



Chapter 2  
GREENHOUSE GAS EMISSIONS INVENTORY,  
PROJECTIONS, AND TARGETS





This chapter summarizes the City of Escondido's ("City's") accounting of greenhouse gas ("GHG") emissions from activities within the community and provides an introduction to the primary steps in developing a Climate Action Plan ("CAP"). The climate action planning process is composed of four main steps: identifying and estimating primary sources and annual levels of GHG emissions for a baseline year (i.e. baseline inventory); estimating likely trends and emissions projections in the absence of reduction measures (i.e. projections); setting emissions reduction goals over time to reduce contributions to climate change effects locally (i.e. targets); and determining actions the City can take to reduce emissions from communitywide activities to meet the reduction targets (i.e. reduction strategies and measures).

## 2.1 Purpose of the GHG Emissions Inventory

An emissions inventory provides a snapshot of the major sources of emissions in a single year, while also providing a baseline used to project emission trends. This inventory is used to inform what local actions are needed to reduce GHG emissions and to develop reduction targets that are consistent with State mandates. The GHG emissions inventory serves as the foundation for strategies and measures outlined in this CAP that the City will implement to reduce GHG emissions to meet its targets.

Assembly Bill ("AB") 32, Senate Bill ("SB") 32, and Executive Orders B-30-15 and S-3-05 set GHG emissions reduction goals for the State by using 1990 levels as a baseline year. Due to the absence of 1990 emissions data at the city level, an inventory was prepared for a 2012 baseline year, which represents the best available data. The 2012 baseline year included in this CAP was prepared consistent with the California Air Resource Board's ("CARB's") guidance and the baseline year as the San Diego Association of Government's ("SANDAG's") Series 13 Regional Growth Forecast.

The GHG emissions inventory baseline is used to:

- Identify major sources and quantities of GHG emissions from community activities;
- Provide an emissions baseline for forecasting and determining necessary reduction targets; and,
- Set a baseline to develop, evaluate, and implement strategies to meet reduction targets.

The City's GHG inventory also provides a framework to track communitywide emissions over time, as the City will prepare updated GHG emissions inventories after the CAP is adopted. The City's previous CAP, adopted in 2013, included a 2010 baseline. The 2012 inventory provides an update to the 2010 inventory and is included in [Appendix A](#). As part of future CAP updates and as data becomes available for more recent years, the City will prepare updated emissions inventories. These updated inventories can be compared to the 2012 inventory to track the City's progress in CAP implementation.

## 2.2 GHG Inventory

A baseline inventory provides detailed accounting of the sources and quantities of GHG emissions generated from activities within the city. The inventory provides an estimate of communitywide emissions for a defined set of gases that contribute to climate change. The three primary GHGs quantified include: carbon dioxide ("CO<sub>2</sub>"), methane ("CH<sub>4</sub>"), and nitrous oxide ("N<sub>2</sub>O"). Emissions of these gases are converted to a comparable unit by multiplying each non-CO<sub>2</sub> gas by their global warming potential ("GWP"), reporting emissions in terms of carbon dioxide equivalent ("CO<sub>2</sub>e"). This conversion allows consideration of all gases in comparable terms and makes it easier to communicate how various sources and types of GHG emissions contribute to global climate change. A metric ton of CO<sub>2</sub>e ("MTCO<sub>2</sub>e") is the standard measurement of the amount of GHG emissions produced and released into the atmosphere.

## 2013 CAP GHG Inventory

The *City of Escondido Climate Action Plan*, adopted in 2013 (“2013 CAP”), included a baseline inventory using 2010 communitywide and municipal activities. The 2010 inventory built on and reflected changes in methodology from a 2005 inventory, prepared prior to development of the 2013 CAP. The 2013 CAP set a target to reduce emissions to 15 percent below 2005 levels by 2020, to be consistent with the previous emissions inventory preparation and State requirements at the time.

This CAP provides an update to the previous GHG emissions inventories. The previous inventory prepared was for baseline year 2010. This CAP includes a baseline inventory for 2012, based on the most up-to-date inventory methodology.

The 2010 baseline inventory in the 2013 CAP estimated citywide emissions in six categories: transportation (i.e. on-road vehicles); energy (i.e. electricity consumption and natural gas combustion); area sources (i.e. landscaping and wood burning); water (i.e. potable water conveyance and wastewater treatment); waste management (i.e. transfer of solid waste and decomposition at landfills); and construction. This baseline inventory was used to project future citywide emissions in 2020, the year for which the City’s reduction target was set, and 2035, representing the buildout year of the City’s General Plan. The GHG reduction measures identified in the 2013 CAP were estimated to reduce citywide GHG emissions by approximately 207,000 MTCO<sub>2</sub>e in 2030, to 15 percent below 2005 emissions.

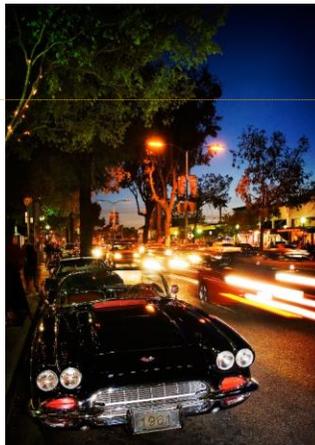
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## 2020 CAP GHG Inventory

As described in the 2013 CAP, the City is committed to updating its GHG emissions inventory periodically to reflect changes in methodology and technology, and to set additional reduction targets based on updated State requirements. A 2012 baseline GHG emissions inventory was prepared for this CAP, for which the best available regionwide data was available.

The 2012 GHG inventory updates the emissions categories identified in the 2013 CAP to be consistent with SANDAG’s Regional Climate Action Planning Framework (“ReCAP”) and State guidance. The emissions categories identified in this CAP are: on-road transportation, electricity, natural gas, off-road transportation, solid waste, and water and wastewater. **Table 2-1** provides a description of emissions associated with each category (organized in order of total contribution to citywide GHG emissions) and the relationship between the categories identified in this CAP and categories defined in the 2013 CAP.



Source: City of Escondido

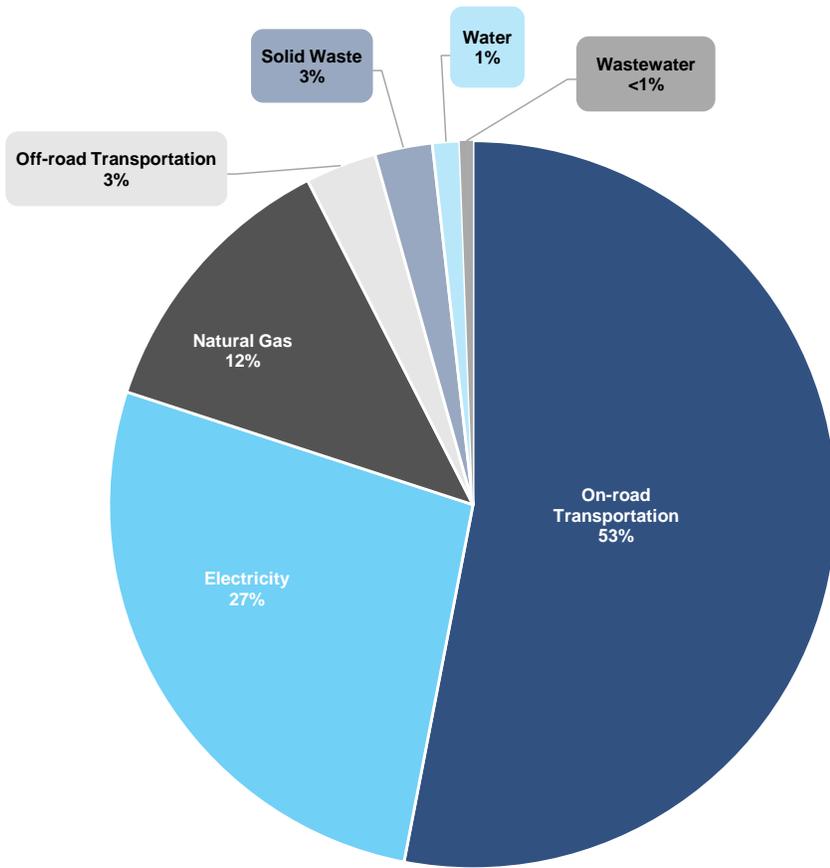
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| <b>Emissions Category</b> | <b>Description</b>   | <b>Relation to 2013 CAP Emissions Categories</b>  |
|---------------------------|--|---|
| On-Road Transportation    | On-road transportation emissions associated with gasoline and diesel consumption from motor vehicles on local and regional roadways.   | On-road vehicles account for all emissions in the 2013 CAP "Transportation" category.                                 |
| Electricity               | Building energy use emissions associated with electricity use in residential and non-residential buildings.  | Electricity was included as a subcategory of "Energy" emissions.  |
| Natural Gas               | Building energy use emissions associated with combustion of natural gas in residential and non-residential buildings.  | Natural gas was included as a subcategory of "Energy" emissions.  |
| Solid Waste               | Waste emissions associated with waste generated by residents and businesses of the city and disposal of mixed and organic waste in landfills.                                | No change from the "Solid Waste" category.  |
| Off-Road Transportation   | Off-road transportation emissions associated with gasoline and diesel fuel use from recreational vehicles, construction equipment, and residential and commercial equipment. | "Construction" emissions, a separate category in the 2013 CAP, are included in this off-road transportation category. |
| Water                     | Emissions associated with the water supplied, conveyed, treated, and distributed to residents and businesses within the city.  | Water was included as a subcategory of "Water and Wastewater" emissions.  |
| Wastewater                | Wastewater treatment fugitive and process emissions consisting of GHGs from combustion of anaerobic digester gas and operational fossil fuels.                               | Wastewater was included as a subcategory of "Water and Wastewater" emissions.   |

Notes: City = City of Escondido; GHG = Greenhouse Gas  
Source: EPIC 2018

The 2012 GHG inventory, prepared by the University of San Diego's Energy Policy Initiatives Center ("EPIC"), estimated that community activities within the City generated approximately 943,000 MTCO<sub>2</sub>e in 2012. Emissions from on-road transportation account for the greatest contribution to citywide emissions. This category, which includes emissions from vehicular gasoline and diesel consumption, was calculated based on estimated vehicle miles traveled ("VMT") for vehicles traveling within and to/from the city and accounted for approximately 53 percent of citywide emissions in 2012. Electricity and natural gas emissions, collectively referred to as the "energy" category, are the second largest contributors with 27 and 12 percent of total emissions in 2012, respectively. Emissions from off-road transportation, solid waste, water, and wastewater each accounted for no greater than three percent of the city's 2012 baseline emissions. The City's 2012 baseline emissions by category are shown in **Figure 2-1**.

Citywide activities in 2012 generated approximately 943,000 MTCO<sub>2</sub>e. This is equal the weight of nearly 350 million rainbow trout caught at Dixon Lake.



Source: EPIC 2018.

**Figure 2-1 City of Escondido 2012 GHG Emissions**

Additional details related to the specific emission categories, data sources, assumptions, and methodologies can be found in [Appendix A](#). A summary of the City's estimated emissions in 2012 by category is provided in [Table 2-2](#).

**Table 2-2 2012 City of Escondido Greenhouse Gas Inventory**

| Emissions Category      | MTCO <sub>2</sub> e | Percent (%) |
|-------------------------|---------------------|-------------|
| On-road Transportation  | 498,000             | 53          |
| Electricity             | 256,000             | 27          |
| Natural Gas             | 118,000             | 12          |
| Off-road Transportation | 30,000              | 3           |
| Solid Waste             | 24,000              | 3           |
| Water                   | 11,000              | 1           |
| Wastewater              | 6,000               | <1          |
| <b>Total</b>            | <b>943,000</b>      | <b>100</b>  |

Notes: Columns may not add to totals due to rounding.  
MTCO<sub>2</sub>e = metric tons of carbon dioxide equivalent  
Source: EPIC 2018.

The City's emissions in 2012, 943,000 MTCO<sub>2</sub>e, are equivalent to combusting over 106 million gallons of gasoline, or the total combustion from 200,000 passenger vehicles driving continuously for one year. It would require approximately 1.2 million acres of U.S. forests to sequester the MTCO<sub>2</sub>e emitted in the city in one year (U.S. EPA 2020).

### 2.3 Emissions Projections

GHG emissions projections provide an estimate of future levels based on a continuation of current trends in activity, while also accounting for known regulatory actions by federal and State agencies (i.e., "legislative" actions) that can reduce emissions in the future. GHG emissions projections provide insights into the scale of local reductions needed to achieve GHG emission reduction targets.

This CAP uses two projections, referred to as the "business-as-usual" ("BAU") and Legislatively-Adjusted BAU scenarios. Both the BAU and Legislatively-Adjusted BAU assume that population, employment, and transportation activity will grow over time, consistent with estimates in the SANDAG Regional Growth Forecast. The BAU projection is based on a continuation of current trends in activity, assuming that no additional efforts or legislative actions beyond what have already been adopted will be made to reduce GHG emissions in the future.



Source: City of Escondido

Legislatively-Adjusted BAU projections provide a reduction from BAU projections, accounting for federal and State actions that are expected to take place in the future.

Details on how the projections were developed and the activity data used to forecast emissions in each emissions category can be found in [Appendices A and B](#).

## Demographic Trends

GHG emission projections were estimated for 2020, 2030, and 2035 using city-specific demographic and transportation activity projections. The SANDAG Series 13 Regional Growth Forecast was used to estimate transportation activity in the City in the form of VMT. At the time of developing and estimating emissions forecasts, the SANDAG Series 13 Regional Growth Forecast represents the best population, employment, and VMT forecasts available at the city-level, based on 2012 baseline data.

In general, the City is anticipated to experience modest growth by 2020, 2030, and 2035. Based on the data used by EPIC, the City's population is expected to increase by 13 percent by 2020, 17 percent by 2030, and 18 percent by 2035, compared to the 2012 baseline levels. Furthermore, employment is expected to increase by 9 percent by 2020, 14 percent by 2030, and 18 percent by 2035 from 2012 levels. The BAU emissions projections assume activities within the city would continue producing GHG emissions at a similar rate and that these projected demographic trends would continue. Further details on the underlying data used for emissions projections can be found in [Appendix A](#).



Source: City of Escondido

Commented [LH4]: Did it increase by 13%?

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Commented [LH6]: And employment by 9%?

## Business-as-Usual Projections

Comprehensive GHG emissions projections are developed under a BAU scenario, which assumes the continuation of conventional behaviors without the inclusion of any additional efforts or legislative actions beyond what has already been adopted at the time of the baseline year (i.e., 2012). Therefore, federal, State, and local policies, programs, and regulations designed to take effect in future years, as well as the associated GHG reductions, are not considered.

Citywide GHG emissions projections in 2020 indicate that the City has an overall reduction in annual GHG emissions since 2012, as shown in [Table 2-3](#). This observed decrease in BAU emissions is likely due to a combination of State and local actions that result in fewer emissions, including use of improved statewide renewable energy portfolios, decreased residential and commercial water usage, improved vehicle standards and turnover of vehicle fleets, and implementation of the 2013 CAP. The City's GHG emissions would slowly increase under BAU conditions from 2020 until 2035, as a result of growth in population and employment.

Business-as-usual projections assume City operations, residents, and businesses would continue operating and acting as they do today. These projections do not account for any changes in existing activities that would reduce GHG emissions.

## Legislatively-Adjusted Reductions

The Legislatively-Adjusted BAU scenario accounts for a variety of approved legislative actions that will further reduce BAU emissions from the City by: 1) estimating the impacts of these actions on the various GHG emissions categories in the CAP; and 2) adjusting emissions levels accordingly. While these projections include federal and State actions, they do not include local government actions, such as the implementation of measures identified in this CAP. The legislative actions applied to estimate this scenario include:



Source: City of Escondido

- **Federal and State Vehicle Efficiency Standards:** Federal and State agencies have set tailpipe emissions standards through 2025 (in place at the time emissions projections were prepared in 2018), including the California Zero Emissions Vehicle Program.<sup>1</sup>
- **California Renewables Portfolio Standards:** Utilities operating in California are required to meet power mix targets to include increasing percentages of renewable energy. As required by the State’s Renewables Portfolio Standard (“RPS”), San Diego Gas & Electric’s (“SDG&E’s”) power mix would include at least 60 percent renewables by 2030.
- **California Energy Efficiency Programs:** The California Public Utilities Commission (“CPUC”) sets energy efficiency targets for utilities companies in the state, including SDG&E. Utilities achieve these targets through, but are not limited to, rebate programs and updates to codes and standards.
- **California Solar Policies and Programs:** The State has several policies and programs to encourage customer-owned, behind-the-meter photovoltaics (“PV”), including the California Solar Initiative, New Solar Home Partnership, Net Energy Metering, and updated Building Efficiency Standards.

The Legislatively-Adjusted BAU emissions, presented in **Table 2-3**, include all legislative actions provided above. With the application of these legislative actions in the city, the projected citywide emissions would continue to decrease through 2035. Based on these projections, the City’s emissions would be 16 percent below 2012 levels in 2020, 36 percent below 2012 levels in 2030, and 39 percent below 2012 levels in 2035.

Legislative actions account for federal and State regulations that will primarily result in GHG reductions in the transportation and energy sectors.

**Commented [LH7]:** This will depend on the implementation of certain rules such as SB 743. How as the city factored in those requirements? The method the County is using is unlikely to be able to be relied on to reduce VMT. The city should commit to implementing SB 743 per the OPR direction.

<sup>1</sup> In November 2019, the U.S. EPA issued the final rule for Part 1 of the Safer Affordable Fuel-Efficient Vehicle Rule (“SAFE Rule”). Part 2 of the SAFE Rule was finalized in March 2020 and sets revised federal Corporate Average Fuel Efficiency standards to replace California’s Advanced Clean Cars program. During the preparation of this CAP, these new standards have not taken effect.

**Table 2-3 City of Escondido Emissions Projections (MTCO<sub>2</sub>e)**

| Emissions Category       | 2012           | 2020           |                            | 2030           |                            | 2035           |                            |
|--------------------------|----------------|----------------|----------------------------|----------------|----------------------------|----------------|----------------------------|
|                          |                | BAU            | Legislatively-Adjusted BAU | BAU            | Legislatively-Adjusted BAU | BAU            | Legislatively-Adjusted BAU |
| On-road Transportation   | 498,000        | 445,000        | 430,000                    | 425,000        | 337,000                    | 427,000        | 323,000                    |
| Electricity              | 256,000        | 187,000        | 163,000                    | 196,000        | 61,000                     | 199,000        | 42,000                     |
| Natural Gas              | 118,000        | 126,000        | 123,000                    | 131,000        | 129,000                    | 133,000        | 131,000                    |
| Off-road Transportation  | 24,000         | 26,000         | 26,000                     | 32,000         | 32,000                     | 33,000         | 33,000                     |
| Solid Waste              | 30,000         | 30,000         | 30,000                     | 31,000         | 31,000                     | 31,000         | 31,000                     |
| Water                    | 11,000         | 11,000         | 11,000                     | 12,000         | 11,000                     | 12,000         | 12,000                     |
| Wastewater               | 6,000          | 6,000          | 6,000                      | 6,000          | 6,000                      | 6,000          | 6,000                      |
| <b>Total</b>             | <b>943,000</b> | <b>831,000</b> | <b>789,000</b>             | <b>833,000</b> | <b>608,000</b>             | <b>841,000</b> | <b>578,000</b>             |
| Percent change from 2012 | -              | -12%           | -16%                       | -12%           | -36%                       | -11%           | -39%                       |

Notes: Columns may not add to totals due to rounding.  
 BAU = business as usual; GHG = greenhouse gas emissions; MTCO<sub>2</sub>e = metric tons of carbon dioxide equivalent  
 Source: EPIC 2018, EPIC 2020.

**Commented [LH8]:** Hard to believe that BAU will result in reductions. Also, if Legislative BAU will already reduce emission by 16% and the goal of the plan is only 4% reduction, does that mean that there are 12% of reductions happening even if the city does nothing? The 2030 goal, set at 42%, then, really is only 6% more reduction and the 2035 goal will only represent 13% reductions by the city. Am I understanding that correctly?

In August 2019, the U.S. Environmental Protection Agency (“EPA”) and National Highway Traffic Safety Administration (“NHTSA”) jointly published a notice of proposed rulemaking for Part One of the Safer Affordable Fuel-Efficient Vehicle Rule (“SAFE Rule”). The SAFE Rule proposed new and amended CO<sub>2</sub>, Corporate Average Fuel Economy (“CAFE”), and GHG emissions standards for passenger cars and light trucks. Further, Part One of this rule proposed to withdraw the State of California’s waiver, afforded under the Clean Air Act (“CAA”) to set GHG and zero-emission vehicle (“ZEV”) standards separate from the federal government. Part One of the SAFE Rule became effective in November 2019. CARB has provided adjustment factors for pollutants, including NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>, and CO, from light-duty vehicle exhaust to account for Part One of the SAFE Rule. However, corresponding adjustment factors for GHG emissions are not available at this time. In March 2020, EPA and NHTSA announced Part Two of the SAFE Rule, which would set amended fuel economy and CO<sub>2</sub> standards for passenger cars and light trucks for model years 2021-2026. Part Two would become effective 60 days after publication in the Federal Register. The impact of Parts One and Two of the SAFE Rule on GHG emissions factors in California has not been quantified by CARB in the Emissions Factor model (“EMFAC”) or related modeling tools. These modeling tools would need to be amended, or corresponding adjustment factors published, to quantitatively assess the impact on City GHG emissions. Therefore, the quantitative methodology used to project Legislatively-Adjusted BAU emissions in this CAP does not include the impact of the SAFE Rule. At the time of this writing, the methodology represents current guidance and best available data from CARB. As more information becomes available from regulatory agencies, the City will continue to monitor the impact of the SAFE Rule, as discussed further in [Chapter 4](#).

## 2.4 Reduction Targets

This CAP focuses on reducing emissions by 2020 and 2030 to be consistent with the legislative State targets, and reducing emissions by 2035 to demonstrate the recommended trajectory to meet the State’s 2050 goal. CARB’s *California’s 2017 Climate Change Scoping Plan* (“2017 Scoping Plan”) provides a pathway to achieving State targets as directed in AB 32, SB 32, and Executive Orders B-30-15 and S-3-

05. These targets are consistent with prevailing climate science and the state's role in stabilizing global warming below dangerous thresholds. These goals aim to reduce statewide emissions to:

- 1990 levels by 2020;
- 40 percent below 1990 levels by 2030; and
- 80 percent below 1990 levels by 2050.

To determine an equivalent reduction target at the local level, the 2017 Scoping Plan recommends communitywide GHG reduction goals for local climate action plans that will help the State achieve its 2030 target and 2050 goal (80 percent below 1990 levels). CARB recommends that local governments evaluate and adopt robust and quantitative locally-appropriate goals that align with the State's sustainable development objectives. Estimating equivalent reductions needed from the 2012 GHG inventory, the City will aim to reduce emissions to:

- 4 percent below 2012 levels by 2020;
- 42 percent below 2012 levels by 2030; and
- 52 percent below 2012 levels by 2035.

The City's 2020 goal to reduce emissions to four percent below 2012 levels is equivalent to 907,000 MTCO<sub>2e</sub> per year. As shown previously in [Table 2-3](#), the City's projected BAU emissions in 2020 would be below this target level. Achievement of this target is largely the result of existing State measures and the City's implementation of the 2013 CAP.

To meet reduction targets, the City will need to reduce emissions to:

- 907,000 MTCO<sub>2e</sub> in 2020
- 547,000 MTCO<sub>2e</sub> in 2030
- 456,000 MTCO<sub>2e</sub> in 2035.

The City's 2030 target is based on State requirements and requires emissions to be reduced to 547,000 MTCO<sub>2e</sub> in 2030. The City has set its 2035 target based upon the trajectory necessary to meet the statewide 2050 goal and requires citywide emissions to be reduced to 456,000 MTCO<sub>2e</sub> in 2035. A summary of the method used to develop these targets is provided in [Appendix B](#).

## 2.5 Local Emissions Gap

While existing activities would be adequate to meet the City's 2020 target, these activities, along with federal and State legislative actions, would not meet the City's 2030 and 2035 GHG reduction targets. As shown in [Figure 2-2](#), with the Legislatively-Adjusted BAU, the City's 2030 emissions under were estimated to be 608,000 MTCO<sub>2e</sub>, or approximately 61,000 MTCO<sub>2e</sub> higher than the City's 2030 target. The City's 2035 emissions under the Legislatively-Adjusted BAU were estimated to be 578,000 MTCO<sub>2e</sub>, or approximately 122,000 MTCO<sub>2e</sub> higher than the City's 2035 target. This additional reduction is referred to as the "local emissions gap." To close this gap, the City would need to implement actions that would reduce approximately 61,000 MTCO<sub>2e</sub> in 2030 and 122,000 MTCO<sub>2e</sub> in 2035. A detailed description of the calculations and estimates for these emissions projections, targets, and reductions is provided in [Appendix B](#).

California's GHG reduction targets have been legislatively adopted for 2030 and 2035, while the 2050 goal is expressed in an executive order. While it is important to create a long-term emissions reduction goal, it would be speculative to demonstrate achievement of a goal for 2050 with the

This CAP identifies strategies and measures that would reduce citywide GHG emissions by at least:

- 61,000 MTCO<sub>2e</sub> by 2030, and
- 122,000 MTCO<sub>2e</sub> by 2035

CHAPTER 2 GREENHOUSE GAS EMISSIONS INVENTORY, PROJECTIONS, AND TARGETS

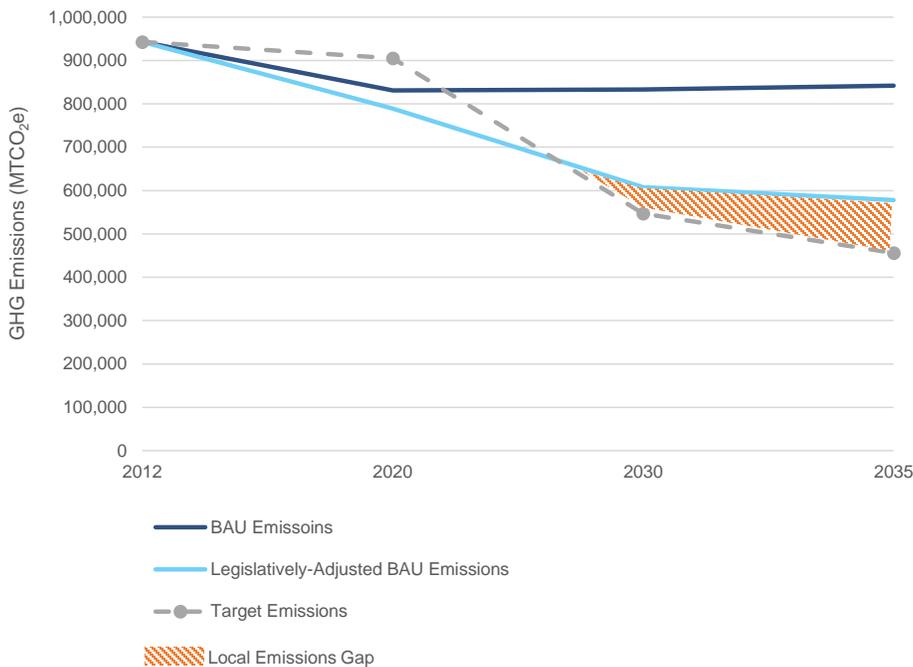
information known today. CARB’s Scoping Plan Update focuses on meeting the 2030 reduction target, as directed in SB 32. Therefore, the CAP aligns with the State in proposing measures to meet the 2030 target, and has set a 2035 target based upon the trajectory for meeting the State’s 2050 reductions. As climate change science and policy continues to advance, the City will be able to apply new reductions toward meeting a long-term 2050 GHG emissions reduction goal in future CAP updates, as outlined in **Chapter 4**. Over the coming decades, GHG reductions may come from:

- new innovations and technologies likely to become available in the future
- new methods to quantify measures that are currently unquantifiable
- new State and federal regulations that further reduce emissions in categories currently addressed primarily by local actions and supporting measures.

However, should state and federal laws in effect or planned to reduce emissions be reversed, fail to pass, or be incorrectly implemented, then those planned reductions in ghg emissions will not occur.

It should be noted that residents, businesses, and organizations make choices daily that produce GHG emissions that may be beyond the influence of the City and the CAP. While the measures identified in the CAP are focused on the City’s GHG emissions inventory, individual residents or businesses should not feel limited to measures outlined in the CAP; members of the community can make a number of climate-friendly choices, such as buying locally-grown foods and locally-manufactured products. These actions are not specifically listed in the CAP but further reduce energy use and the local carbon footprint and contribute to helping reverse climate change trends on a global scale.

**Commented [LH9]:** A fun project would be to create a resident database where residents track their own actions and emission reductions to see how we can help the city reduce.



Source: EPIC 2020.

**Figure 2-2 City of Escondido GHG Emissions Forecasts and Targets**