/sites/default/files/2021-08/emfac2021_technical_documentation_april2021.pdf

[5] Advanced Clean Trucks, https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks.

[6] Heavy-Duty Low NOx Omnibus Regulations, Available at: https://ww2.arb.ca.gov/rulemaking/2020/hdomnibuslownox.

Figure 3-1 compares 2018 (top) and 2030 (bottom) on-road emissions estimates between the 2022 AQMP calculated using EMFAC2017 (blue) and the Draft PM2.5 plan calculated using EMFAC2021 (green). For year 2018, EMFAC2021 estimates notably higher VOC and NOx emissions, and lower emissions of PM2.5 than EMFAC2017. Estimates of NOx and VOC in EMFAC2021 are higher than in EMFAC2017 because newer vehicle test data show that light-duty vehicles have higher exhaust emissions, and updated DMV data for 2018 indicate that medium heavy-duty trucks are older than what was assumed in EMFAC2017. PM2.5 emissions are substantially reduced in EMFAC2021 with respect to EMFAC2017, as a result of updates on emissions and speed correction factors for brake wear obtained from newer emission testing. The differences in VOC and PM2.5 emissions are propagated through 2030, whereas NOx emissions only differ slightly between EMFAC2017 and EMFAC2021.

As shown on Figure 3-1 (bottom), both EMFAC2017 and EMFAC2021 project significantly lower emissions in the year 2030, which are attributable to the ongoing implementation of regulations and programs such as CARB's 2010 Truck and Bus rule, Advanced Clean Cars Program, Federal Phase 2 GHG Standards, Advanced Clean Truck (ACT) and Heavy-Duty (HD) Omnibus low NOx requirements. Despite growth in vehicular activities, emissions from on-road mobile sources are expected to decrease in future years. Specifically, vehicle emissions under the Draft PM2.5 plan calculated using EMFAC2021 are projected to decline from 2018 to 2030 by 49, 73, 19, and 34 percent for VOC, NOx, SOx, and PM2.5 emissions, respectively.

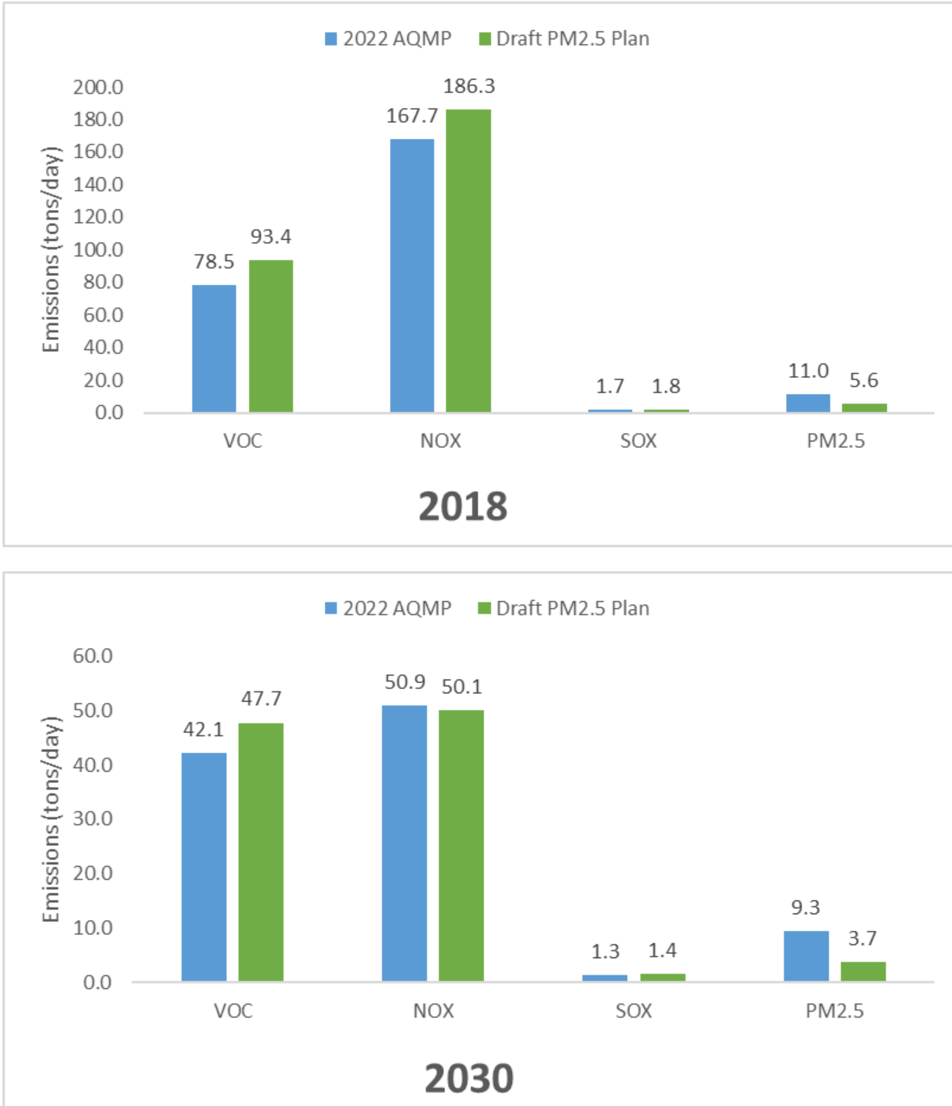

FIGURE 3-1
COMPARISON OF ON-ROAD EMISSIONS INCLUDED IN THE 2022 AQMP AND THE DRAFT PM2.5 PLAN.

Off-Road

Emissions from off-road vehicle categories are primarily based on estimated activity levels and emission factors using a suite of category-specific models or, where a new model was not available, the OFFROAD2007 model. Separate models have been developed for estimating emissions from different categories of off-road mobile sources.[7] The emissions presented here are consistent with the off-road emissions developed for the 2022 AQMP, except for a small change in construction equipment emissions.

[7] More information on the models for offroad sources can be found in the following link: https://ww3.arb.ca.gov/msei/msei.htm

After the development of the 2022 AQMP, an error was discovered in the emission allocations for in-use emissions from off-road construction equipment in Riverside County. This error only affected future year emissions and is now corrected in this Draft PM2.5 Plan. As Figure 3-2 shows emissions from off-road sources in this Draft PM2.5 Plan remain unchanged in 2018 with respect to the 2022 AQMP, whereas there is a slight increase in emissions of VOC and NOx in 2030.

FIGURE 3-2

COMPARISON OF OFF-ROAD EMISSIONS BETWEEN 2022 AQMP AND DRAFT PM2.5 PLAN

Uncertainties in the Emissions Inventory

An effective AQMP and SIP development relies on a complete and accurate emissions inventory. Methods for quantifying different emission sources continue to improve, allowing for development of more effective control measures. Increased use of continuous monitoring and source testing has contributed to improved point source inventories. Technical assistance to facilities and auditing of reported emissions have also improved the accuracy of the emissions inventory. Area source inventories that rely on average emission factors and regional activities have inherent uncertainty. Industry-specific surveys and source-specific studies during rule development have provided much-needed refinement to these emissions estimates. Emission factors for many area sources are adapted from the U.S. EPA's AP-42, but some categories have not been updated for extended periods of time, posing additional uncertainties in estimated emissions. Mobile source inventories are also continuously updated and improved. As described earlier, many improvements are included in the on-road mobile source model EMFAC2021, which estimates emissions from trucks, automobiles, and buses. Overall, the Draft PM2.5 Plan is based on the most current data and methodologies, resulting in the most accurate inventory available.

There are many challenges inherent in making accurate projections based on future growth, such as where vehicle trips will occur, the distribution between various modes of transportation (such as trucks and trains), as well as estimates for population growth and the number and type of jobs. Forecasts are made with the best information available; nevertheless, there is uncertainty in emissions projections. AQMP/SIP updates are generally developed every three to four years, thereby allowing for frequent updates and improvements to the inventories.

Gridded Emissions

The air quality modeling domain extends to southern Kern County in the north, the Arizona and Nevada borders to the east, northern Mexico to the south and more than 100 miles offshore to the west. The modeling domain is divided into a grid system comprised of 4 km by 4 km grid cells. Both stationary and mobile source emissions are allocated to individual grid cells within this system. In general, emissions are modeled as total daily emissions. Variations in temperature, hours of operation, speed of motor vehicles, or other factors are considered in developing gridded motor vehicle emissions. The "gridded" emissions data used for the PM2.5 attainment demonstration differ from the annual average day inventory emission data in several ways: (1) the modeling region covers larger geographic areas than the Basin, (2) emissions represent day-specific instead of annual average conditions, and (3) emissions are adjusted with daily meteorological conditions such as temperature and humidity.

Base Year Emissions

2018 Emission Inventory

Table 3-2 compares the annual average emissions in the Draft PM2.5 Plan, and the emissions estimated in the 2022 AQMP for all PM2.5 precursors. As described above, the major differences between the 2022 AQMP and the Draft PM2.5 Plan was caused by the switch from EMFAC2017 to EMFAC2021 for on-road sources. The error in construction equipment category did not affect the base year emissions.

Overall, base year 2018 emissions of VOC, NOx and SOx in the Draft PM2.5 Plan are higher than in the 2022 AQMP by 4 percent, 5 percent and 1 percent, respectively. Conversely, overall PM2.5 emissions in the Draft PM2.5 Plan are 9 percent lower than in the 2022 AQMP.

Table 3-3 shows the 2018 annual average emissions inventory by major source category. Stationary sources are subdivided into point sources (e.g., petroleum production and electric utilities) and area sources (e.g., architectural coatings, residential water heaters, consumer products, and permitted sources smaller than the emission reporting threshold – generally 4 tons per year). Mobile sources consist of on-road (e.g., passenger cars and heavy-duty trucks) and off-road sources (e.g., locomotives and ships).

Figure 3-3 illustrates the relative contribution of each source category to the 2018 inventory. VOC and NH3 emissions are both largely driven by area sources, though specific area sources differ for the two pollutants. For VOC emissions, over half of area sources emissions are from architectural coatings and consumer products. For NH3 emissions, humans and pets contribute to half of all area source emissions. Mobile sources, stationary point source, and stationary area source categories are the top respective contributors to NOx, SOx, and PM2.5 emissions. Overall, total mobile source emissions account for almost 45 percent of VOC emissions and 85 percent of NOx emissions. The on-road mobile category alone contributes over 23 percent and 49 percent of VOC and NOx emissions, respectively. For directly emitted PM2.5, tailpipe and non-tailpipe emissions from mobile sources represent 18 percent of total emissions with an additional 15 percent from vehicle-related entrained dust from paved and unpaved roads. Stationary sources are responsible for most of the SOx emissions in the Basin, with the point source category (larger facilities subject to AER requirements) contributing 49 percent of total SOx emissions. Non-vehicle related area sources, such as commercial cooking and residential fuel combustion are the predominant source of directly emitted PM2.5 emissions, contributing 46 percent of total emissions.

Figure 3-4 shows the fraction of the 2018 inventory by responsible agency. The U.S. EPA, CARB, and South Coast AQMD split regulatory authority over these pollutants, with the U.S. EPA and CARB primarily responsible for mobile sources. Specifically, the U.S. EPA’s authority applies to aircraft, locomotives, OGVs, military harbor craft, and other mobile categories, including California international registration plan (CAIRP) and out-of-state (OOS) medium- and heavy-duty trucks and pre-empt off-road equipment with less than 175 horsepower. CARB regulates other mobile sources, consumer products, and portions of area sources related to fuel combustion, and petroleum production and marketing. The South Coast AQMD has limited authority over mobile sources, which it exercises via fleet rules and facility-based mobile source measurements. On the other hand, it exercises authority over most area sources and all point sources.

Figure 3-4 illustrates agency responsibility as it pertains to VOC, NOx, SOx, NH3, and directly emitted PM2.5 emissions. VOC, NOx, SOx, NH3 are PM2.5 precursors, forming secondary PM2.5 once emitted into the atmosphere. NOx and VOCs are important precursors to ozone and PM2.5 formation. As shown, most NOx and VOC emissions in the Basin are from sources that fall under the primary jurisdiction of the U.S. EPA or CARB. For example, 84 percent of NOx and 74 percent of VOC emissions are from sources primarily under CARB and the U.S. EPA control. Conversely, 61 percent of SOx emissions, 76 percent of NH3 emissions and 81 percent of directly emitted PM2.5 emissions are from sources under the South Coast AQMD control. This illustrates that actions at all levels of regulatory authorities including State, and federal level are necessary to ensure that the region attains the federal ambient air quality standards.

TABLE 3-2

COMPARISON OF THE 2018 BASE YEAR EMISSIONS BETWEEN THE 2022 AQMP AND THE DRAFT PM2.5 PLAN (TONS PER DAY)

	On-Road Vehicles	Total Emissions
VOC		
2022 AQMP	78.5	387.0
Draft PM2.5 Plan	93.4	401.9
% Change	19	4
NOx		
2022 AQMP	167.7	364.7
Draft PM2.5 Plan	186.3	383.2
% Change	11	5
SOx		
2022 AQMP	1.7	14.3
Draft PM2.5 Plan	1.8	14.4
% Change	6	1
PM2.5		
2022 AQMP	11	61.5
Draft PM2.5 Plan	5.6	56.0
% Change	-49	-9
NH3		
2022 AQMP	16.3	74.5
Draft PM2.5 Plan	16.4	74.6
% Change	1	0

TABLE 3-3
SUMMARY OF EMISSIONS BY MAJOR SOURCE CATEGORY: 2018 BASE YEAR IN DRAFT PM2.5 PLAN (TONS PER DAY[1])

Source Category	PM2.5 PLAN				
	VOC	NOx	SOx	PM2.5	NH3
Fuel Combustion	5.4	21.1	2.1	5.3	7.8
Waste Disposal	14.7	1.4	0.4	0.3	5.7
Cleaning and Surface Coatings	36.9	0.0	0.0	1.4	0.1
Petroleum Production and Marketing	19.6	0.3	0.3	0.9	0.1
Industrial Processes	10.2	0.1	0.1	4.7	8.7
Misc. Processes					
Residential fuel combustion	8.9	19.1	0.3	6.8	0.1
Cooking	1.1	0.0	0.0	11.4	0.0
Paved & Unpaved Road Dust	0.0	0.0	0.0	10.3	0.0
Others	2.6	0.2	0.1	4.1	34.3
Solvent Evaporation	120.0	0.0	0.0	0.0	1.2
RECLAIM Sources		17.8	5.5		
Total Stationary Sources	**219.4**	**59.9**	**8.8**	**45.2**	**58.0**
On-Road Vehicles	93.4	186.3	1.8	5.6	16.4
Off-Road Vehicles	89.2	137.1	3.8	5.2	0.2
Total Mobile Sources	**182.6**	**323.3**	**5.6**	**10.8**	**16.5**
TOTAL	**401.9**	**383.3**	**14.4**	**56.0**	**74.6**

[1] Values may not sum due to rounding

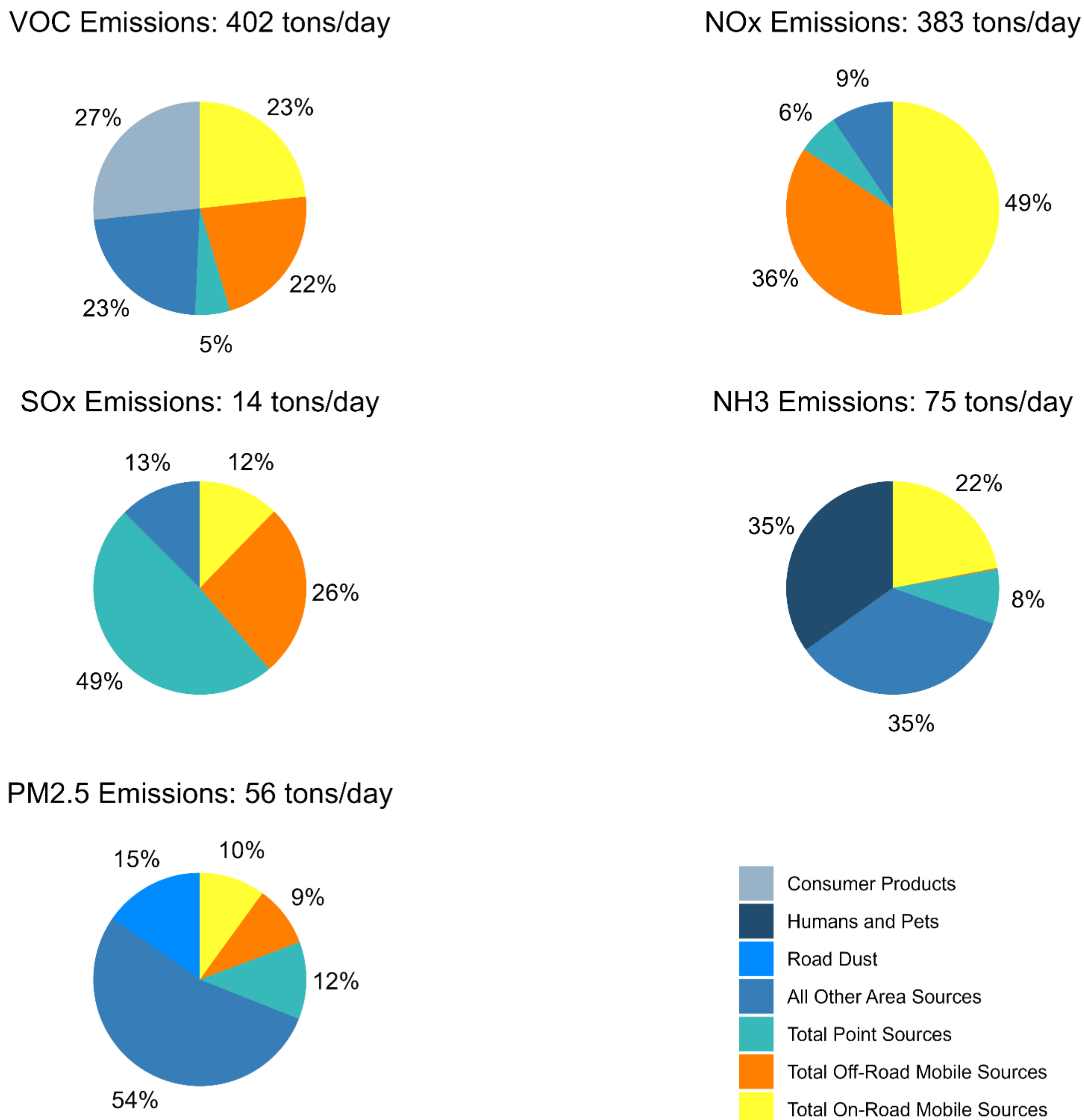

FIGURE 3-3

RELATIVE CONTRIBUTION BY MAJOR SOURCE CATEGORY TO 2018 EMISSIONS INVENTORY

(*ANNUAL AVERAGE, VALUES ARE ROUNDED AND MAY NOT SUM DUE TO ROUNDING*)

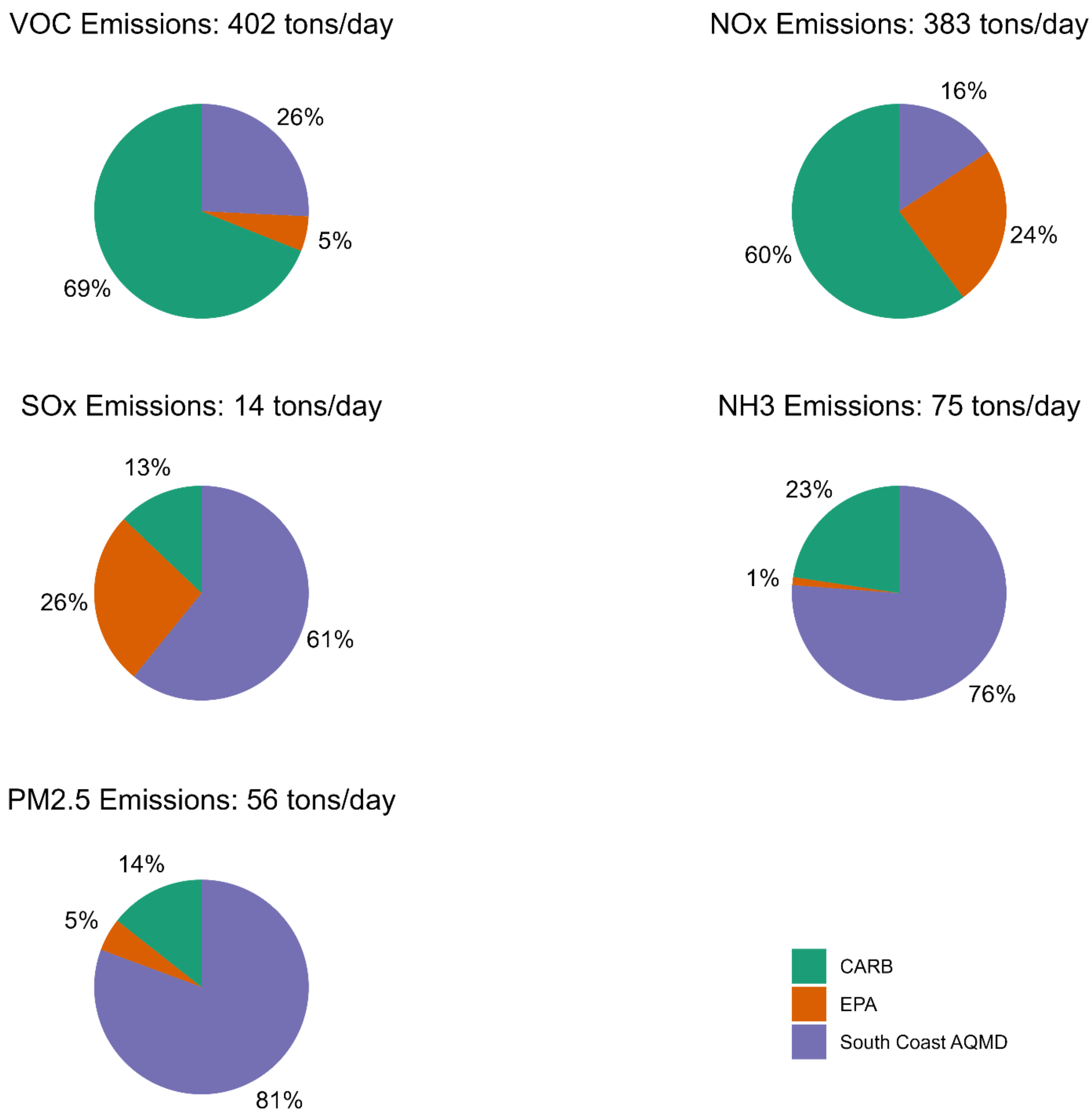

FIGURE 3-4

2018 EMISSION INVENTORY AGENCY PRIMARY RESPONSIBILITY

(*ANNUAL AVERAGE, VALUES ARE ROUNDED TO NEAREST INTEGER AND MAY NOT SUM DUE TO ROUNDING*)

Future Emissions

Inventory Development

Inventories were developed for 2018, the base year, 2030, the attainment year for the 2012 annual PM2.5 standard of 12 μg/m^3, and milestone years – 2025 and 2028– to demonstrate Reasonable Further Progress (RFP) and post attainment year, 2031. Detailed emissions inventories for all the milestone years are provided in Appendix I.

Future-year emissions were derived using: (1) emissions from the 2018 base year, (2) expected controls after implementation of the South Coast AQMD rules adopted by October 2020 and Rule 1109.1 and CARB regulations adopted by December 2021, and (3) activity growth in various source categories between the base and future years. CARB's H/D I & M was reflected in the baseline emissions as off-model adjustments as well.

Since the development of the 2022 AQMP, additional regulations pertaining to stationary sources have been implemented. These regulations affecting non-RECLAIM sources are detailed in Table 3-1, while those affecting RECLAIM sources are outlined in Table 3-4. Some regulations apply to both RECLAIM and non-RECLAIM sources, and thus, are listed in both tables. Notably, the regulations listed in Table 3-4 include those adopted prior to the October 2020 cutoff date for the 2022 AQMP. The reductions attributed to the non-shave portion of Rule 1109.1, which amount to 3.94 and 4.65 tons per day by 2030 and 2037, respectively, are already reflected in the baseline emissions (and not included in Table 3-4).

In accordance with the CMB-05 of the 2016 AQMP, multiple regulations targeting NOx emissions were enacted to transition the RECLAIM program into a traditional command-and-control regulatory framework. A portion of the emission reductions resulting from these regulations overlapped with the RECLAIM shave, reducing the allocation cap as stipulated in Rule 2002, which was adopted in December 2015. However, the 2022 AQMP did not incorporate the reductions from the landing rules, which were intended to phase out the RECLAIM program in favor of a command-and-control structure. At the time of the 2022 AQMP development, many of these rules were still in progress, and it was uncertain whether the reductions would be considered part of the RECLAIM shave. To prevent double counting, the reductions from the landing rules were assumed to be included in the RECLAIM shave in the 2022 AQMP. Subsequently, the majority of the landing rules have been adopted, and they are expected to achieve reductions exceeding the requirements of the RECLAIM shave over a longer timeframe. As of September 2023, 11 rules have been adopted, as listed in Table 3-4, and they are anticipated to reduce NOx emissions by 0.61 and 3.47 tons per day by 2022 and 2030, respectively. The 2022 reductions include only the rules adopted and implemented prior to 2022.

Given the maturity of the RECLAIM shave in 2022, any reductions in excess of the 2022 reductions are considered new reductions. Consequently, the net NOx reductions from landing rules beyond the shave are projected to be 2.86 and 3.01 tons per day by 2030 and 2037, respectively. The reductions from non-RECLAIM rules listed in Table 3-1 are 0.34 and 1.14 tons per day by 2030 and 2037, respectively. While these additional reductions are not reflected in the baseline emissions, they have been factored into the attainment and Reasonable Further Progress (RFP) demonstrations.

Furthermore, adjustments have been made to the sunset timeline for RECLAIM emissions. In the 2022 AQMP, it was assumed that 2025 and 2026 would mark the initial years without RECLAIM programs for NOx and SOx, respectively, based on the best available information at the time of plan development. However, during the development of the landing rules, the sunset timeline was revised, delaying the sunset of the NOx RECLAIM program by one year and placing the sunset of the SOx RECLAIM program on hold to accommodate operational requirements and stakeholder feedback. Consequently, for this PM2.5 plan, 2026 is considered the first year without the NOx RECLAIM program, while the SOx RECLAIM program remains in effect. To maintain transparency and consistency with emissions included in previous AQMPs and SIPs, NOx emissions from former RECLAIM sources are provided as line-item information under “former-RECLAIM” for post-RECLAIM years.

Activity growth factors for future years are the same as the ones adopted for the 2022 AQMP. Future growth projections were based on demographic growth forecasts for various socioeconomic categories (e.g., population, housing, employment by industry) developed by SCAG for their 2020 RTP/SCS. Industry growth factors for 2030 were also provided by SCAG. Table 3-5 summarizes key socioeconomic parameters used in the Draft PM2.5 Plan emissions inventory development. Appendix I provides further detail on growth surrogates for different source sectors.

TABLE 3-4

RECLAIM LANDING RULES ADOPTED IN 2017 AND AFTERWARDS BUT NOT REFLECTED IN THE BASELINE EMISSIONS OF THE DRAFT PM2.5 PLAN

Adopted/Amended Date	District Rule	Implementation Schedule		Total Reductions from RECLAIM Sources in 2030 (tpd)	2030 Reduction in excess of 2022 reductions (tpd)
		Start Year	End Year		
11/1/2019	Rule 1110.2 – Control of Emissions from Gaseous- and Liquid-fueled Engines	2020	2029	0.25	0.21
1/4/2019	Rule 1118.1 – Control of Emissions from Non-Refinery Flares	2022	2025	0.03	0.03
4/5/2019	Rule 1134 – Emissions of Oxides of Nitrogen from Stationary Gas Turbines	2024	2027	1.66	1.66
11/2/2018	Rule 1135 – Electricity Generating Facilities	2020	2025	0.30	0.18
12/7/2018	Rule 1146 & 1146.1 – Emissions of Oxides of Nitrogen from Industrial, Institutional, Commercial Boilers, Steam Generators, and Process Heaters	2019	2033	0.36	0.08
12/7/2018	Rule 1146.2 – Emissions of Oxides of Nitrogen from Large Heaters and Small Boilers and Process Heaters	2022	2023	0.002	0.002
5/6/2022	Rule 1147 – NOx Reductions from Miscellaneous Sources	2024	2059	0.40	0.40
8/6/2021	Rule 1147.1 – NOx Reductions from Aggregate Dryers	2025	2057	0.01	0.01
4/1/2022	Rule 1147.2 – NOx Reductions from Metal Melting and Heating Furnaces	2026	2057	0.49	0.36
8/4/2023	Rule 1153.1 – Emissions of Oxides of Nitrogen from Commercial Food Ovens	2024	2036	0.02	0.02
Cumulative reductions from the landing rules listed above*				3.47	2.86

* Reductions are calculated for each rule individually. Because some sources are affected by more than one rule, the compounded emission reductions are slightly lower than the sum of reductions from individual rules.

TABLE 3-5
BASELINE DEMOGRAPHIC FORECASTS FOR THE SOUTH COAST AIR BASIN EMPLOYED IN THE DRAFT PM2.5 PLAN

Category	2018	2030	% Growth from 2018 to 2030
Population (Millions)	16.7	18.0	7.9
Housing Units (Millions)	5.3	6.0	11.7
Total Employment (Millions)	7.7	8.3	7.3
Daily VMT (Millions)	388	395	1.8

Current forecasts indicate that this region will experience population growth of 7.9 percent between 2018 and 2030, with a 1.8 percent increase in VMT. Housing units show the largest change of the socioeconomic indicators with a projected 11.7 percent increase from 2018 to 2030.

Summary of Future Baseline Emissions

To illustrate trends in future baseline annual average inventories, emissions by source category and by pollutant for 2030 are presented in Table 3-6. Baseline inventories are projected future emissions that reflect already adopted regulations and programs but do not incorporate additional controls proposed in this Draft PM2.5 Plan. The 2018 base year emission inventory, which captures actual 2018 emissions, is used as the basis for future projections.

Even without any additional control measures, VOC and NOx emissions are expected to decrease due to existing South Coast AQMD and CARB regulations and programs, such as controls for on- and off-road equipment, new vehicle standards, and Rule 1109.1 for refinery emissions. For VOC and NOx, these updated regulations result in 15 and 46 percent lower emissions in 2030 than 2018. These decreases are not uniform across sources; per Figures 3-3 and 3-5, mobile source contributions to VOC emissions decline by 45 percent but area sources, including consumer products, continue to be a significant source of VOC emissions. For NOx emissions, amidst an overall decrease in emissions from 2018 to 2030, relative contributions change dramatically, where on-road contributions decrease from 49 to 24 percent while contributions from off-road sources increase from 36 to 54 percent. On-going implementation of adopted regulations contributes to the changes. For example, controls on heavy-duty vehicles are expected to reduce NOx emissions significantly but could lead to increased NH3 emissions due to ammonia slip. The contribution of on-road vehicle emissions to NH3 increases from 22% in 2018 to 27% in 2030.

Similarly, projected economic growth results in a corresponding 3 percent projected increase in SOx emissions. Stationary sources are projected to remain the predominant source of SOx, with point sources contributing almost half of total SOx emissions in 2030. However, OGVs are significant source of SOx emissions in the Basin, and growing shipping and OGV activity in future years is expected to increase SOx emissions at a faster rate than growth in point source emissions, driving the 3 percent increase. The highest-ranking source categories in the 2018 and 2030 inventories are discussed in a later section.

For directly emitted PM2.5, mobile sources account for 14 percent of total emissions in the 2030 inventory, a 4 percent decrease from the total mobile source contribution in 2018. This estimate excludes entrained paved/unpaved road dust sources, which shows a modest increase from 15 percent in the 2018 inventory to 17 percent in the 2030 inventory. Area sources excluding entrained paved/unpaved road dust sources are projected to remain the predominant source of directly emitted PM2.5, contributing 54 percent of emissions in 2018 and 57 percent in 2030. This is mainly due to the increases in population, VMT and economic activities.

Figure 3-6 shows the fraction of the 2030 inventory by responsible agency for VOC, NOx, SOx, NH3 and directly emitted PM2.5 emissions. In 2030, slightly larger fractions of NOx and VOC emissions will fall under the South Coast AQMD control (31 percent for VOC and 23 percent for NOx) due to different relative rates of emission reductions among sources controlled by the three agencies. Despite changes, the majority of VOC and NOx emissions will remain primarily under CARB and U.S. EPA jurisdiction. NOx sources under federal control, such as OGVs (33 tons per day), locomotives (18 tons per day), aircraft (24 tons per day), out-of-state and international heavy-duty trucks (4 tons per day), military portion of commercial harbor craft (1 ton per day), and pre-empted off-road equipment (4 tons per day) contribute 36 percent of total NOx emissions in the Basin in 2030, compared to 25 percent in 2018, indicating growing disparity between regulations on federal sources and sources under State and local control. VOC emissions from consumer products, which are regulated by CARB, are projected to reach 122 tons per day in 2030, representing 39 percent of total VOC emissions in the Basin. This increase in emissions, which mostly originate from the use of personal care, hygiene, and cleaning products, reflects projected population growth in the region. The fraction of SOx emissions that falls under the South Coast AQMD regulatory authority will remain largely unchanged from the 2018 base year inventory.

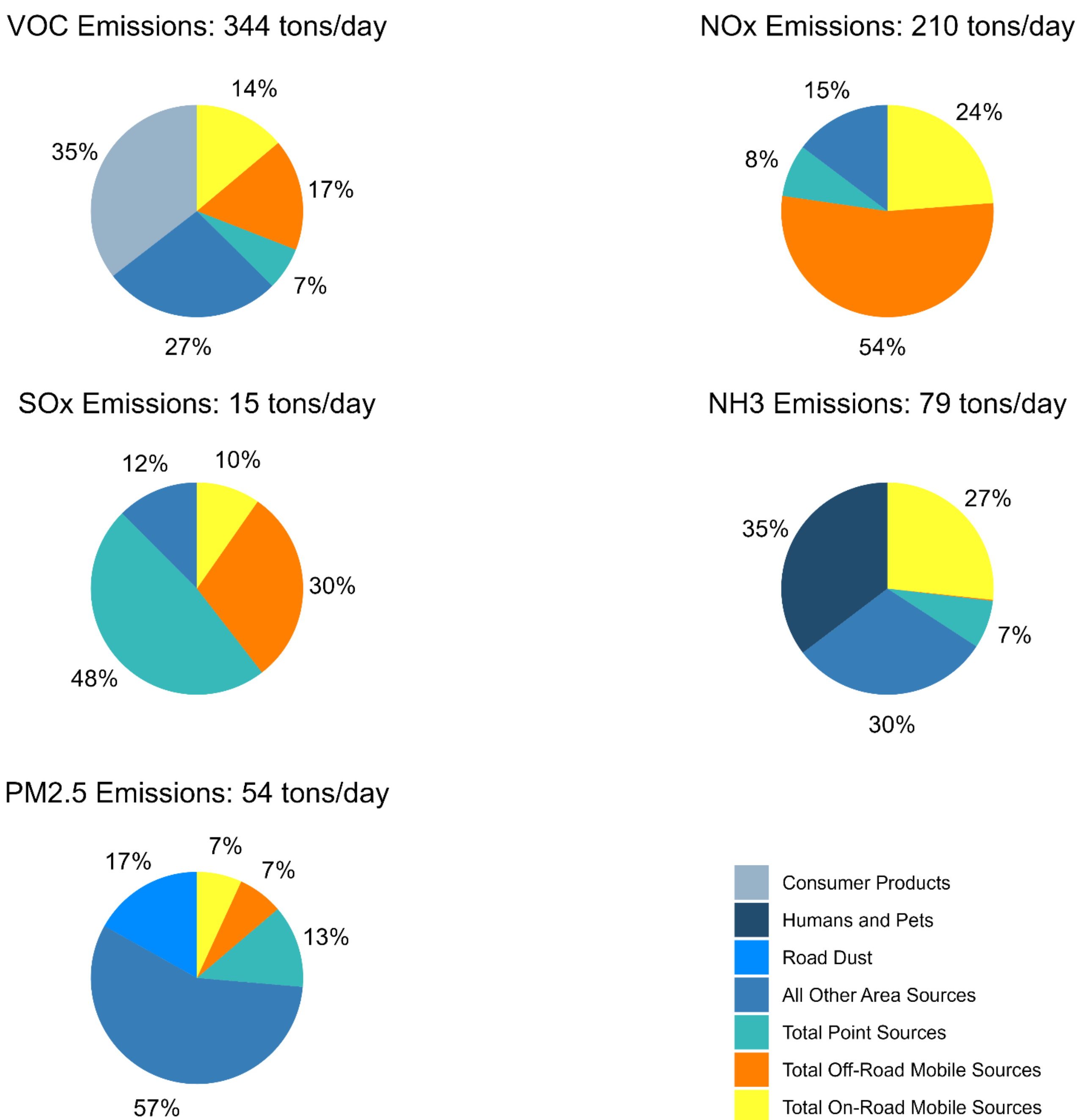

FIGURE 3-5

RELATIVE CONTRIBUTION BY SOURCE CATEGORY TO 2030 EMISSIONS INVENTORY

(ANNUAL AVERAGE, VALUES ARE ROUNDED AND MAY NOT SUM DUE TO ROUNDING)

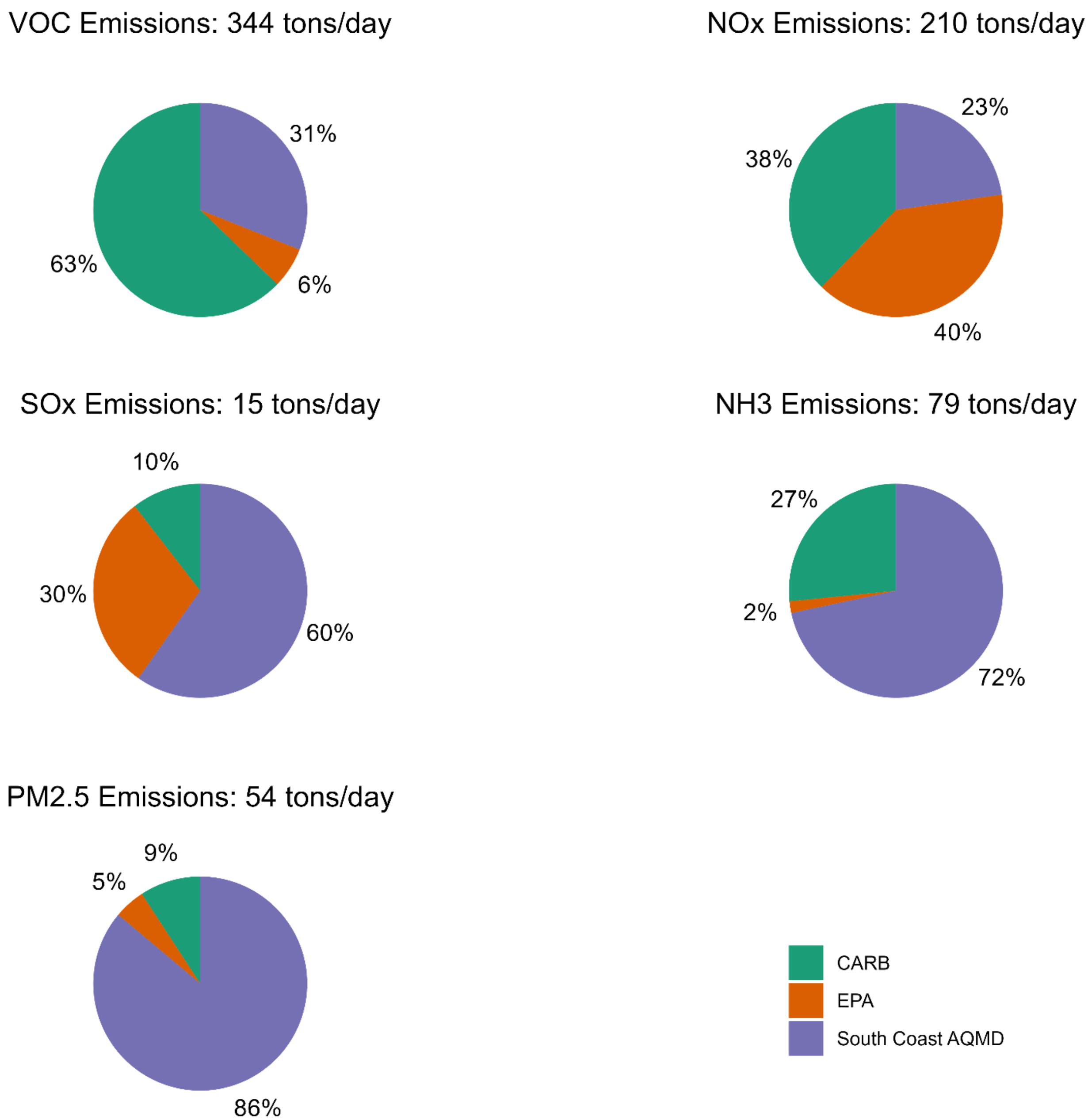

FIGURE 3-6

2030 EMISSIONS INVENTORY AGENCY RESPONSIBILITY

(*ANNUAL AVERAGE, VALUES ARE ROUNDED TO NEAREST INTEGER AND MAY NOT SUM DUE TO ROUNDING*)

TABLE 3-6
SUMMARY OF EMISSIONS BY MAJOR SOURCE CATEGORY: 2030 BASELINE
DRAFT PM2.5 PLAN (TONS PER DAY[1])

Source Category	DRAFT PM2.5 PLAN					
	VOC	NOx	CO	SOx	PM25	NH3
Fuel Combustion	5.4	29.4	75.3	6.1	5.2	7.3
Waste Disposal	15.7	1.6	0.7	0.5	0.3	6.4
Cleaning and Surface Coatings	39.2	0.0	0.1	0.0	1.6	0.2
Petroleum Production and Marketing	18.7	0.6	2.6	1.5	0.9	0.1
Industrial Processes	10.7	0.8	0.8	0.6	5.4	8.7
Misc. Processes						
Residential fuel combustion	8.9	15.2	47.4	0.3	6.6	0.1
Cooking	1.2	0.0	0.0	0.0	12.3	0.0
Paved & Unpaved Road Dust	0.0	0.0	0.0	0.0	11.6	0.0
Others	1.59	0.2	5.9	0.0	3.5	34.2
Solvent Evaporation	136.0	0.0	0.0	0.0	0.0	1.2
Total Stationary Sources	**237.4**	**47.8**	**132.7**	**9.0**	**46.6**	**58.0**
On-Road Vehicles	47.7	50.1	438.1	1.4	3.7	21.2
Off-Road Vehicles	58.6	112.6	595.7	4.4	3.7	0.1
Total Mobile Sources	**106.3**	**162.7**	**1033.8**	**5.8**	**7.4**	**21.3**
TOTAL	**343.7**	**210.4**	**1166.5**	**14.8**	**54.1**	**79.3**

[1] Values are rounded to nearest integer and may not sum due to rounding

Impact of Growth

The Draft PM2.5 Plan forecasts the 2030 emissions inventories ‘‘with growth’’ through a detailed consultation process with SCAG. The region is projected to see 8 percent growth in population, 12 percent growth in housing units, 7 percent growth in employment, and 2 percent growth in VMT between 2018 and 2030. To illustrate the impact of demographic growth on emissions, “no growth” emissions were estimated by removing the growth factors from 2030 baseline emissions. Table 3-7 presents a comparison of projected 2030 emissions with and without growth. The growth impacts to 2030 VOC, NOx, SOx, NH3 and directly emitted PM2.5 emissions are 27.5, 30.0, 1.0, 5.4, and 3.3 tons per day, respectively.

While economic growth is beneficial for the region, it presents a challenge to air quality improvement efforts as projected growth could offset the progress made in reducing VOC, NOx, SOx, and PM2.5 emissions through adopted regulations from the South Coast AQMD and CARB. Meeting the U.S. EPA’s current 2012 Annual PM2.5 standard of 12 $\mu g/m^3$ and other NAAQS will require continued emission reduction efforts with shared responsibility from all levels of government.

TABLE 3-7
GROWTH IMPACT TO 2030 EMISSIONS IN TONS PER DAY

With Growth	VOC	NOX	SOX	PM2.5	NH3
Stationary Point and Area	237.4	47.8	9.0	35.8	58.0
Road Dust	0.0	0.0	0.0	10.8	0.0
On-Road	47.7	50.1	1.4	3.7	21.2
Off-Road	58.6	112.6	4.4	3.7	0.1
Total	**343.7**	**210.4**	**14.8**	**54.1**	**79.3**
No Growth	**VOC**	**NOX**	**SOX**	**PM25**	**NH3**
Stationary Point and Area	217.6	47.4	8.8	34.0	56.1
Road Dust	0.0	0.0	0.0	10.3	0.0
On-Road	45.4	38.1	1.3	3.3	17.8
Off-Road	53.2	94.9	3.8	3.2	0.1
Total	**316.2**	**180.4**	**13.9**	**50.8**	**74.0**
Impact of Growth	**VOC**	**NOX**	**SOX**	**PM25**	**NH3**
Stationary Point and Area[1]	19.8	0.4	0.2	1.9	1.9
Road Dust	0.0	0.0	0.0	0.5	0.0
On-Road	2.3	11.9	0.2	0.4	3.4
Off-Road	5.4	17.7	0.6	0.5	0.0
Total	**27.5**	**30.0**	**1.0**	**3.3**	**5.4**

[1] Overall growth in Electric Utilities is projected as a composite factor of employment growth, efficiency improvements and renewable portfolio standards. For this analysis, the growth portion is based on employment growth alone, which is the surrogate for overall electricity demand growth. Proposed control measures promoting zero emissions technology will increase electricity demand significantly, beyond what these baseline projections suggest.

Top Ten Source Categories in 2018 and 2030

The top ten source contributors to 2018 and 2030 annual average emissions inventories for VOC, NOx, SOx, directly emitted PM2.5 and NH3 for years 2018 and 2030 are shown in Figures 3-7 to 3-14 and briefly discussed in this section.

Figures 3-7 to 3-8 provide the top ten source categories for VOC emissions in 2018 and 2030. These top ten categories account for approximately 82.8 and 81.5 percent of the total VOC inventories in 2018 and 2030, respectively. Consumer products, Light and Medium Duty Vehicles, and Off-Road Equipment are the three highest-emitting categories in both years. Emissions from Light and Medium Duty Vehicles and Off-Road Equipment decline substantially, which reflects the effect of regulations on vehicles and off-road equipment. On the other hand, emissions from Consumer Products, Coatings and Related Processes, and Architectural Coatings and Related Solvents emissions continue to rise due to increase in population and industrial activities.

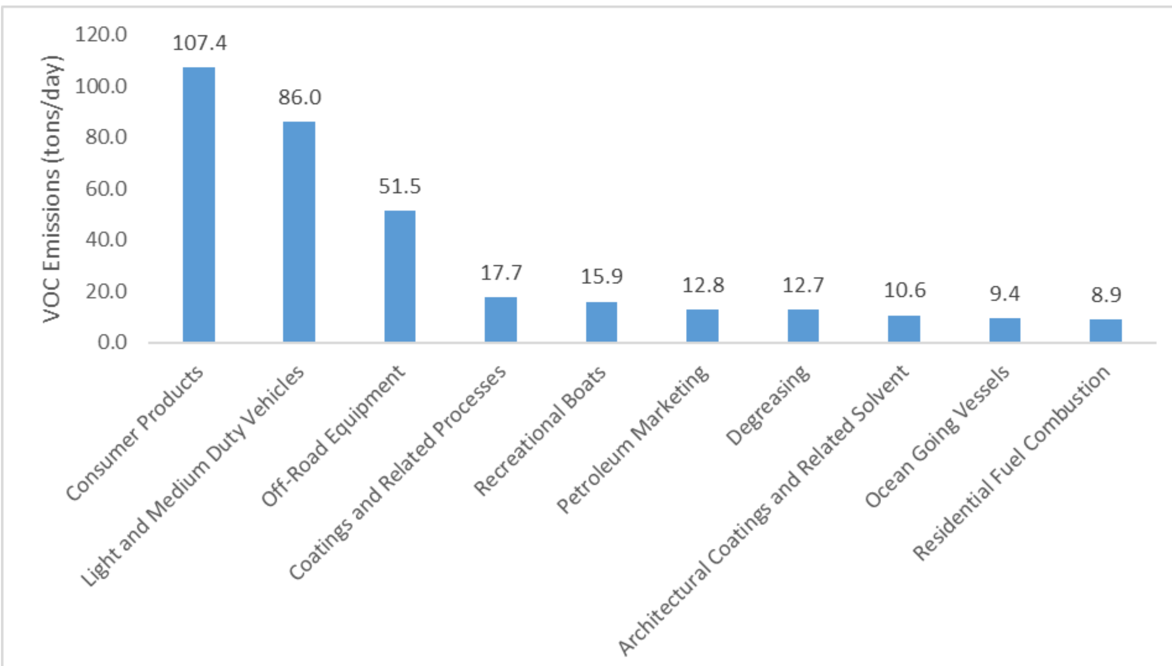

FIGURE 3-7
TOP TEN EMITTER CATEGORIES FOR VOC IN 2018
(ANNUAL AVERAGE)

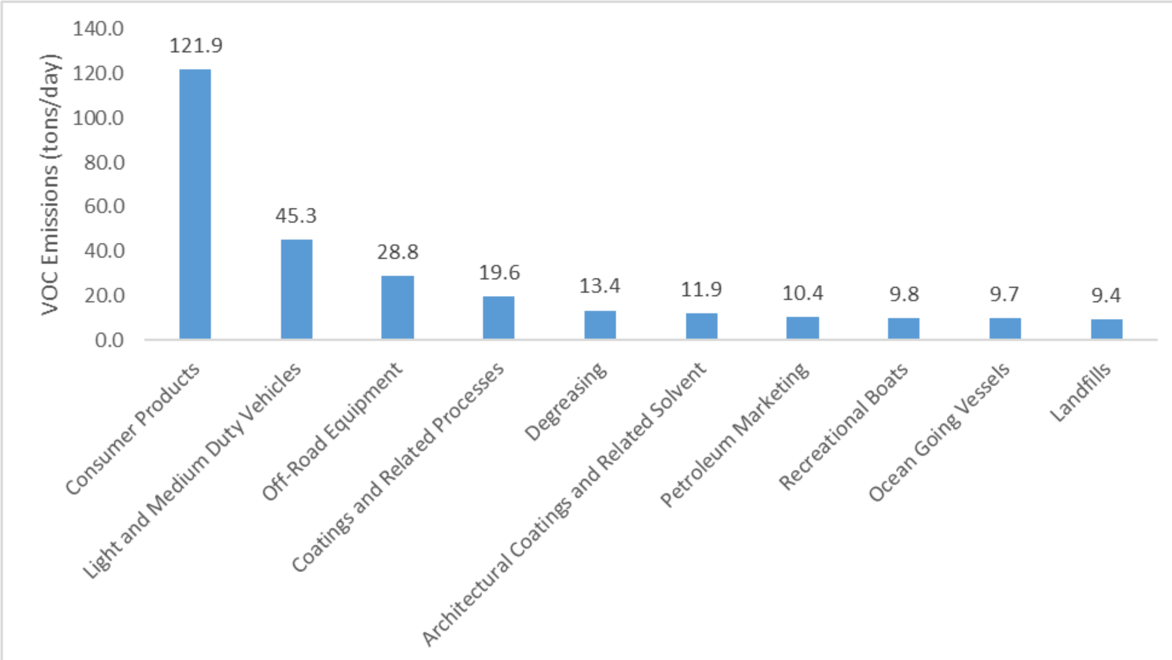

FIGURE 3-8
TOP TEN EMITTER CATEGORIES FOR VOC IN 2030
(ANNUAL AVERAGE)

Figures 3-9 to 3-10 show the top ten categories for NOx emissions in base year 2018 and future attainment year 2030. The top ten categories account for 90.8 percent of the total NOx inventory in 2018 and 89.6 percent in 2030. Mobile source categories remain the predominant contributor to NOx emissions. Heavy-Duty Trucks, Light and Medium Duty Vehicles, Off-road equipment, and OGVs are the top emitters in 2018. Heavy-Duty Trucks is the top source in 2018 but their emissions are projected to decrease substantially through 2030 because of emission regulations. Other sources that are projected to decline due to regulations include Light and Medium Duty Vehicle, Off-Road Equipment and Residential Fuel Combustion. On the contrary, emissions from OGV, Aircrafts and Trains are projected to increase through 2030 driven by increases activities in those sectors.

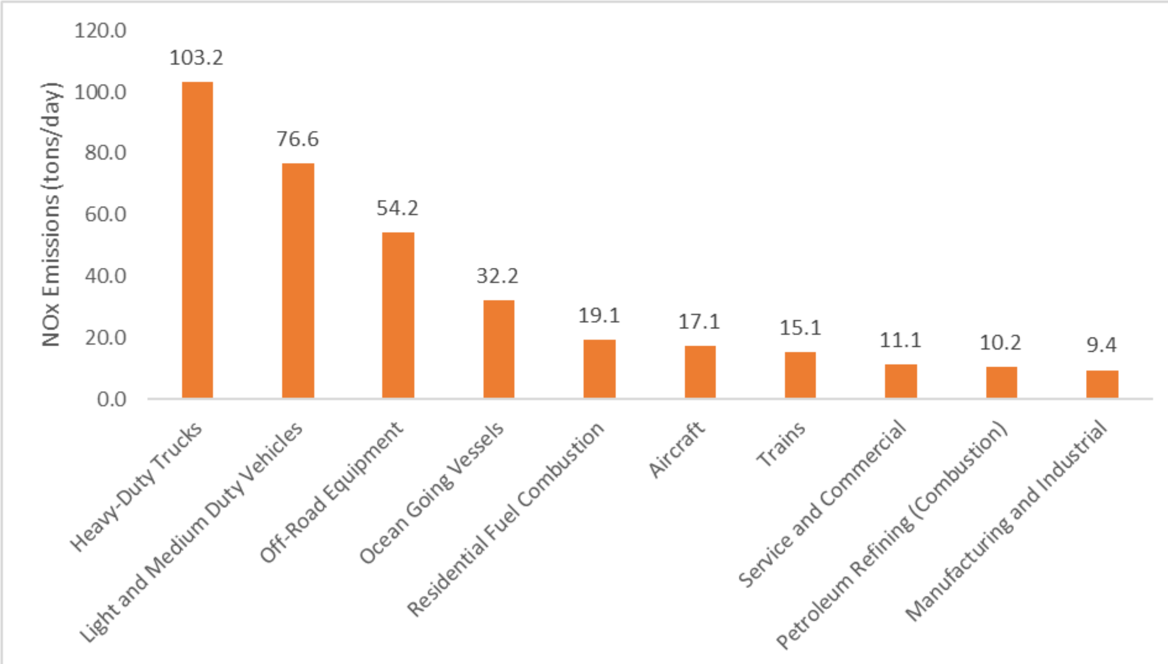

FIGURE 3-9
TOP TEN EMITTER CATEGORIES FOR NOx IN 2018
(ANNUAL AVERAGE)

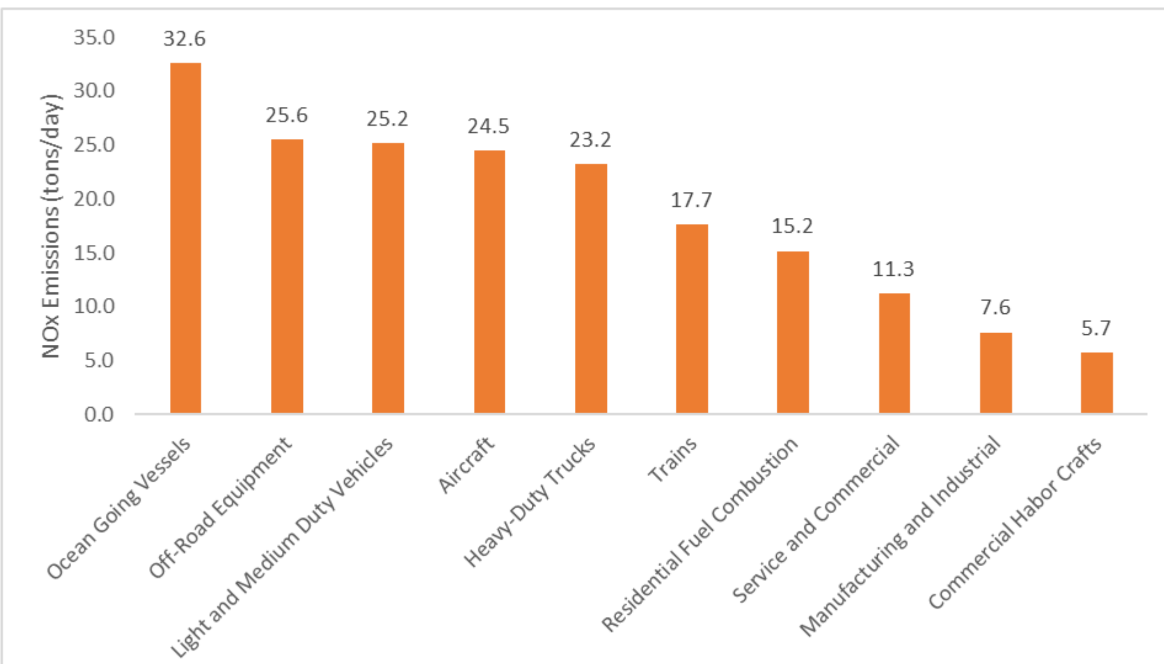

FIGURE 3-10
TOP TEN EMITTER CATEGORIES FOR NOx IN 2030
(ANNUAL AVERAGE)

Figures 3-11 to 3-12 show the top source categories for SOx emissions in 2018 and 2030. The top ten categories represent approximately 92 percent of total SOx inventory in 2018 and 2030. SOx emissions are projected to not change substantially from 2018 to 2030. Combustion in Petroleum Refining is the largest source in the Basin in both 2018 and 2030. OGV and Aircraft are the only sources that are expected to grow due to the expected increase in activity on those sectors and the limited regulations applicable to those sources. On the other hand, regulations and turnover to cleaner vehicles result in a marginal reduction in SOx from Light and Medium Duty Vehicles.

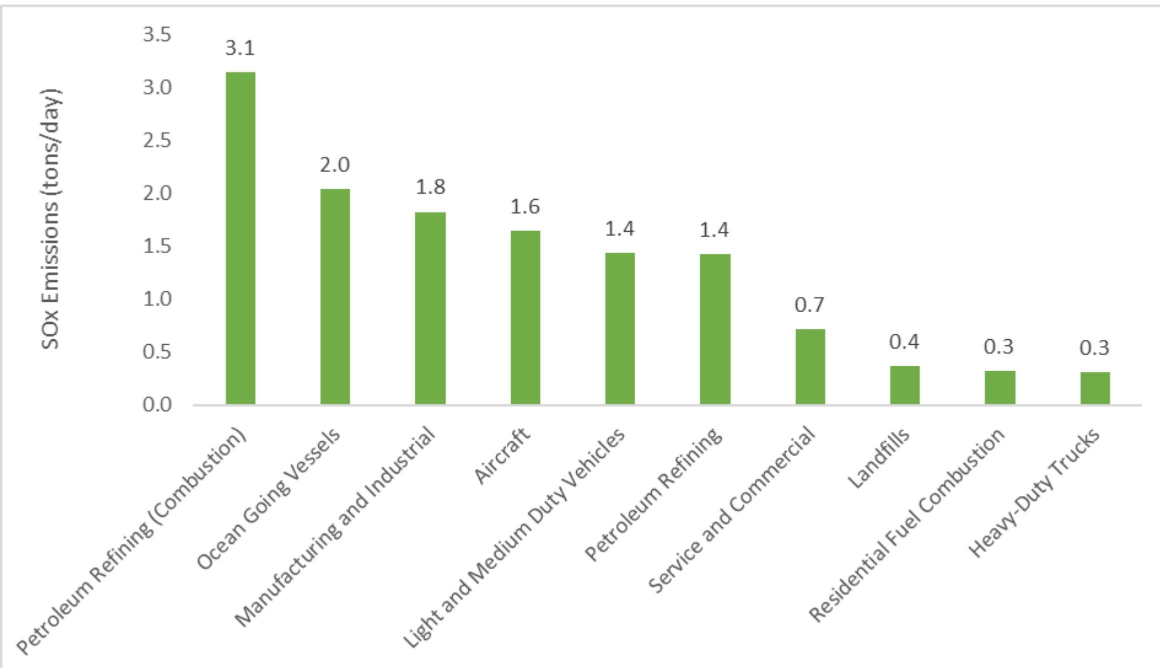

FIGURE 3-11
TOP EMITTER CATEGORIES FOR SOx IN 2018
(ANNUAL AVERAGE)

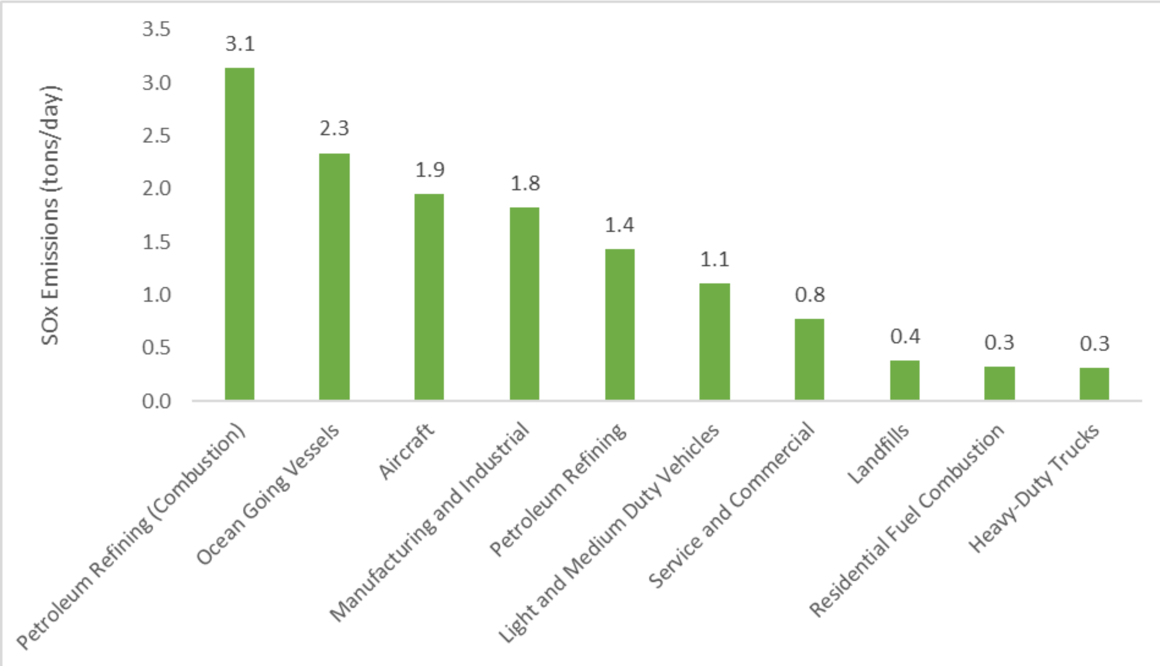

FIGURE 3-12
TOP EMITTER CATEGORIES FOR SOx IN 2030
(*ANNUAL AVERAGE)*

Figures 3-13 to 3-14 show the top ten source categories for annual average directly emitted PM2.5 in 2018 and 2030. The top 10 categories represent 76.4 percent of the total directly emitted PM2.5 inventory in 2018 and 78.6 percent in 2030. Commercial cooking, paved road dust, and residential fuel combustion are the largest contributors to total direct PM2.5 emissions. Emissions from cooking and paved road dust are projected to grow through 2030 because of the increase in population and vehicle activity. On the other hand, tailpipe emissions from vehicles are expected to decline due to vehicle emission regulations, despite the increase in vehicle miles traveled, however non-tailpipe emissions such as tire and break ware emissions are expected to grow due to increased VMT. Emissions from residential fuel combustion are also projected to decline through 2030 due to efficiency improvements and emissions regulations, despite the increase in population. Emissions from wood and paper industries, and from construction and demolition are among the top ten sources and are expected to grow through 2030 due to the projected increase in industrial activity in those sectors.

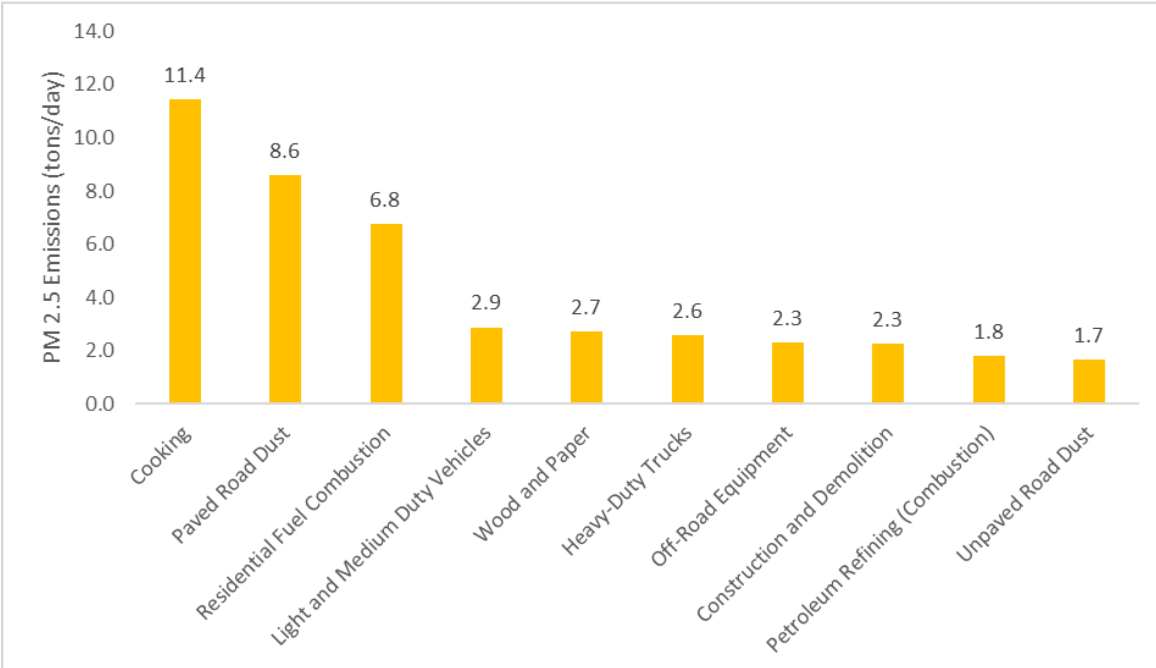

FIGURE 3-13

TOP TEN EMITTER CATEGORIES FOR DIRECTLY EMITTED PM2.5 IN 2018

(*ANNUAL AVERAGE*)

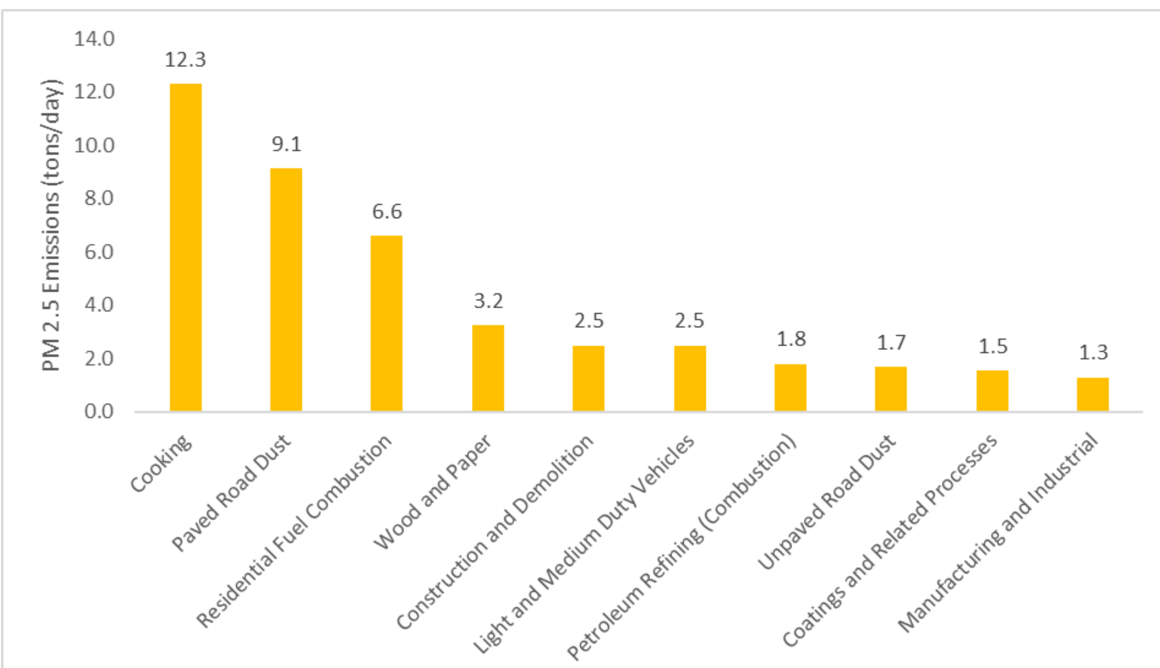

FIGURE 3-14

TOP TEN EMITTER CATEGORIES EMITTED PM2.5 IN 2030

(*ANNUAL AVERAGE*)

Figures 3-15 to 3-16 show the top ten source categories for NH3 emissions in 2018 and 2030. The largest source of ammonia is a group of miscellaneous sources that include human and pet perspiration. This source is expected to grow through 2030 as population grows in the basin. Emissions from vehicles are expected to grow through 2030 as well. Emissions of NH3 from gasoline vehicles are produced as a reaction in the catalytic converter. NH3 emitted by heavy-duty diesel trucks originates from the use of selective catalytic reactors to control NOx emissions from diesel vehicles.[8] The projected increase in vehicle activity for light-, medium- and heavy-duty vehicles leads to the increase in NH3 emissions. On the other hand, emissions from farming operations are projected to decline over the years as it is projected that some farming will gradually move away from the basin.[9]

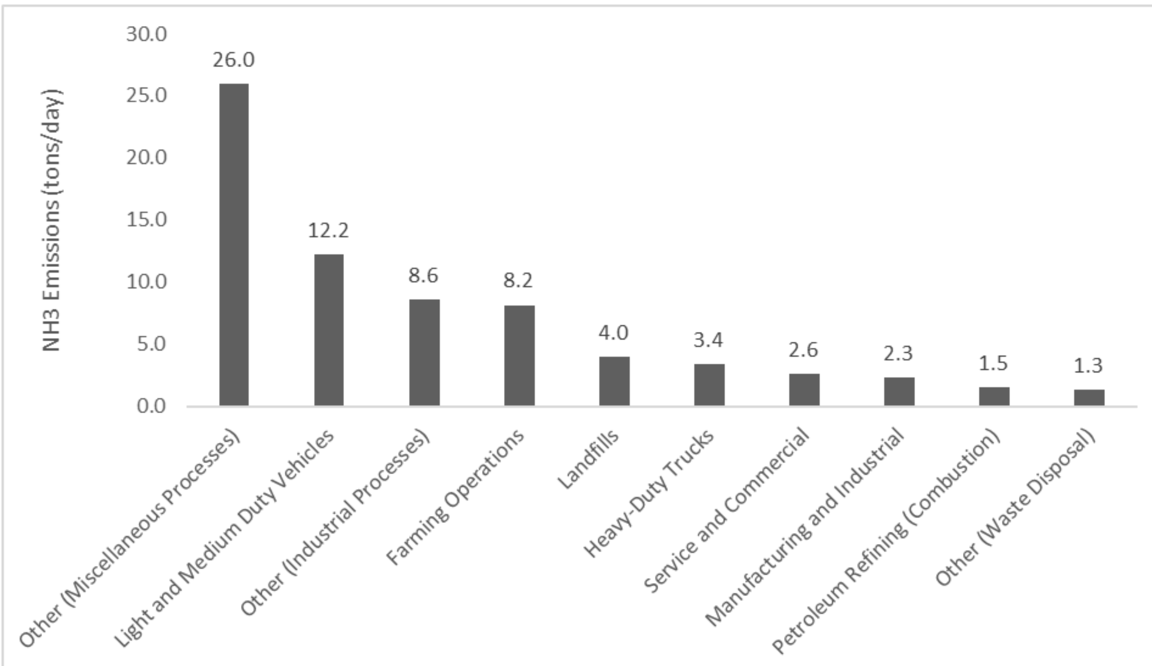

FIGURE 3-15
TOP TEN EMITTER CATEGORIES EMITTED NH3 IN 2018
(*ANNUAL AVERAGE*)

---

8 Ammonia emissions from Selective Catalytic Reaction (SCR) systems is generally referred to as *ammonia slip*. SCR technology reduces NOx emissions by converting them into harmless nitrogen and water vapor through a reaction with ammonia. However, if the SCR system injects more ammonia than required for the NOx reduction process, or if the catalyst becomes inefficient, unreacted ammonia can escape into the exhaust stream.

9 Farming operations include emissions from livestock operations, with dairy cattle being the largest source in the basin. Cattle emissions are primarily based on the 2012 Census of Agriculture. Historical trends from the Santa Ana Water Control Board show a 39% decrease in the number of cows in the basin from 2008 to 2018. Growth profiles are based on CARB’s projections of Census of Agriculture’s historical livestock population trends, 2012. Additional information on CARB’s methodology for farming operations is available at: https://ww2.arb.ca.gov/carb-miscellaneous-process-methodologies-farming-operations

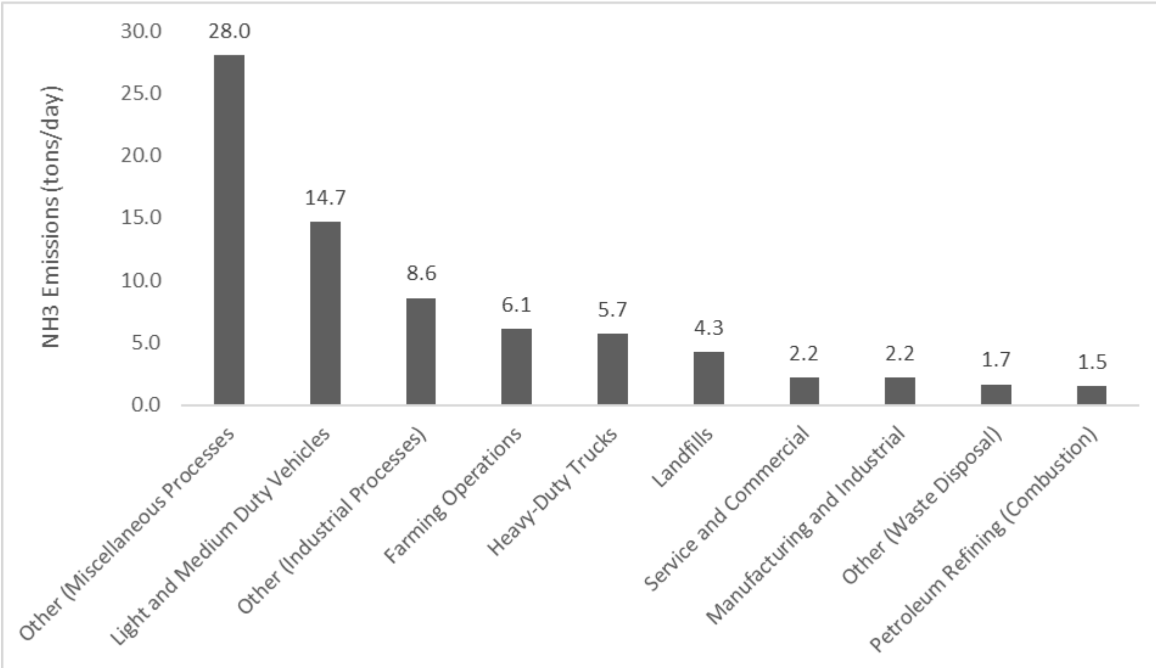

FIGURE 3-16
TOP TEN EMITTER CATEGORIES EMITTED NH3 IN 2030
(*ANNUAL AVERAGE*)

Condensable and Filterable Portions of PM2.5 Emissions

Per PM2.5 NAAQS final implementation rule,[10] the SIP emissions inventory is required to identify the condensable and filterable portions of PM2.5 separately, in addition to primary PM2.5 emissions. Primary PM emissions consist of condensable and filterable portions. Condensable PM is the material that is in vapor phase in stack conditions. Filterable PM comprises "particles that are directly emitted by a source as a solid or liquid [aerosol] at stack or release conditions." The U.S. EPA's Air Emissions Reporting Requirements (AERR) requires states to report annual emissions of filterable and condensable components of PM2.5 and PM10, "as applicable," for large sources for every inventory year and for all sources every third inventory year, beginning with 2011.[11] Subsequent emissions inventory guidance[12]

[10] 40 CFR 51.1008(a)(1)(iv).

[11] 40 CFR §51.15(a)(1) and §51.30(b)(1).

[12] USEPA. 2017. Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. Available at: https://www.epa.gov/sites/production/files/2017- 7/documents/ei_guidance_may_2017_final_rev.pdf.

from the U.S. EPA clarifies the meaning of the phrase "as applicable" by providing a list of source types "for which condensable PM is expected by the AERR."

Category specific conversion factors developed by CARB and used in the Imperial County 2018 SIP[13] were applied in the current analysis to estimate condensable PM and then filterable PM was calculated by subtracting the condensable from the total PM2.5 primary emissions. This approach is consistent with South Coast AQMD's South Coast PM2.5 Plan for 2006 PM2.5 Standard.[14] The baseline 2018, future attainment year 2030 are included in the analysis. Figure 3-17 shows the annual average emissions of primary (or direct), condensable, and filterable PM2.5 emissions for 2018 and 20230. Details on the condensable and filterable PM2.5 emissions are provided in Appendix I of this Plan.

As shown on Figure 3-17, total primary PM2.5 emissions increase between base and future years from 45.2 tons per day in 2018 to 46.6 tons per day in 2030. The increase in total primary PM2.5 appears in both condensable and filterable portions with 0.8 tons per day and 0.6 tons per day increase, respectively, between 2018 and 2030. These increases can be attributed to the growth in population and economic activities in the Basin.

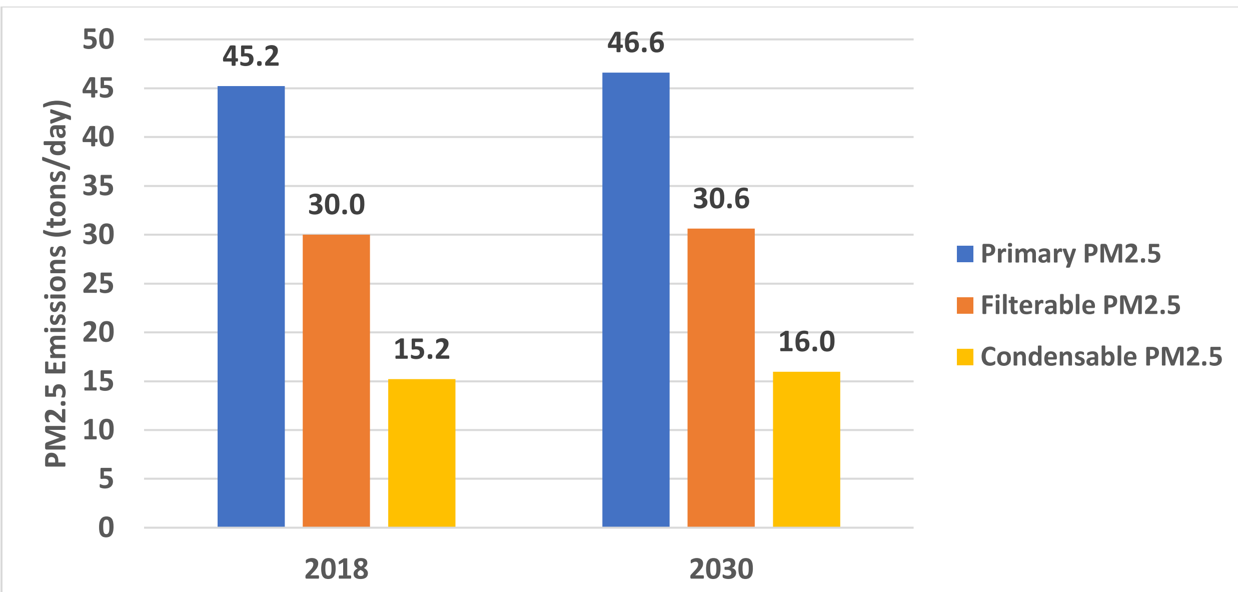

FIGURE 3-17
ANNUAL AVERAGE PRIMARY, FILTERABLE AND CONDENSABLE PM2.5 EMISSIONS FROM STATIONARY SOURCES

---

13 Imperial County 2018 Annual Particulate Matter less than 2.5 microns in Diameter State Implementation Plan, April 2018. Available at https://ww3.arb.ca.gov/planning/sip/planarea/imperial/final_2018_ic_pm25_sip.pdf.

14 Available at http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/2-final-attainment-plan-for-2006-24-hour-pm2-5-standard-for-the-south-coast-air-basin.pdf?sfvrsn=6

Table 3-8 presents the top five source categories for condensable PM2.5 in 2018 and future milestone years. The majority of condensable PM2.5 is emitted from the "Cooking" category, which accounts for 75.1 percent and 76.8 percent of the total condensable PM2.5 in 2018 and 2030, respectively. The sum of the top five condensable PM2.5 categories represents 95.7 percent and 95.9 percent of the total condensable PM2.5 both in 2018 and 2030, respectively. Table 3-9 shows the top five categories for filterable PM2.5. The "Paved Road Dust" source category is the top emitter of filterable PM2.5. The top five filterable PM2.5 emissions categories account for approximately 70.7 percent (2018) and 72.9 percent (2030) of the total filterable PM2.5 emissions. This points to a marginally higher contribution of top five filterable categories to total filterable PM2.5 emissions in future years. Detailed emissions by major source category are included in Appendix I of this Plan.

TABLE 3-8
TOP 5 CATEGORIES EMITTING CONDENSABLE PM2.5 (TONS PER DAY)

Category	2018	2030
Cooking	11.41	12.27
Petroleum Refining (Combustion)	1.00	1.00
Residential Fuel Combustion	0.79	0.77
Manufacturing and Industrial	0.75	0.72
Service and Commercial	0.61	0.57

TABLE 3-9
TOP 5 CATEGORIES EMITTING FILTERABLE PM2.5 (TONS PER DAY)

Category	2018	2030
Paved Road Dust	8.59	9.11
Residential Fuel Combustion	5.98	5.82
Wood and Paper	2.70	3.23
Construction and Demolition	2.27	2.49
Unpaved Road Dust	1.67	1.67