Imperial County

Regional Climate Action Plan

Prepared for:

SCAG
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

Southern California Association of Governments

ICTC
IMPERIAL COUNTY TRANSPORTATION COMMISSION

Imperial County Transportation Commission

June 2021

Imperial County Regional Climate Action Plan

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June 2021

The preparation of this report was funded through a Sustainability Planning Grant from SCAG. The contents do not necessarily reflect the official view or policies of SCAG. This report does not constitute a standard, specification, or regulation.

Credits and Acknowledgements

Caltrans

City of Brawley

City of Calexico

City of Calipatria

City of El Centro

City of Holtville

City of Imperial

City of Westmorland

County of Imperial Executive Office

Imperial County Air Pollution Control District

Imperial Irrigation District

Southern California Association of Governments

Southern California Gas Company

Table of Contents

Appendices

Figures

Tables

List of Abbreviations

°F	degrees Fahrenheit
AB	Assembly Bill
BAU	business-as-usual
CAA	Clean Air Act
CAFE	corporate average fuel economy
CalRecycle	California Department of Resources Recycling and Recovery
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CFC	chlorofluorocarbons
CH_4	methan
CNRA	California Natural Resources Agency
CO_2	carbon dioxide
County	County of Imperial
CPUC	California Public Utilities Commission
El Centro	City of El Centro
EPA	U.S. Environmental Protection Agency
GHG	greenhouse gas
GWP	warming potential
HFC	hydrofluorocarbons
ICAPCD	Imperial County Air Pollution Control District
ICLEI	International Council for Local Environmental Initiatives
ICTC	Imperial County Transportation Commission
IID	Imperial Irrigation District
IPCC	Intergovernmental Panel on Climate Change
IVRMA	Imperial Valley Resource Management Agency
IVT	Imperial Valley Transit
mpg	miles per gallon
MPO	Metropolitan Planning Organization
$MTCO_2e$	metric ton of carbon dioxide equivalent
N_2O	nitrous oxide
NHTSA	National Highway Traffic Safety Administration
O_3	ozone
PFC	perfluorocarbons
POE	Ports of Entry
PV	photovoltaics
Regional CAP	Imperial Valley Regional Climate Action Plan

RPS	Renewables Portfolio Standard
RTAC	Regional Target Advisory Committee
RTP	Regional Transportation Plan
SANDAG	San Diego Association of Governments
SB	Senate Bill
SCAG	Southern California Association of Governments
SCLP	Short-lived climate pollutants
SCS	Sustainable Communities Strategy
SF_6	sulfur hexafluoride
SGC	Strategic Growth Council
SoCalGas	Southern California Gas Company
SR	State Route
USDA	U.S. Department of Agriculture
VMT	vehicle miles traveled

Chapter 1

Introduction

The purpose of this Imperial Valley Regional Climate Action Plan (Regional CAP) is to address the impacts of climate change and reduce greenhouse gas (GHG) emissions in the Imperial Valley region which includes the County of Imperial (County) and the cities of Brawley, Calexico, Calipatria, Holtville, El Centro, Imperial, and Westmorland. The Regional CAP is consistent with and complementary to statewide legislation and regulatory mandates, and establishes local strategies, measures, and actions aimed at reducing GHG emissions.

1.1 Introduction to Climate Change

The greenhouse effect, caused by the retention of solar radiation in the atmosphere and absorbed by the Earth's surface, keeps temperatures on Earth conducive to life as we know it and is essential for the planet to support life when not exacerbated. Additional description of the greenhouse effect is included in Chapter 2. There are many natural factors (e.g., volcanic eruptions) and anthropogenic (i.e., human induced) factors that contribute to climate change. Climate fluctuations have always been a part of Earth's history, which is evident in geological records. However, the rapid rate and the magnitude of climate change occurring now cannot be explained by only natural factors. Seasons are shifting, average temperatures are increasing, precipitation levels are changing, and sea levels are rising. These changes have the potential to adversely affect human health and safety, economic prosperity, provision of basic services, and the availability of natural resources.

In recent decades, human activities, such as the burning of fossil fuels for transportation and energy and increasing rates of development disrupting natural systems, have contributed to an elevated concentration of gases that insulate the earth, referred to as GHGs, in the atmosphere above natural ambient concentrations. This increase in GHGs is responsible for intensifying the greenhouse effect and leading to a trend of unnatural warming of the Earth's climate, known as "climate change." Additional detail on the greenhouse effect, pollutants contributing to increased GHG concentrations, and the effects of climate change on the region is provided in Chapter 2.

1.2 Climate Change in the Context of the Region

The impacts of climate change are occurring at a national, state, and regional level, as average temperatures are rising, severe weather events are more frequent and severe, and precipitation patterns are changing. The impact of climate change in California varies across the state due to its diverse biophysical setting, climate, and jurisdictional characteristics. At a regional level, annual temperatures are projected to increase and changes in precipitation are projected to result in longer dry spells over time (CEC 2021).

Average temperatures are anticipated to increase through the 21st century within the Imperial Valley. By mid-century (2035-2064) average temperatures are projected to increase between 4.1-5.0 degrees Fahrenheit (°F) and by end-century (2070-2099) between 5.1-8.5 °F above historical temperatures. Additionally, the region is projected to see an increase in extreme heat days (i.e., the number of days in a year when daily maximum temperatures are above 111.2 °F). Historically, Imperial Valley has experienced, on average, three to five extreme heat days per year. As a result of climate change, the region is projected to experience 25 to 32 extreme heat days per year by mid-century and 33 to 66 extreme heat days per year by end-century (CEC 2021).

The Imperial Valley is a historically dry region, and as a result of climate change is projected to become drier. Further, dry years are also likely more likely to be followed by dry years, increasing the risk of drought. While the Imperial Valley is not projected to see a significant change in annual precipitation over the next 50 to 100 years, even modest changes could have significant effects on the region's ecosystems. Additionally, precipitation events are anticipated to occur less frequently but become more intense (e.g., fewer days of rain but greater amounts of rain during each storm). In Imperial Valley, the maximum number of consecutive days in a year without precipitation is projected to increase by nine to 12 days per year by mid-century and by 11 to 23 days by end-century (CEC 2021).

These changes to average temperatures and precipitation patterns could result in increased heat waves, wildfire risk, and extended droughts, resulting in adverse effects on human health and safety, economic prosperity, infrastructure, and agricultural resources. Though climate change is a global issue, it requires efforts from regional and local governments and citizens to help reduce GHG emissions and adapt their communities to climate change.

The impacts of climate change do not recognize jurisdictional boundaries and impacts will be experienced by all persons, businesses, and communities in the region. Not all of these impacts will be new, but the frequency, duration, and intensity of existing hazards including wildfires, poor air quality, extreme heat events, flooding, and drought will be exacerbated by climate change. Through the Regional CAP, ICTC and member agencies intend to reduce GHG emissions from regional and jurisdiction-specific activities to reduce the regional impacts of climate change. While not directly addressed within the Regional CAP, these activities will assist the region in building resilience to anticipated climate change impacts. Further actions for regional and local climate change adaptation would be achieved through local adaptation efforts and plans.

1.3 Purpose of the Regional CAP

A coordinated, multi-jurisdictional effort is important to address climate change as climate action requires communities working together to reduce GHG emissions. State programs and legislation (described in Chapter 2) are essential to reduce both statewide and local GHG emissions, but regionally- and locally-specific actions are also necessary to meet long-term GHG emissions reduction goals. A Regional CAP recognizes the shared nature of the challenge of combating climate change and the varying capacity of individual jurisdictions to achieve GHG emissions goals. This Regional CAP identifies GHG reduction strategies and measures that would be implemented on a regional level as well as jurisdiction-specific measures that would further reduce local GHG emissions.

1.3.1 Regional Approach

In recent years, various jurisdictions within the Imperial Valley region have implemented varying levels of climate action planning or general planning activities with the intent to reduce GHG emissions. The purpose of this Regional CAP is to consolidate these efforts and provide support to all jurisdictions in devising and implementing GHG emissions reducing activities. Led by the Imperial County

Transportation Commission (ICTC) through funding from the Southern California Association of Governments (SCAG), the Regional CAP will also assist the region in securing funding for sustainable and transportation projects, streamline the process to approve projects, and achieve community goals requiring regional investment and participation.

Implementation of the Regional CAP will require participation from all jurisdictions within the Imperial Valley, as well as local households, businesses, and agricultural industries. Successful implementation will require a funding strategy that is flexible, can evolve over time, and can provide funding shared across multiple jurisdictions.

Continuous improvements in technologies and changing markets inform how scientists identify climate impacts and apply solutions. Regional agencies, in partnership with ICTC and SCAG, can work together to update the Regional CAP or relevant sections, as needed, to continuously address ongoing climate change impacts and action needs. As best practices, research, and technologies change, the strategies to combat climate change and reduce GHG emissions identified in this Regional CAP may become obsolete. In addition, State and federal laws to address climate change may be updated over time, necessitating further changes to the Regional CAP in order to comply. While the Regional CAP may change and evolve over time, the overarching goal remains the same: to reduce GHG emissions generated by regional activities.

ICTC and SCAG by virtue of their respective roles will provide support at the regional level, particularly in implementing regional programs such as the Regional Transportation Plan (RTP) and Sustainable Communities Strategy (SCS). Both agencies will work to align these programs, and future regional initiatives, with the goals of this Regional CAP. A brief description of each regional agency's role is provided below.

Southern California Association of Governments

SCAG is designated under federal law as the Metropolitan Planning Organization (MPO) and under state law as a Regional Transportation Planning Agency and a Council of Governments for multiple counties in southern California. The SCAG region encompasses six counties: Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura. The agency develops long-range regional transportation plans include sustainable communities strategies, regional transportation improvement plans, and regional housing needs allocations. SCAG has delegated responsibility to six County Transportation Commissions that hold the primary responsibility for programming and implementing regionally-specific projects and plans.

Imperial County Transportation Commission

ICTC serves as the regional delegated transportation commission for Imperial County that participates in development and implementation of the RTP and distributes and oversees the Local Transportation Fund. ICTC's jurisdiction includes the seven incorporated cities in the county, the unincorporated county, and the Imperial Valley Transit (IVT) System.

1.3.2 Role of Local Jurisdictions

Implementation of the Regional CAP, including meeting local GHG emissions targets will require collaboration between ICTC, SCAG, local governments, and communities at-large. The seven incorporated cities and unincorporated County will oversee the successful implementation and tracking of local GHG reduction strategies, and will be primarily responsible for coordinating with other local and regional agencies to gather data, report on progress, track completed projects, and support funding appropriation.

The Regional CAP identifies measures and actions that can be taken by local jurisdictions to reduce communitywide GHG emissions. This document is not intended to set specific requirements for these jurisdictions, rather, it provides a suggested framework of measures that each jurisdiction could implement locally. Local activities could include incorporation of information contained herein into other planning documents, such as a General Plan or inclusion of additional measures the jurisdiction would implement, as a formally adopted local climate action plan. Agencies may also choose to expand the scope of their individual documents to address climate adaptation.

1.4 Document Organization

The Regional CAP includes five chapters that provide a summary of climate change and regional climate change impacts, existing and proposed legislative actions that would reduce GHG emissions, and GHG reduction strategies and measures that would be implemented at regional and local levels. A brief summary of the contents of each chapter are provided below.

- Chapter 1 provides an introduction to climate change and climate action planning. This includes a discussion of regional climate change issues, the regional agency organization supporting the development of this Regional CAP, and the purpose and goals of preparing and implementing a Regional CAP.
- Chapter 2 describes underlying climate change science and the anticipated regional impacts from climate change. This chapter also describes existing federal and State regulations related to GHG emissions and climate change, regional and local climate action planning efforts, and other relevant efforts related to the Regional CAP.
- Chapter 3 reports the existing regional GHG emissions inventory and future projections. The multi-year regional GHG inventory summarizes GHG emissions generated from regionwide activities in 2005, 2012, and 2018. Forecasted regional emissions in 2020, 2030, and 2050 are provided in this chapter using the 2018 GHG inventory as a baseline.
- Chapter 4 includes local GHG inventories and forecasts for each jurisdiction (i.e., the County and seven incorporated cities) consistent with the regional GHG inventory and forecasts. This chapter also identifies local GHG emissions targets, local GHG emissions gaps required to achieve these targets, and locally-specific GHG reduction measures.
- Chapter 5 identifies how regional and local agencies shall prioritize, implement, and monitor GHG emissions reduction strategies and measures. This chapter includes a summary of the implementation

requirements of GHG reduction measures, implementation priorities and processes, and methods for monitoring and reporting GHG emissions reduction progress.

1.5 How to use this Document

The Regional CAP is designed to be accessible and useful to a wide range of users. Measures to reduce regional and local GHG emissions are complex and require implementation from multiple levels including regional agencies, local governments, community organizations, and individual residents and businesses. Although most of the measures and actions identified to reduce GHG emissions will be the responsibility of local governments and regional agencies to implement, residents, businesses, and community groups must remain engaged to achieve GHG emissions targets.

This document will be used as a regional guidance document for reducing GHG emissions and identifies:

- relevant State legislation requiring the documents preparation and target setting;
- actions that will be taken by the regional agencies to reduce emissions across all jurisdictions and support the funding of future emissions reducing activities; and
- measures and actions that will be taken by local governments to reduce GHG emission and meet local emissions gaps.

1.5.1 Plan Participants

As a community-wide plan, the Regional CAP has many different audiences, each with their own interests and needs. Identified below are the aspects of the Regional CAP that would be most applicable to various audiences.

Regional Agencies

Regional agencies (e.g., ICTC, SCAG, Imperial Irrigation District, Imperial County Air Pollution Control District) have a critical role in reaching the emissions targets by providing countywide services and programs that would be difficult for local governments to provide on their own. Responsibilities of these agencies are described in Chapter 2 and the identification of regional GHG emissions reduction activities are outlined in Chapter 3.

Local Governments

Cities and the County will be primarily responsible for the implementation and monitoring of locally-specific GHG emissions reduction measures. Strategies and measures identified for each individual jurisdiction are outlined in Chapter 4. Funding for these measures will be imperative to the successful implementation and achievement of GHG emissions targets. Methods for implementing measures, identification of potential funding sources, and the role of the regional agencies in supporting local implementation are outlined in Chapter 5.

Community Groups

Interests of community groups (e.g., local chambers of commerce, neighborhood associations) within the county are varied, and many groups have specific interest in GHG emissions reduction efforts associated with specific sectors (e.g., transportation, energy). Regional strategies outlined in Chapter 3 and local measures and strategies outlined in Chapter 4 will be of specific interest to community groups to identify activities the region will undertake to reduce GHG emissions. Additional information provided in Chapter 2 identifies federal, State, and regional efforts that are currently being taken to reduce emissions, and Chapter 5 outlines the responsible agencies for implementing specific measures.

Residents and Businesses

The interests of individual Imperial Valley residents and businesses are wide-ranging, but the role of individuals is necessary to ensure community buy-in for GHG emissions reducing activities and Regional CAP strategies. Chapter 1 introduces the need for this Regional CAP and the basis for implementing GHG emissions reduction strategies. Chapter 4 outlines the GHG emissions reduction measures that will be implemented in individual jurisdictions including measures that will rely on efforts from residents and businesses.

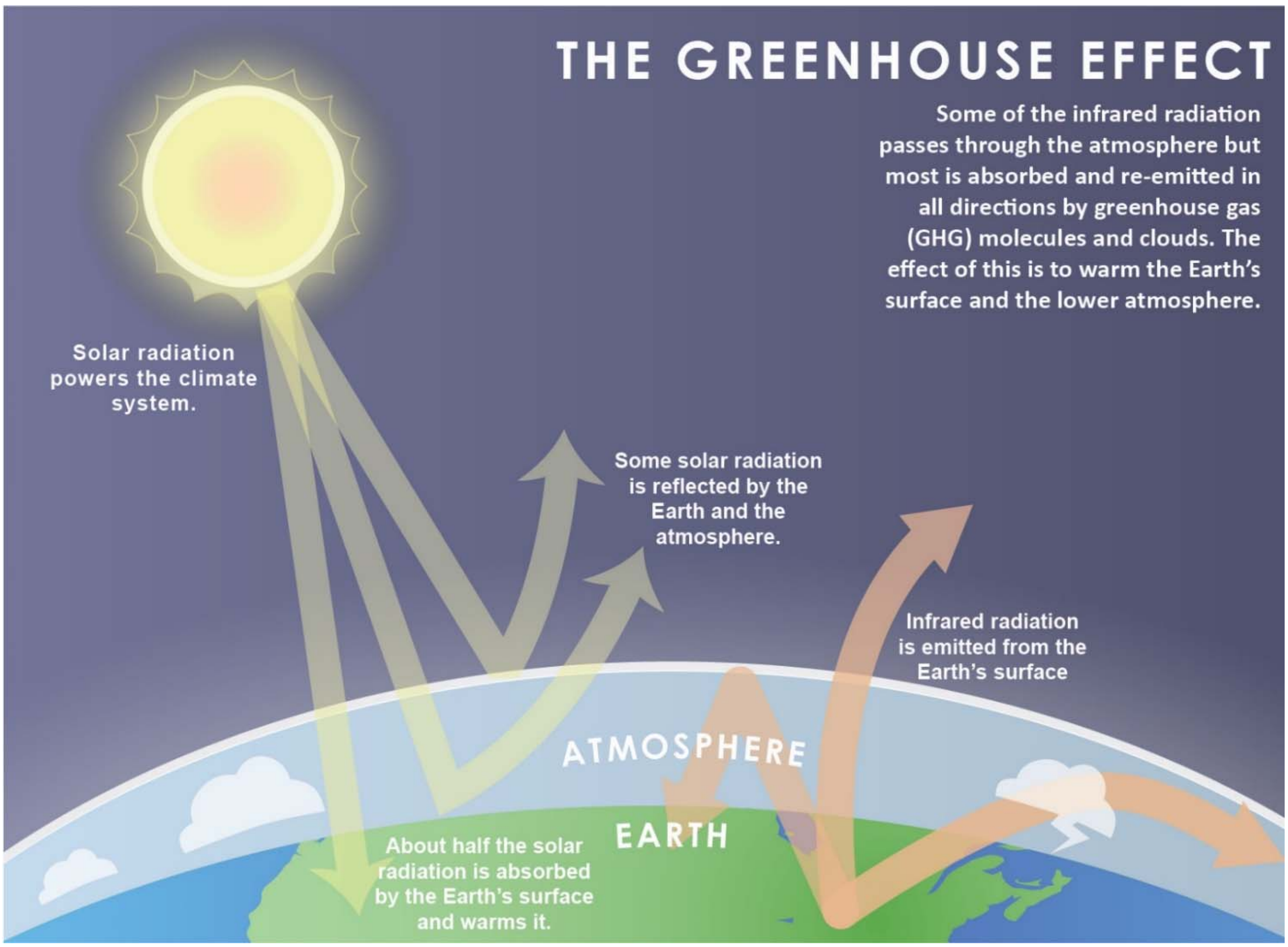
Chapter 2

Background

This chapter describes the science underlying climate change and the potential climate change impacts on the region. Included in this chapter is a summary of federal, state, and local regulations intended to reduce GHG emissions and adapt to climate change.

2.1 Climate Change Science

The greenhouse effect, as identified below in Figure 2-1, results from a collection of atmospheric gases called GHGs that insulate the Earth and help regulate its temperature. These gases, mainly water vapor, carbon dioxide (CO_2), methan (CH_4), nitrous oxide (N_2O), ozone (O_3), and chlorofluorocarbons (CFCs) all act as effective global insulators, reflecting Earth's visible light and infrared radiation to keep temperatures on Earth conducive to life as we know it. The greenhouse effect is essential for the planet to support life.



Source: Ascent Environmental, 2020

Figure 2-1 The Greenhouse Effect

2.1.1 Greenhouse Gas Emissions and Sources

Human activities in recent decades (e.g., burning of fossil fuels for transportation and energy, increased agricultural productivity) have contributed to elevated concentrations of GHGs in the atmosphere. Human cause (i.e., anthropogenic) emissions of GHGs above natural ambient concentrations are responsible for intensitifying the greenhouse effect and leading to a trend of unnatural warming of the Earth's climate, known as global climate change, or global warming. There is strong scientific consensus that is is "extremely likely" that most of the changes in the worlds climate during the last 50 years are a result of anthropogenic GHG emission (Intergovernmental Panel on Climate Change 2014). Climate change, in turn, is the driver behind changes in percipitation patterns, shrinking polar ice caps, rising sea levels, and other impacts to biological resources and humans.

Climate change is a global problem that can lead to significant fluctuations in regional climates. Climate change is the driver behind rising average temperatures and changes to precipitation patterns globally, resulting in increased extreme heat events, reduced water supplies, and extended droughts.

Short-lived climate pollutants (SCLPs), which are GHGs that remaining in the atmosphere for a much shorter period than long-lived climate pollutants (e.g., CO_2 and N_2O), have an outsized impact on climate change in the near term. Despite their relatively shorter atmospheric lifespan, their relative potency in terms of how they heat the atmosphere (i.e., global warming potential [GWP]) can be tens, hundreds, or even thousands of times greater than that of CO_2. SLCPs include CH_4, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and black carbon.

2.2 Climate Change Impacts and Vulnerability

The Imperial Valley is located in the Inland Desert Region of California, as defined by the California Natural Resources Agency (CNRA) in California's Fourth Climate Change Assessment (CNRA 2018). Despite its sparse population, the region is important for protected lands, tourism, and agriculture. Regionally important wildlife refuges, including the Salton Sea, and biodiversity hotspots such as oases and sand dunes, provide climate refuge against extreme heat and aridity that characterizes lowland areas.

2.2.1 Regional Impacts of Climate Change

Like much of California, many of the effects of climate change will be mediated through climate-driven stress to water supply and quality. Land use patterns in the region are highly dependent on water availability, and competing needs for water amongst urban development, agriclture, and natural ecosystems. Increasing climate extremes (e.g., extreme high temperatures, likelihood of flash flooding, wildfire risk) will stress transportation and energy infrastructure currently in place, and will increase energy demand for cooling. Population growth and urbanization in the region is likely to exacerbate strains on infrastructure, land use, and water supply, and may increase wildland-urban interface areas that could potentially lead to more wildfire activity without careful planning.

The Salton Sea, the state's largest lake is maintained by inflows from agricultural runoff. Future environmental quality of the region is highly dependent on the fate of the Salton Sea, which is currently threatend by diminshing levels of inflows. As it shrinks, the increasily exposed dry lakebed is likely to become a major source of dust, polluting the air of the region and potentially of areas beyond. The region already suffers from high rates of childhood asthma and cardiovascular disease though to be linked to dust emissions from the shrinking sea (Imperial County Public Health 2016).

While climate change will exacerbate water supply and quality issues, climate change will have significiant impacts on environmental quality, habitat, and public health challenges. Key climate change impacts the Imperial Valley is facing include:

- Increasing average temperatures and extremely high maximum temperatures
- Increasing stress on water supply and quality from increased temperatures and changing water availability
- Increasing demand for energy for cooling
- Decreasing air quality from exposed dry lakebeds and water use reductions on sandy landscapes
- Increasing stress on infrastructure from demand for renewable energy developments

2.2.2 Equity and Social Vulnerability

Several factors contribute to people's vulnerability to climate change. These can include personal attributes (e.g., age, economic status, race, citizenship) and the physical environment (e.g., pollution, shade trees). Vulnerability can also be exacerbated by historic underinvestment and marginalization or institutionalized racism and legacy of segregation. Proximity to preexisting sources of pollution is another source of long-enduring vulnerability.

An uneven distribution of vulnerability to climate change impacts means that without deliberate planning and action, certain groups and individuals will experience greater impacts. Particular to the Imperial Valley, the consequences of climate change related water impacts are particularly acute for communities already dealing with a legacy of inequalities. Low-income households, people of color, and communities already burdend with environmental pollution currently suffer the most severe impacts caused by water supply shortages and rising costs of water (Feinstein et al. 2017). Recently, while all water districts faced similar challenges during the drought, small water districts (defined as serving fewer than 10,000 people) were less likely to have resources and capcity to overcome those challenges. These districts are most likely to serve small rural communities which have historically been home to marginailzed populations in agriculture heavy areas (Greene 2018). Inequities not only exist in varying exposures to climate risk, but also in the ability and implementation of potential adaption or GHG emissions reduction actions.

Much of Imperial Valley is challenged by high poverty and unemployment rates and low educational attainment levels, making residents more vulnerable to the effects of climate change. The extreme heat projected for the region is likely to threaten these vulnerable populations directly through heat-related illness, and indirectly through strain on infrastructure and via changing levels of air pollution and disease.

2.3 Regulatory Framework

In response to the increase in human-caused GHG emissions and the threat of climate change, the federal, State, and local governments have already taken several steps to both reduce GHG emissions and adapt to climate change. Regulatory actions taken by the federal and State government assist in reducing GHG emissions from sources that local agencies have limited control (e.g., fuel consumption in vehicle fleets, energy procurement).

2.3.1 Federal Regulations

The federal Clean Air Act (CAA) was enacted in 1975 and most recently amended in 1990. The CAA regulates air emissions from stationary and mobile sources to protect public health and reglate hazardous air pollutants. In 2007, the U.S. Supreme Court ruled that CO_2 is an air pollutant as defined under the CAA, and the U.S. Environmental Protection Agency (EPA) has the authority to regulate emissions of GHGs.

In October 2012, the EPA and the National Highway Traffic Safety Administration (NHTSA), issued final rules to further reduce GHG emissions and improve corporate average fuel economy (CAFE) standards for light-duty vehicles for model years 2017 and beyond (77 Federal Register [FR] 62624). These rules would increase fuel economy to the equivalent of 54.5 miles per gallon (mpg), limiting vehicle emissions to 163 grams of CO_2 per mile for the fleet of cars and light-duty trucks by model year 2025.

2.3.2 State Regulations and Initiatives

In 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05, which directed California to reduce GHG emissions to 1990 levels by 2020, and 80 percent below 1990 levels by 2050. A year later, in 2006, the Global Warming Solutions Act (Assembly Bill [AB] 32) was passed, establishing regulatory, reporting, and market mechanisms to achieve quantifyable reductions in GHG emissions. AB 32 put a cap on GHG emissions, setting a target of reducing GHG emissions to 1990 levels by 2020.

On April 20, 2015, Governor Edmund G. Brown Jr. signed Executive Order B-30-15, establishing a new GHG emissions reduction target of 40 percent below 1990 levels by 2030. This target aligns with those of leading interation governments usch as the 28-nation European Union which adopted the same target in October 2014. In September 2016, Senate Bill (SB) 32 was signed, codifying into statute the mid-term 2030 target established by Executive Order B-30-15. The 2030 GHG emissions reduction target was determined to set California on a trajectory to meet the goal of reducing statewide emissions by 80 percent below 1990 levels by 2050.

As part of its implementation of AB 32 and Executive Order S-3-05, the California Air Resources Board (CARB) developed the first Climate Change Scoping Plan (Scoping Plan) in 2008. The 2008 Scoping Plan, along with its update in 2014, described the approach California will take to reduce GHGs to achieve the 2020 reduction target. In response to Executive Order B-30-15 and SB 32, CARB was directed to update the Scoping Plan to reflect the path of achieving the 2030 target and demonstrating a trajectory towards meeting the 2050 reduction goal. In November 2017, CARB publsihed the 2017 Scoping Plan which identifies GHG reductions by emissions sector to achieve a statewide emissions level that is 40 percent below 1990 levels by 2030.

Other State regulations or initiatives relevant to the CAP are identified below:

Table 2-1 Relevant State Regulations and Initiatives

Regulation/ Initiative	Title/Issue	Description
SB 97	CEQA Amendments	Amendments for the feasible reduction of GHG emissions or the effects of emissions along with additional guidance for analyzing potential impacts to climate change and GHG emissions under CEQA.
SB 375	Sustainable Communities and Climate Protection Act of 2008	Requires regional targets for GHG reductions from passenger vehicles through better land use and transportation planning and an SCS.
SB 350	Clean Energy and Population Reduction Act	Sets 2030 targets for increasing the state renewable energy mix to 50 percent, doubling of energy efficiency in existing buildings, and a modernized electric grid.
EO S-01-07	Low Carbon Fuel Standard	Establishes a target to reduce the amount of carbon in transportation fuels by 10 percent by 2020.
AB 1493 and Advanced Clean Cars Program[1]	Passenger Vehicle GHG emissions	AB 1493 (Pavley) requires CARB to develop and adopt regulations that reduce GHGs emitted by passenger vehicles and light-duty trucks. California's Advanced Clean Cars Program sets emission standards for vehicles and targets for deployment of zero-emissions vehicles.
SB 1000	Environmental Justice	Requires cities and counties to include a section on environmental justice when they update their general plans.
SB 535 and AB 1550	Disadvantaged and Low-Income Communities	Requires the identification of disadvantaged and low-income communities throughout the state and sets minimum targets for overall investments from the State Cap-and-Trade Program.
SB 379	Climate Adaptation and Resiliency Planning	Requires cities and counties to incorporate climate adaptation and resiliency into core local planning documents and processes.
Climate Change Assessment	Climate Adaptation and Resiliency Planning	Most recently updated in 2018, the California's Fourth Climate Change Assessment provides information to build resilience to climate impacts and informs local resilience actions.
Title 24	California Building Standards Code	Title 24, Part 6 (Energy Efficiency Standards) sets building energy efficiency standards for residential and non-residential buildings. Title 24 is updated periodically to allow consideration and possible incorporate of new energy efficiency technologies and methods. Title 24, Part 11 (Green Building Standards) identifies mandatory and voluntary performance standards for all new construction.
SB X1-2 and SB 100	Renewable Electricity Sources	SB X1-2, signed in 2011, requires all California utilities to generate 33 percent of their electricity from renewables by 2020. SB 100, signed in 2018, updates SB X1-2 and requires California's renewable energy and zero-carbon resources supply 100 percent of electric retail sales to end-use customers and 100 percent of electricity procured to serve state agencies by 2045.

Table 2-1	Relevant State Regulations and Initiatives	
Regulation/ Initiative	Title/Issue	Description
Cap-and-Trade	GHG Emissions from Covered Entities	Regulates GHG emissions generated by covered entities by setting a firm cap on overall GHG emissions that gradually is reduced over time. Employs market mechanisms to cost-effectively reduce overall GHG emissions by allocating specific GHG allowances to covered entities that are allowed to buy or sell additional offset credits to other covered entities.

Notes: AB = Assembly Bill; CEQA = California Environmental Quality Act; EO – Executive Order; GHG = greenhouse gas; SB = Senate Bill; SCS = Sustainable Communities Strategy

[1] In August 2019, the U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHSTA) jointly published a notice of the proposed rulemaking for the Safer Affordable Fuel-Efficient Vehicles Rule (SAFE Rule). Part One of the SAFE Rule withdrew California's waiver under the CAA to set GHG and zero-emissions vehicle standards separate from the federal government. Part Two of the SAFE Rule set amended fuel economy and CO2 standards for passenger cars and light-duty trucks for model years 2021 through 2026. The SAFE Rule limits California's regulatory authority to implement the Advanced Clean Cars Program.

2.4 Local Initiatives and Actions

Guided by State regulations and initiatives, many regional and local agencies in the Imperial Valley have already undertaken planning efforts to implement programs with the goal of reducing GHG emissions. These actions range from regional plans including the Sustainable Communities Strategy and regional transportation investments, to local activities including climate action plans and municipal energy programs. These varying initiatives and actions currently being implemented at the regional and local levels are described below.

2.4.1 Regional Actions

The regional initiatives and actions described below contribute to the development and success of this Regional CAP. Many of these programs are administered by the Imperial County Transportation Commission (ICTC) and several are conducted by other regional entities in partnership with ICTC.

Southern California Association of Governments

The Southern California Association of Governments (SCAG) is the regional planning agency for Imperial, Los Angeles, Orange, Riverside, San Pernadino, and Ventura counties, and serves as a forum for regional issues relating to transportation, the economy, community development, and the environment. SCAG serves as the federally designated metropolitan planning organization (MPO) for the Southern California region and is the largest MPO in the U.S.

SCAG prepared the 2020 Regional Transportation Plan/Sustainable Communities Strategy (2020 RTP/SCS), which includes policies, strategies, and porjects for advancing the region's mobility, economy, and sustainability through 2040. The RTP serves as a long-range transportation plan that is developed and updated by SCAG every four years, providing a vision for the development of transportation facilities throughout the region based on growth forecasts and economic trends over a 20-year period. The SCS expands upon transportation strategies in the RTP to analyze growth patterns and establish future land use strategies that aid the region in meeting its GHG reduction targets. The SCS does not mandate future land use policies for local jurisdictions, but rather provides a foundation of regional policy upon which local governments can build.

On September 3, 2020, SCAG's Regional Council unanimously voted to approve and fully adopt Connect SoCal (2020–2045 Regional Transportation Plan/Sustainable Communities Strategy), and the addendum to the Connect SoCal Program Environmental Impact Report.

Connect SoCal is a long-range visioning plan that builds upon and expands land use and transportation strategies established over several planning cycles to increase mobility options and achieve a more sustainable growth pattern. It charts a path toward a more mobile, sustainable and prosperous region by making connections between transportation networks, between planning strategies and between the people whose collaboration can improve the quality of life for Southern Californians.

Connect SoCal outlines more than $638 billion in transportation system investments through 2045. It was prepared through a collaborative, continuous, and comprehensive process with input from local governments, county transportation commissions, tribal governments, non-profit organizations, businesses and local stakeholders within the counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino and Ventura.

Imperial County Air Pollution Control District

The Imperial County Air Pollution Control District (ICAPCD) is the regulatory agency responsible for air quality in the Imperial Valley region. ICAPCD regulates emission sources and ensures regional compliance with State and federal regulations.

On July 26, 2017, California Governor Jerry Brown signed into law Assembly Bill (AB) 617 (C. Garcia, Chapter 136, Statutes 2017), which amended and added sections to the California Health and Safety Code regarding air pollution. This bill directs CARB and local air districts throughout the state (including ICAPCD) to enact measures to promote public health and welfare by reducing air pollution on a local scale, particularly in communities that are disproportionately burdened by air pollution. AB 617 was designed to accomplish this via the establishment of the Community Air Protection Program (CAPP), which puts the emphasis on community-focused actions that go beyond the regional and statewide air quality programs already in place.

On August 3, 2018, ICAPCD partnered with a local advocacy and environmental justice group known as Comite Civico del Valle, Inc. ("CCV") to author a report entitled Imperial County AB 617 Community Nominations. This report proposed the nomination of the community of El Centro-Heber-Calexico (Corridor) to CARB, to be selected to participate in the first year of CAPP, given the Corridor's health, socioeconomic, and air quality conditions of this group of two cities (Calexico and El Centro) and one unincorporated community (Heber). On September 27, 2018, CARB selected ten Year 1 statewide communities to participate in the CAPP, and the El Centro-Heber-Calexico Corridor was chosen for both community air monitoring and a community emissions reduction program (CERP). Soon thereafter, the ICAPCD in conjunction with CCV assembled a steering committee for the Corridor known as the AB 617 Community Steering Committee (CSC). This group provided input to the ICAPCD in developing the CERP for the Corridor during monthly (and occasionally bi-weekly) CSC meetings that were open to the public. On October 8, 2019, the ICAPCD Board adopted the CERP for the Corridor, which provides the framework to reduce emissions at the local scale by identifying targets and implementing strategies to improve local air quality in the Corridor.

Imperial County Transportation Commission

ICTC serves as the regional transportation commission in Imperial Valley, providing regulatory guidance in regional transportation planning and permitting. ICTC is responsible for the development of the Imperial Valley RTP as well as Regional, State, and Federal transportation improvement programs. These programs include:

- distribution and oversight of Local Transportation Fund monies;
- preparation and submittal of applications for transportation related funds;
- planning, programming, and administration of regional transit services;
- implementation of various transportation-related plans and programs and citizen participation activities; and
- management and development of transportation and sustainability plans at U.S./Mexico Ports of Entry (POEs) within the county.

ICTC manages and funds the Imperial Valley Resource Management Agency (IVRMA), which develops, implements, and supports efficient and sustainable programs for waste reduction, reuse, recycling, and composting in Imperial Valley. IVRMA implements programs compliant with local, state, and national mandates, including mandatory commercial recycling programs under Assembly Bill (AB) 341, waste diversion programs, and hazardous waste disposal.

ICTC also prepares and fund transportation and circulation projects in coordination with both the U.S. and Mexico federal governments for POE and binational planning efforts along the U.S./Mexico border. These efforts include the California-Baja California Border Master Plan, the California/Baja California Pedestrian and Bicycle Transportation Access Study, and Calexico Traffic Circulation Plan. These plans identify actions taken by ICTC, and state and federal agencies, to improve transportation efficiencies at POEs, facilitate international trade and goods movement, and improve non-vehicular access at POEs.

In coordination with the San Diego Association of Governments (SANDAG), ICTC developed a Regional Mobility Hub Implementation Strategy which demonstrates how transportation services, amenities, and supporting technologies can improve transit access and shared mobility choices between Imperial Valley and the San Diego region.

2.4.2 Local Actions

Local agencies, including the County and city governments, have already begun developing or implementing plans or initiatives with the goal of reducing GHG emissions. A majority of these plans have been developed to address GHG emissions or sustability within a specific jurisdiction. The goal of this Regional CAP is not to replace local sustainability activities, but rather to incorporate these activities into the regional framework and encourage multi-jurisdicitonal partnerships in implementation efforts. The local actions that have already been undertaken by the County and seven cities in Imperial Valley are described below.

Imperial County

Imperial County General Plan

The Imperial County General Plan is a comprehensive plan document that guides future growth, resources, and infrastructure in the unincorporated County. The County adopted its current General Plan in 1993, with subsequent updates as recently as 2016. The General Plan is intended to create a comprehensive guide for development within the County and provides mechanisms to achieve desired community goals and objectives through a coordinated implementation plan. The General Plan consists of nine elements, each with element specific goals and objectives. Elements with relevant goals and objectives to climate action planning efforts include the Conservation and Open Space Element (updated in 2016), the Housing Element (updated in 2013), and the Renewable Energy and Transmission Element (2015). A summary of the relevant goals and objectives from these elements are described below in Table 2-2.

Table 2-2 Imperial County General Plan Objectives Related to Climate Action Planning

Element	Objective/ Program[1]	Description
Renewable Energy and Transmission[2]	1.6	Encourage the efficient use of water resources required in the operation of renewable energy generation facilities
	3.3	Encourage the development of services and industries associated with renewable energy facilities.
	5.2	Encourage development of utility-scale distributed generation projects in the County.
Conservation and Open Space[3]	1.1	Encourage uses and activities that are compatible with the fragile desert environment and foster conservation.
	2.3	Support investigation of long-term climate change effects on biological resources.
	6.1	Ensure the use and protection of all the rivers, waterways, and groundwater sources in the County for use by future generations.
	6.10	Encourage water conservation and efficient water use among municipal and industrial water users, as well as reclamation and reuse of wastewater.
	7.6	Explore and assess strategies to reduce greenhouse gas emissions in the County.
	9.2	Encourage renewable energy developments that include Salton Sea restoration components.
Housing[4]	2.1	Continue to use existing financing services to stimulate the development of innovative financial techniques that will reduce housing cost and facilitate housing production in Imperial County for all incoming levels and special needs groups. This is supported by Program 2.1.1 which encourages the use of solar energy, xeriscaping, and green building materials.
	6.1	Promote architectural design and orientation of residential developments in a way that promotes energy conservation. This is supported by Program 6.1.1 which promotes weatherization of existing homes, and Program 6.1.2 which encourages

Table 2-2	Imperial County General Plan Objectives Related to Climate Action Planning	
Element	Objective/ Program[1]	Description
		continued implementation of Title 24 Energy Conservation Requirements and home rehabilitation efforts.

[1] The terms "objective" and "policy" refer to the specific directive or action identified in each element to support a long-term goal. The General Plan uses the terms objective in the Renewable Energy and Transmission, and Conservation and Open Space elements. The term "policy" is used in the Housing element.

[2] Source: Imperial County 2015

[3] Source: Imperial County 2016

[4] Source: Imperial County 2013

Imperial County Regional Active Transportation Plan

The Imperial County Regional Active Transportation Plan incorporates existing plans and studies, including the Imperial County Safe Routes to School Regional Master Plan and Imperial County Bicycle Master Plan, into a comprehensive regional active transportation plan. The Active Transportation Plan includes six goals aimed at improving active transportation (i.e., walking and bicycling) improvements throughout the unincorporated County (Imperial County 2018). These goals include:

- **Goal 1: Improved Access.** Provide a bicycling and walking experience within each community and between communities by providing multimodal facilities designed following local and national best practices. Develop walkable communities that provide walk and bike access to community destinations such as schools, parks, public facilities, and community centers.
- **Goal 2: Network Connectivity.** Identify and create a well-connected network of local on-street walkways and bikeways designed for people of all ages and abilities. While resources may not be available to address all streets, develop an active transportation network that provides a consistent level of service for the length of the trip. Identify gaps in the pedestrian and bicycle systems and provide projects that reduce barriers to travel.
- **Goal 3: Safety.** Pedestrians and bicyclists travel at a slower speed than motorists. They are smaller and less visible. Higher speed vehicles pose a potential safety hazard for pedestrians and bicyclists. A project goal is to provide a plan and identify projects that will provide a safer environment for walking and bicycling. As part of the plan, address the shared roadway with vehicles by addressing travel speeds and crossings at intersections. Enable safe pedestrian and bicycle travel during daytime and during evening hours.
- **Goal 4: Increase Active Transportation Travel Within Each Community.** Develop a pedestrian and bicycle network that will meet the needs of community residents that will encourage walking and biking, in order to provide a viable travel option to the use of a vehicle. Make walking and biking a way of traveling through each community. This may include improving both educational programs that provide information about the benefits of walking and biking, as well as providing improved multimodal facilities.

- **Goal 5: Health.** Promoting the health benefits of walking and biking through education programs in schools and events around the community can be effective in increasing physical activity amongst residents.
- **Goal 6: Equity.** Provide an active transportation network that serves all people. Establish walking, bicycling, and transit links within areas that have higher concentrations of disadvantaged and underserved communities, where reliance on active transportation is often greatest.

City of Brawley

City of Brawley General Plan

The City of Brawley updated its General Plan in 2008, providing a blueprint for future growth in the city and sphere of influence. This 2008 update included the State required General Plan elements, with the exception of the Housing Element, which was updated subsequent to the General Plan in 2013. A summary of the relevant objectives identified in the City of Brawley General Plan is provided in Table 2-3.

Table 2-3 Brawley General Plan Objectives Related to Climate Action Planning

Element	Objective/ Program	Description
Land Use[2]	7.1	Identify and encourage conservation of prime agricultural lands adjacent to the City of Brawley. This objective is supported by Policy 7.1.2 which protects agricultural land to be used for agricultural purposes, and Policy 7.1.4 which prevents the conversion of agricultural lands to non-agricultural only after urban reserve lands have been developed.
Infrastructure[2]	1.1	Provide a system of streets that meets the needs of current and future inhabitants and facilitates the safe and efficient movement of people and goods. This objective is supported by Policy 1.1.2 which encourages the development of pedestrian and bicycle facilities, and Policy 1.1.11 which encourages transit services, non-vehicular travel, and minimizing vehicle miles traveled.
	4.1	Maximize the efficiency of the circulation system through the use of transportation system management and demand management strategies. This objective is supported by Policy 4.1.6 which encourages employers to reduce vehicular trips by offering incentives.
	5.1	Support the development of an appropriate transportation system that provides mobility to City inhabitants and encourages the use of public transportation as an alternative to automobile travel.
	5.2	Increase the use of bicycle and pedestrian facilities
	6.5	Purchase and operate alternative fuel vehicles and encourage the greater use of alternative fuel vehicles.
Resource Management[2]	8.1	Conserve and protect designated agricultural lands and plan for their continued use. This objective is supported by Policy 8.1.2 which encourages infill development and Policy 8.1.6 which prohibits "leapfrogging" patterns of development.
Housing[3]	1.2	Implement an infill development strategy through development incentives.
	7.19	Promote energy conservation through the implementation of an Energy Conservation Program, which includes:

Table 2-3	Brawley General Plan Objectives Related to Climate Action Planning	
Element	Objective/ Program	Description
		▸ encouraging the use of energy conserving techniques in the siting and design of new housing; ▸ actively enforcing all state energy conservation requirements for new residential construction; ▸ allowing the use of rehabilitation assistance funds to make residences more energy efficient; ▸ continuing to make local residents aware of the free home energy surveys as a means to reduce energy consumption; and ▸ encouraging and promoting the maximum use of solar energy systems and other energy conservation techniques.

[1] The terms “objective” and “program” refer to the specific directive or action identified in each element to support a long-term goal. The General Plan uses the term “objective” in the Land Use, Infrastructure, and Resource Management elements. The term “policy” is used in the Housing element.

[2] Source: City of Brawley 2008

[3] Source: City of Brawley 2013a

City of Brawley Climate Action Plan

The City of Brawley was awarded a Sustainable Communities Planning Grant through the California Strategic Growth Council (SGC) to prepare the City of Brawley Climate Action Plan (Brawley CAP), which was completed in November 2019. The Brawley CAP provides an inventory of GHG emissions generating activities within the city, forecasts GHG emissions from city activities to future years, sets GHG emissions reduction targets, and identifies policies and actions to meet these targets. The GHG reduction policies and actions identified in the Brawley CAP would reduce GHG emissions associated with new and existing private development, and from municipal operations. These policies and actions are organized under five categories from which GHG emissions reductions would occur: energy conservation and efficiency; solid waste management; urban water management; transportation; and land use (City of Brawley 2019).

The GHG inventory for the City of Brawley included in this Regional CAP provides an update to the 2005 and 2012 inventories, and is intended to provide the city with a 2018 GHG inventory using methodology consistent with the region. The policies and actions identified in the 2019 Brawley CAP were incorporated into the Regional CAP as city-specific actions to reduce local emissions.

City of Brawley Non-Motorized Vehicle Transportation Plan

The City of Brawley published the *City of Brawley Non-Motorized Transportation Plan* (Brawley NMTP) in 2013. The Brawley NMTP provided an update to the city’s Bicycle Master Plan and added additional components to address pedestrian facilities, access, and safety. The Brawley NMTP provides bicycle and pedestrian network recommendations, improvements for bicyclist and pedestrian safety, and improvements to multi-modal connections, and promotion of public health benefits of bicycle and walking. The Brawley NMTP includes four goals and 21 objectives that would be implemented by the city to achieve the bicycle and pedestrian infrastructure outcomes identified through public input (City of Brawley 2013b).

City of Calexico

City of Calexico General Plan Update

The City of Calexico was awarded a Sustainable Communities Planning Grant in 2013 to update the city's General Plan, prepare a Climate Action Plan, and prepare an Agricultural Element for the general plan. The City of Calexico General Plan Update (Calexico General Plan) includes nine elements and was adopted in 2015. The Calexico General Plan incorporates by reference the City of Calexico Housing Element Update, described in more detail below, which had been prepared the year prior in 2014. A summary of the relevant objectives identified in the Calexico General Plan is provided in Table 2-4.

Table 2-4 Calexico General Plan Objectives Related to Climate Action Planning

Element	Objective	Description
Circulation	4	The City should use state-of-the-art transportation system management planning programs to increase the efficiency on all of Calexico's street system, while keeping down capital costs. This objective is supported by Policy 4.b which plans for future park-and-ride facilities.
	5	The City shall develop a transit network capable of satisfying both local and regional travel demand. This objective is supported by policies 5.a through 5.h which identify regional partnerships for improving transit access and efficiency, bicycle and pedestrian facility needs, and on-demand transit service partners.
	6	Pedestrian facilities shall be developed throughout the City to encourage walking as an alternative to the automobile. This objective is supported by Policy 6.a and 6.b which identifies improved sidewalk infrastructure throughout the city.
	7	Develop a well-designed bicycle network throughout the City that provides for safe and efficient means of transportation and recreation. This objective is supported by policies 7.a through 7.c which call for the implementation of the Bicycle Master Plan and its associated updates in the General Plan.
	11	Increase travel options which that reduce congestion and provide opportunities to create safer, more accessible streets for all users including motorists, transit vehicles, truckers, bicyclists, and pedestrians.
Economic Development	1	Create a Downtown Mixed Use Zone and other incentives to stimulate new development and the revitalization of Downtown Calexico. This objective is supported by policies that encourage infill development and increase available residential units in Downtown Calexico.
Agricultural	1	Maintain agricultural lands for the longest feasible time. This objective is supported by policies that encourage infill development, avoid "leap frog" development patterns, and maintain an agricultural buffer zone.
	2	Minimize the loss of agricultural land zoned agricultural which is located within the sphere of influence. This objective is supported by policies that preserve Prime Farmland by maintaining a compact urban form.

Source: City of Calexico 2015a

City of Calexico Housing Element

As noted previously, the City of Calexico Housing Element was updated in 2014 and addresses housing needs and demand in the city between 2013 and 2021. The Housing Element identifies four programs that describe actions the City will take to efficiently and sustainably provide housing within the city and avoid housing loss. Housing Element programs relevant to climate action planning include:

- Program #1 which encourages more intensive use of under-utilized land for residential uses and the development of mixed-use buildings near Downtown Calexico.
- Program #7 which encourages the development of affordable rental housing and identifies potential funding sources for these developments.

City of Calexico Climate Action Plan

The City of Calexico prepared the City of Calexico Climate Action Plan (Calexico CAP) through funding provided by the Strategic Growth Council and was completed in 2015. The Calexico CAP provides an inventory of GHG emissions generating activities within the city, forecasts GHG emissions from city activities to future years, sets GHG emissions reduction targets, and identifies policies and actions to meet these targets. The GHG reduction policies and actions identified in the Calexico CAP would reduce GHG emissions associated with new and existing private development, and from municipal operations. These policies and actions are organized under five categories from which GHG emissions reductions would occur: residential energy use; commercial and industrial energy use; transportation; solid waste; and municipal operations (City of Calexico 2015b).

The GHG inventory for the City of Calexico included in this Regional CAP provides an update to the 2005 and 2012 inventories, and is intended to provide the city with a 2018 GHG inventory using methodology consistent with the region. The policies and actions identified in the 2015 Brawley CAP were incorporated into the Regional CAP as city-specific actions to reduce local emissions.

City of Calipatria

City of Calipatria General Plan Update

The City of Calipatria updated its General Plan in 2015. The General Plan outlines how land is used in the city and sets goals and objectives for planning its future. The Calipatria General Plan seven elements.

City of El Centro

City of El Centro General Plan

The City of El Centro adopted its current General Plan in 2004 and updated its Housing Element most recently in 2013. The General Plan sets long-term goals and policies the City's decision makers use to guide growth and development and address the community's goals. A summary of the relevant policies identified in the El Centro General Plan and Housing Element update is provided in Table 2-5.

Table 2-5	El Centro General Plan Objectives Related to Climate Action Planning	
Element	Policy	Description
Housing[1]	4.1	Promote passive energy conservation measures through site planning and landscaping techniques.
	4.2	Encourage developers to exceed minimum Title 24 energy conservation requirements.
	4.3	Educate the public regarding simple energy conservation measures that can be implemented in the home.
	4.4	Encourage weatherization improvements, roofing repairs, window replacement, and appliance upgrades to conserve energy.
Land Use[2]	2.5	Encourage Infill development to occur within the urbanized community before expanding new development onto agricultural lands surrounding El Centro.
Circulation[2]	2.1	Coordinate with the Imperial Valley Association of Governments (now SCAG) to ensure that adequate bus service, including a fixed-route public transit system, is available for all segments of the community.
	2.2	Encourage the increased use and expansion of public transportation opportunities.
	2.3	Provide for the location of necessary transit infrastructure, such as bus stops, in major activity centers.
	2.4	Support ridesharing services and other similar alternative modes of transportation.
	3.1	Provide and maintain a system of pedestrian and bicycle access-ways that links residential areas with parks, scenic areas, schools, libraries, civic center, major employment and retail centers, and other areas of congregation within El Centro and the surrounding area.
	3.3	Encourage the incorporation of bicycle facilities, such as bike lockers and showers at workplaces, bicycle racks on buses, and bike lockers and/or racks in retail areas to facilitate bicycle travel.
	3.4	Maintain the pedestrian and bicycle system, including improving the road surface and sidewalk, to reduce safety hazards associated with drainage grates, manholes, potholes, and uneven surfaces.
	3.5	Strive to include a separation between curbs and sidewalks, such as a landscaped planting strip, as well as implementing traffic calming measures in order to reduce safety hazards to pedestrians, create "walkable" streets, and provide an aesthetically pleasing environment.
	4.4	Encourage passenger rail service between El Centro, Calexico and San Diego.
Conservation and Open Space[2]	1.2	Continue to implement the City's Urban Development Program to encourage compact and contiguous development within El Centro, minimizing the amount of agricultural land converted to urban uses.
	1.3	Promote infill and compact development to minimize the amount of agricultural land necessary for future growth.
	2.3	Promote water conservation by El Centro residents, businesses, agriculture, and government to reduce overall demand for water.
	2.4	Use recycled water for irrigation.
	2.5	Utilize drought tolerant materials in the design of parks, recreation facilities and detention basins.

Table 2-5	El Centro General Plan Objectives Related to Climate Action Planning	
Element	Policy	Description
	3.3	Develop pedestrian and bicycle trails to connect existing and new parks, consistent with the City of El Centro Bicycle Master Plan. Examine new street rights-of-way, utility easements, river banks, and the canal rights-of-way system to create the trail system.
	4.2	Create a Desert Demonstration Garden to highlight desert plant material and adapted drought tolerant plant material.
	8.4	Promote the use of geothermal energy by local residents and businesses.
	9.1	Promote energy conservation by the public and private sectors.
	9.2	Provide incentives for subdivision plans that incorporate energy conserving design.
	9.3	Encourage the use of passive solar design concepts and the retrofitting of older buildings with energy-conserving features as a way to reduce energy consumed.
	9.4	Encourage the recycling of waste heat and the application of direct geothermal energy.

[1] Source: City of El Centro 2013

[2] Source: City of El Centro 2004

Vision 2050 Strategic Plan

The City of El Centro adopted the Vision 2050 Strategic Plan in December 2015. The Vision 2050 Strategic Plan was developed as an initiative set forth by Mayor Efrain Silva to identify a pictorial representation of what the City of El Centro would look like in the year 2050. This plan includes strategies identifying how the City would achieve this vision, with the overarching goal of making El Centro a better place to live, work, and play. The Vision 2050 Strategic Plan includes five elements, each with their own goals and strategies (City of El Centro 2015). A brief summary of relevant goals and policies is provided below:

- The Quality of Life element includes Strategy QL-7 which supports the use of drought tolerant landscaping to conserve water and other resources.
- The Economic Development element includes Strategies ED-4 and ED-22 which encourage the development of underutilized properties and rehabilitation of existing development in the downtown area.
- The Development and Mobility element includes multiple strategies that encourage infill development and development along major arterials (Strategies DM-3 and DM-15), and encourage the improved pedestrian and bicycle connectivity and infrastructure (Strategies DM-7, DM-9, DM-18, DM-37, DM-38, and DM-30).

Active Transportation and Safe Routes to School Plan

In November 2019, the City of El Centro adopted its Active Transportation and Safe Routes to School Plan (ATP-SRTS) which combines previous planning efforts related to active transportation including the 2010 Bicycle Master Plan Update, city-specific portions of the 2016 Imperial County Safe Routes to School Plan, the 2008 Parks and Recreation Facilities Master Plan, and relevant goals and policies of the 2004 General Plan. The objectives of the ATP-SRTS are listed below:

- Identifying gaps and barriers, both perceived and actual, in the existing pedestrian and bicycling network where high-priority routes are disconnected.
- Analyzing the existing infrastructure around all schools to determine appropriate solutions.
- Development a methodology for prioritizing projects including family-friendly routes, first and last mile connections to transit, and a tiered network that serves both experienced riders and less experienced riders.
- Encouraging walking and bicycling as viable transportation modes.

City of Holtville

City of Holtville General Plan Update

The City of Holtville updated its General Plan in 2017, which identifies a community vision for future urban services. The Holtville General Plan emphasizes the provision of available public services to residents and businesses and ensure future growth occurs sustainably. The Holtville General Plan identifies goals and objectives for city growth and development over a 20-year period. A summary of the relevant policies identified in the Holtville General Plan is provided in Table 2-6.

Table 2-6 Holtville General Plan Objectives Related to Climate Action Planning

Element	Policy	Description
Land Use	3.2	Focus on infill growth to reduce transportation carbon emissions through promoting alternatives to driving (e.g., walking, biking, transit, and car sharing)
	5.2	Provide incentives, and where necessary, establish requirements to encourage water conservation, waste reduction and recycling, and innovative mobility systems.
	5.5	Ensure that new City buildings incorporate green building features and are models of sustainability.
Circulation	2.1	Implement the City's Complete Streets Plan in order to maintain a safe and accessible bicycle and pedestrian network that links public, civic, and recreational activity areas.
	2.2	Review progress and determine Complete Street project priorities during annual budget preparation or when funding categories become available through grants.
	2.3	Cooperate with local and regional agencies and organizations to provide accessible, efficient, affordable, and reliable transit.
Conservation and Open Space	2.2	Discourage non-agricultural development on prime farmland or farmland of statewide and local importance.
	2.5	Promote infill and higher density development within the City limits to minimize expansion into surrounding farmland that would conflict with existing and future residential development.
	2.6	Direct urbanization toward vacant lands that are not located adjacent to prime agricultural lands or into agricultural areas that are of lower quality.
	4.3	Promote water conservation by encouraging the use of reclaimed water, promoting the use of water efficient landscaping and requiring development to utilize water conservation measures.
	5.3	Promote the growth of clean industry as a method of managing air quality.

Table 2-6	Holtville General Plan Objectives Related to Climate Action Planning	
Element	Policy	Description
	6.1	Encourage the implementation and use of renewal energy resources, such as geothermal, solar, and wind.
	6.2	Inventory areas available for the management or utilization of natural resources, such as wind energy generation, hydroelectric power, geothermal power, and large-scale solar power.
	6.3	Inventory energy conservation opportunities, including transportation economies, land use patterns, and residential, commercial, and industrial conservation programs.
	6.4	Promote the incorporation of energy conserving buildings in new infill development.
	6.5	Promote weatherization and rehabilitation activities that will help existing projects meet minimum energy conservation requirements.
	6.6	Educate residents and business owners about opportunities to conserve energy in their homes and businesses.
	6.7	Promote energy efficiency and clean energy projects that include low-income weatherization, wind generated, and solar programs.
	7.2	Encourage the recycling of waste resources through Imperial Valley Resource Management Agency programs and services.
	7.3	Promote recycling of waste generated by residents in an effort to reduce the amount of solid waste disposed.

Source: City of Holtville 2017

Bicycle Master Plan

The City of Holtville Bicycle Master Plan was developed in 2014 and provides recommendations for future bikeway system developments and strategies for implementation. This Bicycle Master Plan was developed to provide implementation strategies to assist the City in meeting the goals and policies outlined in the General Plan (City of Holtville 2014). Specifically, the Bicycle Master Plan includes seven key objectives for developing bikeways that meet the City's General Plan goals and policies:

- Plan, design, and construct roadways that include facilities for bicyclists.
- Encourage cycling by recognizing there will be cyclists and plan accordingly when developing new schools, parks, and residential communities.
- Integrate bicycle facilities as part of the design and construction of new roadways and upgrade of existing roadways.
- Consider the "bicycle perspective" as a guide when designing and constructing new and improving any roadway.
- Provide opportunities for bicycle facilities that will offer facilities for all ages and physical abilities.
- Encourage educational programs that promote the safe and efficient travel of cyclists.
- Provide for bicycle access to employment, commercial, and other transportation and travel destination.

Complete Streets Plan

The City of Holtville Complete Streets Plan provides recommendations for a citywide active transportation network of bicycle paths, pedestrian improvements, and support facilities intended to ensure active transportation continues to be a viable transportation option for people of all ages and abilities to live, work, and play in the city. The Complete Streets Plan identifies deficiencies or improvement areas in the City's active transportation network and presents recommendations for specific near-term and long-term active transportation projects (City of Holtville 2016).

City of Imperial

City of Imperial General Plan

The City of Imperial updated its General Plan in 2017, with the exception of the Housing Element, which was updated in 2019. A summary of the relevant policies identified in the Imperial General Plan is provided in Table 2-7.

Table 2-7 Imperial General Plan Objectives Related to Climate Action Planning

Element	Policy	Description
Housing[1]	5.4	Explore ways to finance, staff and support local community revitalization and housing rehabilitation programs, senior citizens home repair, energy conservation, weatherization and self-help preventive maintenance programs.
	7.1	Require energy efficiency in the design and construction of housing developments through implementation of the State Energy Conservation Standards (Title 24). The long-term economic and environmental benefits of energy efficiency shall be weighed against any increased initial costs of energy saving measures. Encourage sustainable development by reducing energy use.
Land Use[2]	5.2	New residential development shall incorporate recreation and pedestrian improvements that enhance safety and mobility and provide connections to recreational amenities and services and to encourage healthy lifestyles.
Circulation[2]	2.1	Develop effective Transportation Demand Management to manage the amount of vehicles generated by a land use by promoting alternative modes of transportation and continuing to utilize technology and intelligent transportation systems to stabilize street system flow and safety.
	5.1	The City should assess the connection points between transit facilities and the various land uses and modes of travel and ensure that the transit resources can be easily accessed.
	5.2	Transit services and facilities on roadways designated as having a transit priority shall be maintained in accordance with the standards outlined in the City's street design guidelines.
	7.1	Develop a localized anti-idling ordinance to limit truck idling.
	8.1	Ensure that streets in areas with high levels of pedestrian activity (such as employment centers, residential areas, mixed use areas, and schools) support safe pedestrian travel.
	8.2	Provide pedestrian connections and amenities so that all existing and new residential streets have a sidewalk or path on at least one side of the street and promote their use.

Table 2-7	Imperial General Plan Objectives Related to Climate Action Planning	
Element	Policy	Description
	8.3	Improve safety conditions, efficiency, and comfort for bicyclists through design, maintenance, and law enforcement.
	8.4	Prioritize bicycle users through the corridor on appropriate street typologies and provide for Class II and Class III bicycle facilities to connect with key destinations as appropriate.
	8.5	The City shall support bike education events and classes that help new and experienced bike riders become more knowledgeable and effective at bike riding and bike maintenance, and safety.
	8.6	Design local pathways connecting key community features that can be used by active modes of travel, including equestrian.

[1] Source: City of Imperial 2019

[2] Source: City of Imperial 2017

City of Imperial Bicycle Master Plan

The City of Imperial adopted a Bicycle Master Plan in September 2002. The plan identifies existing bicycle ways and networks, summarizes public input on future bicycle infrastructure needs, and makes recommendations for future investments and plans. The plan proposes a future bikeway network consisting of pathways separated from the roadway, bicycle lanes, and bicycle routes that connect destinations throughout the city. In total, the recommended bicycle network is comprised of 20.36 miles of bicycle paths, lanes, and routes (City of Imperial 2002).

City of Westmorland

City of Westmorland General Plan

The City of Westmorland updated its General Plan developed and approved in 1999 and most recently updated its Housing Element in 2009. A summary of the relevant objectives identified in the Westmorland General Plan is provided in Table 2-8.

Table 2-8	Westmorland General Plan Objectives Related to Climate Action Planning	
Element	Objective	Description
Housing[1]	2.2	Provide opportunities for mixed-use development. This objective is supported by Program 2.2.1 which encourages the development of compact residential, commercial, and industrial uses in the city.
	6.1	Promote the conservation of natural resources and energy conservation in housing design and construction. This objective is supported by Program 6.1.1 through 6.1.7 which encourage partnerships with local utilities to identify energy efficiency programs, optimize building energy efficiency in new and existing developments, and consider adopting Leadership in Energy and Environmental Design provisions.
Circulation[2]	1.4	Promote a public transportation system that provides services to all segments of the City's population. This objective is supported by Policies 8 through 12 which encourage coordination with other agencies to develop efficient transit services,

Table 2-8	Westmorland General Plan Objectives Related to Climate Action Planning	
Element	Objective	Description
		prioritize bicycle and pedestrian infrastructure investments, and remove physical barriers to all non-automobile modes within the city.

[1] Source: City of Westmorland 2009

[2] Source: City of Westmorland 1999

2.5 California Environmental Quality Act

The California Environmental Quality Act (CEQA) is a statute that requires local agencies to identify significant environmental impacts of their actions and avoid or mitigate those impacts, if feasible. In 2007, California's lawmakers enacted SB 97, which expressly recognizes the need to analyze GHG emissions as part of the CEQA process. SB 97 required OPR to develop recommended amendments to address GHG emissions as an environmental effect. In response to the mandate of SB 97, the CEQA Guidelines (Section 15183.5) establish standards for the content and approval process of plans to reduce GHGs.

The Regional CAP has been prepared as an aspirational guiding document for the region to implementing GHG reduction measures that would reduce regional GHG emissions consistent with State targets and goals. However, individual agencies within the Imperial Valley would be able to prepare subsequent environmental documentation, consistent with CEQA Guidelines Section 15183.5. Pursuant to the Section, any environmental review prepared for a jurisdiction could afford development applicants to use CEQA streamlining tools for analysis of GHG emissions and related impacts for project that are consistent with each locally specific plan for reducing GHG emissions.

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Chapter 3

Regional Inventory Forecasts, and Targets

This chapter summarizes the accounting of greenhouse gas (GHG) emissions from activities within the Imperial Valley and introduces the climate action planning process. These steps, included in this chapter and briefly reiterated in Chapter 4, are comprised of: 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 or forecasts); setting emissions reduction goals over time to reduce contributions to climate change effects locally (i.e., targets); and determining actions the region or an individual jurisdiction can take to reduce emissions to meet the reduction targets (i.e., reduction strategies and measures).

3.1 Climate Action Plan Objectives

The purpose of the Imperial Valley Regional Climate Action Plan (Regional CAP) is to estimate GHG emissions generated from regional and local activites, forecast regional and local GHG emissions into the future, set GHG emissions targets for future years, and identify strategies and measures that could be implemented to achieve these targets.

The Regional CAP includes a multi-year regional inventory that summarizes GHG emissions generated in 2005, 2012, and 2018. These inventories capture emissions generated in a single year and provide benchmarks for tracking progress in reducing GHG emissions and achieving the State emissions reduction targets. Emissions targets are set for each jurisdiction within the Imperail Valley, and are described in Chapter 4. These reduction targets, set based on the 2005 inventory for each jurisdiction, are consistent with the targets and goals established under Assembly Bill (AB) 32, Senate Bill (SB) 32, and Executive Order S-3-05. In addition to providing multiple baseline years for the region to track progress towards emissions targets and goals, the inclusion of a 2005 and 2012 baseline are provided in alignment with existing climate action planning efforts taken by the Cities of Brawley and Calexico. As noted previously, the 2005 inventory is used to set emissions targets and goals. The 2018 inventory is used to as the baseline for forecasting GHG emissions, and the 2012 inventory is used to track GHG emissions trends between the 2005 and 2018 inventories.

The methodology discussed within this chapter to estimate regional and local GHG emissions, and additional methodology details included in Appendix A and Appendix B, provide a framework to estimate GHG emissions in future versions of the Regional CAP (or local climate action plans) and to track emissions over time. Regional and local agencies are encouraged to regularly prepare or update GHG inventories as new data becomes available for more recent years to track progress towards emissions targets. These updated inventories, when developed using the same methodology, can be compared to the previous inventories (i.e., 2005, 2012, and 2018 inventories) prepared in this Regional CAP and other local climate action planning efforts.

3.2 Emissions Accounting

A GHG emissions inventory provides a detailed accounting of the sources and quantities of GHG emissions generated from activities within the region or individual jurisdiction. These inventories include an accounting for emissions of a defined set of gases that contribute to climate change. The three primary GHGs quantified include: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

Refer to Chapter 2 for additional information on GHGs and their relationship to the greenhouse effect. Emissions of these gases are converted to a comparable unit by multiplying each non-CO_2 gas by their global warming potential (GWP), reporting emissions in terms of carbon dioxide equivalent (CO_2e). 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_2e ($MTCO_2e$) is the standard measurement of the amount of GHG emissions produced and released into the atmosphere.

GHG emissions accounted for in this inventory are organized by "emissions sector." Each emissions sector identifies emissions generated by activities for that specific use. Table 3-1 summarizes the emissions sectors accounted for within the Regional CAP and a brief description of emissions sources within each sector. GHG emissions were estimated for each individual jurisdiction within the region (i.e., unincorporated County or individual city). Detailed methods for estimating regional and local GHG emissions are provided in Appendix A.

Table 3-1 Regional CAP Emissions Sectors

Emissions Sector	Description
Transportation	The transportation emissions sector consists of two sources: on-road transportation and off-road transportation. On-road transportation includes emissions associated with gasoline and diesel consumption from motor vehicles on local and regional roadways. Off-road transportation includes emissions associated with gasoline and diesel fuel consumption from recreational vehicles, construction equipment, and residential and commercial equipment.
Energy	The energy emissions sector accounts for emissions associated with electricity, natural gas, and propane consumption in residential and non-residential buildings.
Water	The water emissions sector accounts for emissions associated with the electricity required to supply, convey, and distribute water to residents and businesses within the region. This sector also accounts for emissions associated with the treatment of potable water and process emissions generated by wastewater treatment processes.
Solid Waste	The solid waste emissions sector accounts for emissions associated with the disposal of mixed and organic waste in landfills generated by residents and businesses in the region.
Agriculture	The agricultural emissions sector accounts for emissions generated by stationary fuel combustion, gasoline and diesel fuel consumed in off-road agricultural equipment, and agricultural processes (i.e., crop production, livestock enteric fermentation, and livestock manure management).

Notes: Regional CAP = Imperial Valley Regional Climate Action Plan

See Appendix A for details.

3.3 Regional Emissions Inventory

The regional GHG emissions inventory provides a multi-year view of the jurisdictions in the Imperial Valley including:

- City of Brawley
- City of Calexico
- City of Calipatria
- City of El Centro
- City of Holtville
- City of Imperial
- City of Westmorland
- Imperial County (i.e., all unincorporated areas)

Local GHG emissions were estimated based on activities occurring within, or originating from, the boundary of each jurisdiction. Emissions from transportation, energy, water, and solid waste were estimated based on jurisdiction-specific data and activities. Emissions from agricultural activities are reported at the county level and apportioned to each jurisdiction within the Imperial Valley based on sector specific economic data. Additional details on the factors and sources used to estimate regional and local GHG emissions are provided in Appendix A.

3.3.1 Methodology and Emissions Sectors

GHG emissions were calculated using the International Council for Local Environmental Initiatives (ICLEI) methodologies, specifically, the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions Version 1.2 (Community Protocol) (ICLEI 2019). Specific methodologies used within this inventory are described below, by emissions sector, and described in further detail in Appendix A.

Transportation

Emissions from the transportation sector are primarily associated with fuel combustion in vehicles and equipment. This includes the consumption of fuel by both on-road vehicles (e.g., passenger cars and trucks operating on roadways) and off-road vehicles (e.g., operation of heavy-duty construction equipment).

On-Road Transportation

GHG emission from on-road transportation were estimated based vehicle miles traveled (VMT) and vehicle fleet emissions factors for each inventory year. Regional VMT data and methodology were obtained through the Southern California Association of Governments' (SCAG's) trip-based model and the Regional Target Advisory Committee's (RTAC) origin-destination methodology, pursuant to Senate Bill (SB) 375. The VMT attributed to each jurisdiction is based on trips that would begin and/or end within that jurisdiction's boundaries. VMT from vehicle trips that begin and end outside of a jurisdiction's boundary (i.e., pass-through trips) are not included in that jurisdiction's VMT. GHG emissions from each vehicle type (i.e., light-duty automobile, medium duty vehicle, heavy duty truck) were estimated based on emissions factors for each inventory year from the California Air Resources Board (CARB) Emission Factors (EMFAC) 2017 model (CARB 2019) and ICLEI's Community Protocol.

Off-Road Transportation

GHG emissions from off-road transportation were estimated using CARB's OFFROAD models, which estimate emissions from off-road equipment at the county level. CARB currently has two OFFROAD models, OFFROAD 2017 and OFFROAD 2007. OFFROAD 2017 updates emissions estimates originally modeled in 2007, but only for select equipment types. Per CARB recommendations, off-road equipment emissions missing from OFFROAD 2017 were taken from OFFROAD 2007 (CARB 2021). Countywide emissions from off-road activities were scaled to individual jurisdictions based on jurisdictional specific off-road activities (e.g., construction jobs, pleasure craft, or agricultural operations) compared to countywide levels for the same activities. For the purposes of this inventory, off-road emissions from agricultural operations are included in the agriculture sector.

Energy

GHG emissions from the energy sector are associated with electricity, natural gas, and propane consumption in residences; and commercial, municipal, and industrial buildings. Emissions associated with these activities are estimated based on energy source consumption and emissions factors.

Electricity

Emissions generated from electricity consumption are associated with the GHG emissions generated at the source of electricity generation. GHG emissions are estimated based on total electricity consumed, emission factors associated with the electricity supplied to the region, and electricity lost through transmission and distribution. The Imperial Irrigation District (IID) supplies electricity to cities and unincorporated communities in Imperial Valley. Total electricity consumption and emissions factors associated with electricity generation were provided by IID and the U.S. Environmental Protection Agency's (EPA's) *Emissions and Generation Resource Integrated Database* (EPA 2008). Although electricity loss from transmission and distribution occurs outside of the region, these emissions are attributed to countywide activities as the need for transmission was based on regional electricity demand. Emissions from transmission and distribution loss were estimated based on emission factors provided by IID.

Natural Gas

Emissions from natural gas are generated from the direct burning of natural gas in homes and other buildings (e.g., water heating, cooking). The Southern California Gas Company (SoCalGas) supplies natural gas to the Imperial Valley. GHG emissions were estimated for the end-use application in residential and commercial buildings only. Due to California Public Utilities Commission (CPUC) data privacy rules, natural gas associated with industrial uses in the region were not provided and are not included in this inventory. An emissions factor from *The Climate Registry 2018 Default Emissions Factors* (The Climate Registry 2018) was applied to annual natural gas use for inventory years.

Propane

Emissions from propane are generated from the direct burning of propane in residential and commercial uses in appliances and equipment. Emissions are estimated by multiplying emissions factors, specific to each inventory year, from the EPA (EPA 2020) with total propane consumption in each jurisdiction. Residential propane usage was estimated by looking at the difference in the number of households served by SoCalGas and the number of households for each jurisdiction report by SCAG. This difference was then multiplied by the average annual residential propane usage per household (Energy Information Administration 2018:Table CE2.5). Non-residential propane usage was estimated based on employment levels in Imperial Valley and non-residential propane usage per job, calculated from non-residential propane sales and total employment in the state in 2017 (Propane Education and Research Council 2017).

Water

Emissions associated with water sector are generated from the treatment and conveyance of potable water and fugitive emissions from the treatment of wastewater. Emissions associated with water distribution would also result from electricity required to collect and convey water within each jurisdiction. However, due to limitations from separating electricity consumption for water collection and conveyance, these emissions are included in the energy sector.

Potable Water

IID supplies potable water to six of the seven incorporated cities in the Imperial Valley. The City of Calipatria receives water directly from the State Water project. Each incorporated city owns and operates a potable water treatment plant that treats and conveys potable water to uses within that jurisdiction. Data for potable water conveyance in the unincorporated County was not available at the time of the GHG inventory preparation. For this reason, GHG emissions generated from the potable water sector are included within the inventory for informational purposes and are not included in the total regional or jurisdiction-specific inventories.

Wastewater

Similar to potable water, wastewater treatment and disposal is individually managed by jurisdictions within Imperial Valley. ICLEI's Community Protocol methodology was used to estimate emissions from electricity consumed from the collection and treatment of wastewater, and fugitive gases from wastewater treatment processes. Wastewater volumes were estimated using IID's 2012 *Integrated Regional Water Management Plan* (IID 2012), wastewater flow rates, and jurisdictional populations. Jurisdiction-specific wastewater information was also provided by the 2015 Urban Water Management Plans for the cities of Brawley, Calexico, and El Centro.

More than half of the unincorporated County's population is served by on-site septic systems (Imperial County Public Health Department 2015). On-site septic systems generate GHG emissions from off-gassing of septic tanks. Emissions generated from septic system off-gassing were estimated using ICLEI's Community Protocol (method WW.11).

Solid Waste

GHG emissions are generated in the solid waste sector from the decomposition of waste at landfills and waste processing equipment. Solid waste generated in Imperial Valley is disposed at various landfill facilities throughout the region; however, a majority of this waste is disposed of at the Imperial Landfill and Monofill facility. The volume of solid waste disposed at landfills in the county were obtained from each jurisdiction-specific data and the California Department of Resources Recycling and Recovery (CalRecycle). GHG emissions were estimated using methodology from ICLEI's Community Protocol which includes the emissions associated with landfill gas capture at the Imperial Landfill. GHG emissions would also be generated from the transport and collection of solid waste.

However, these emissions are captured in regional VMT estimates and included in on-road vehicle emissions estimates.

Agriculture

Emissions are generated in the agriculture sector from stationary sources such as irrigation pumps, off-road equipment, and agricultural processes. A majority of the GHG emissions generated from the agricultural sector occur within the unincorporated County; however, some incorporated cities have existing agricultural activities occurring within their boundaries. In general, agriculture sector emissions are estimated at the countywide level and apportioned to each jurisdiction based on the proportion of agricultural land cover as defined in U.S. Department of Agriculture's 2016 LANDFIRE dataset. This approach revises to the apportionment conducted in the Draft CAP (March 2021) per comments received from the City of El Centro.

Stationary Sources

Emissions from stationary sources at agricultural uses are primarily associated with the use of irrigation pumps. Irrigation pump activity data and emissions factors were obtained from the CARB Emissions Inventory Methodology (CARB 2006) and interpolated for inventory years based on countywide population. Emissions estimates account for average horsepower, hours of operation, and load factors for equipment. Emissions from stationary sources were apportioned to each jurisdiction based on the number of agricultural jobs.

Off-Road Agricultural Equipment

Off-road equipment associated with agricultural activities generate GHG emissions from fuel combustion. Fuel use from equipment was obtained from OFFROAD2007 (CARB 2007). Off-road equipment emissions were conservatively adjusted to account for high engine load factors. Emissions from off-road agricultural equipment were apportioned to each jurisdiction based on the number of agricultural jobs.

Agricultural Processes

GHG emissions are generated from processes associated with agricultural activities including:

- crop production;
- enteric fermentation; and
- manure management.

Crop production generates GHG emissions through the burning of crop residue, off-road gasoline and diesel agricultural equipment (including irrigation pumps), and soil management activities. Data for crop burning was provided by the Imperial County Air Pollution Control District (ICAPCD). Emissions from crop burning were calculated using methodology from CARB's *California GHG Emissions Inventory* (CARB 2019). Off-road agricultural equipment emissions were available from CARB's OFFROAD 2017 model. The number of diesel irrigation pumps in the county was provided by ICAPCD, and emissions related to the operation of those pumps were calculated using assumptions published in CARB's *Emission Inventory Methodology* (CARB 2003). Fertilizer application rates for each crop type grown in the county were gathered from the University of California Davis Agricultural and Resource Economics Archived Cost and Return Studies database (University of California Davis 2020). Soil management and the application of fertilizer generate nitrous oxide (N_2O) emissions through the process of microbial nitrification. Emissions from fertilizer application were estimated using guidance from the Intergovernmental Panel on Climate Change's (IPCC) *Guidelines for National Greenhouse Gas Inventories* (IPCC 2006).

Enteric fermentation from livestock generates GHG emissions through the release of CH_4 from the digestive processes of ruminant animals. Livestock populations for inventory years were obtained from the U.S. Department of Agriculture's (USDA's) *Census of Agriculture data and the Census Data Query Tool* (USDA 2017) and CARB's *Documentation of California's GHG Inventory Index* (CARB 2019).

Emissions from manure management are generated from direct off-gassing of CH_4 and N_2O, and indirect N_2O off-gassing from surface run-off or off-site deposits. Manure management emissions were estimated using the same methodology as enteric fermentation to estimate livestock populations, and additional methods for estimating direct and indirect manure off-gassing, consistent with the *Documentation of California's GHG Inventory Index* (CARB 2019). This approach assumes that the types of manure management practices in the Imperial Valley reflect the state average. Jurisdiction-specific manure management profiles were not available.

Ports of Entry

Within the Imperial Valley there are two Ports of Entry (POE) that serve as the conduit for truck and vehicle trade and commerce between California and the U.S. and the Mexican State of Baja California. Both POEs, the Calexico West POE and Calexico East POE, are located within the City of Calexico. The Calexico West POE is the third largest land POE in California, processing an estimated four million northbound commercial and passenger vehicles per year (U.S. General Services Administration 2020). Vehicle use at the POE generate both air pollutants and GHG emissions from vehicle idling and engine start-up. Beyond the generation of GHG emissions which contribute to global climate change, air pollutants generated by vehicle operations at the POEs can result in direct impacts to air quality and health in adjacent communities. Serious health concerns include increased rates of asthma or cardiovascular disease, and exacerbation of preexisting health conditions due to reduced air quality. However, because the POEs within Calexico are operated and regulated by federal governments and integral to international trade, there is limited regional or local ability to implementing activities to reduce the generation of air pollutants and GHGs at these locations. Though GHG emissions associated with vehicle use at POEs is included within the regional inventory, they are not apportioned to local jurisdiction inventories due to limited authority to reduce emissions.

GHG emissions at POEs were estimated based on traffic data from ICAPCD's *2015 Vehicle Idling Emissions Study at Calexico East and Calexico West Ports-of-Entry* (ICAPCD 2015). Emissions factors were obtained from EMFAC2017 and applied to the traffic data by vehicle class. Traffic data was only available for the year 2015. Due to limited data to interpolate traffic and emissions for other years, emissions estimates for 2015 were assumed constant for all other inventory years.

3.3.2 Regional Emissions Inventory

Based on the methodologies and data described previously, a summary of regionwide GHG emissions generated from activities within the Imperial Valley is shown in Table 3-2. In general, emissions in the region have steadily decreased between 2005 and 2018.

Table 3-2 Imperial Valley Regional GHG Emissions Inventory

Emissions Sector	Year						
	2005		2012		2018		
	$MTCO_2e$	% Total	$MTCO_2e$	% Change from 2005	$MTCO_2e$	% Total	% Change from 2005
Transportation	656,655	16%	650,729	-1%	748,111	20%	+14%
Energy	1,006,987	25%	757,037	-25%	484,863	13%	-52%
Water	28,114	1%	30,158	-6%	34,291	1%	-12%
Solid Waste	218,847	5%	132,773	-39%	148,337	4%	-32%
Agriculture	2,081,481	52%	2,155,325	+4%	2,354,168	62%	+13%
Propane	13,698	0.3%	14,856	+8%	19,112	1%	+40%
Calexico POE[1]	12,649	0.3%	12,649	N/A	12,649	0.3%	N/A
Total[2]	4,018,430	**100%**	3,753,527	100%	3,801,531	100%	**-5%**

Notes: Columns may not add due to rounding.

[1] Data for emissions at the POEs was only available for 2015. For the purposes of this inventory, emissions estimates from 2015 were assumed constant for each inventory year. Emissions from POEs are not apportioned to individual jurisdictions.

[2] Electricity consumption associated with potable water treatment and delivery is not included in this total, as data for this activity was not available for unincorporated County.

GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; N/A = information not available; POE = Port of Entry

See Appendix A for details.

3.4 Regional Emissions Forecasts

GHG emissions forecasts 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 forecasts provide insights to the scale of regional and local reductions needed to achieve GHG emissions reduction targets.

The Regional CAP uses two emissions forecasts, 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 regional and local demographic growth forecasts (SCAG 2020). The BAU forecast 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. The Legislatively-Adjusted

BAU forecasts provide a reduction from BAU levels, accounting for federal and State actions that are expected to take place in the future.

The GHG emission forecasts were estimated for 2020, 2030, and 2050 using jurisdiction specific demographic data from demographic and growth forecasts provided by SCAG, and vehicle activity projections from the SCAG's trip-based model. The Imperial Valley is anticipated to experience relatively moderate growth between 2018 (i.e., the baseline year from which emissions are forecasted) to 2050. Details on how the projections were developed and activity data used to forecast emissions for each sector are included in Appendix B.

3.4.1 Business-As-Usual Forecast

The BAU forecast assumes a 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. The baseline year for the regional GHG forecast is 2018. Therefore, federal, State, and local policies, programs, and regulations designed to take effect in future years (i.e., post-2018), as well as the associated GHG reductions, are not considered.

Regional emissions in 2020, 2030, and 2050 were estimated under the BAU forecast. Under the BAU forecast, emissions generated from activities in the Imperial Valley are projected to decrease through 2020, before increasing in 2030 and 2050, shown in Table 3-3. The estimated decrease in BAU emissions for year 2020 is likely due to the implementation of State actions and local choices that resulted in fewer emissions, including use of improved regionwide renewable energy portfolios, decreased residential and commercial water usage, improved vehicle standards and turnover of vehicle fleets, and implementation of local CAPs. The increase in emissions above baseline levels in 2030 and 2050 is primarily attributed to increases in regional population and jobs.

3.4.2 Legislatively-Adjusted Forecast

The Legislatively-Adjusted BAU forecast accounts for a variety of approved legislative actions that would reduce BAU emission in the region by estimating the impacts of these actions on the various GHG emissions sectors and adjusting emissions levels accordingly. This forecast includes federal and State actions and does not account for regional or local government actions such as the implementation of measures identifies in this Regional CAP or local climate action planning efforts. The legislative actions applied in this forecast include:

- 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.[1]
- 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

1 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.

Renewables Portfolio Standard (RPS), IID power mix would include at least 60 percent renewables by 2030, and 100 percent renewables and zero-carbon sources by 2045.

- California Energy Efficiency Programs: The California Public Utilities Commission (CPUC) sets energy efficiency targets for utilities companies in the state, including IID. 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 legislation mentioned is forecasted reduce GHG emissions in the Imperial Valley below BAU levels, and below baseline emissions levels through 2050. A summary of estimated regional emissions under Legislatively-Adjusted BAU forecasts is shown in Table 3-3.

3.4.3 Regional Emissions Forecast Summary

Table 3-3 and Figure 3-1 show the regional emissions forecast summary for the Imperial Valley during projected years 2020, 2030, and 2050. It should be noted that GHG emissions for POE were not forecasted and were not included in the forecasted emissions totals.

Table 3-3 Imperial Valley Regional GHG Emissions Forecasts

Emissions Sector	Year						
	2018 (Baseline)	2020		2030		2050	
		BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted
Transportation	748,111	815,181	781,923	917,032	700,321	1,068,046	742,243
Energy	484,863	506,202	407,891	612,893	374,469	826,274	76,768
Water	45,133	35,692	35,692	42,698	42,698	56,710	56,710
Solid Waste	148,337	154,506	154,506	185,347	185,347	247,030	247,030
Agriculture	2,354,168	2,318,609	2,318,609	2,317,746	2,317,746	2,315,907	2,315,907
Propane	19,112	20,081	20,047	24,928	24,555	34,624	33,572
Calexico POE[1]	12,649	N/A	N/A	N/A	N/A	N/A	N/A
Total	**3,801,531**	**3,850,271**	**3,718,668**	**4,100,645**	**3,645,137**	**4,548,592**	**3,472,230**
% Change from 2005	*-5%*	*-4%*	*-7%*	*2%*	*-9%*	*13%*	*-14%*

Notes: Columns may not add due to rounding.

[1] POE emissions not forecasted.

GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent; POE = Port of Entry

See Appendix B for details.

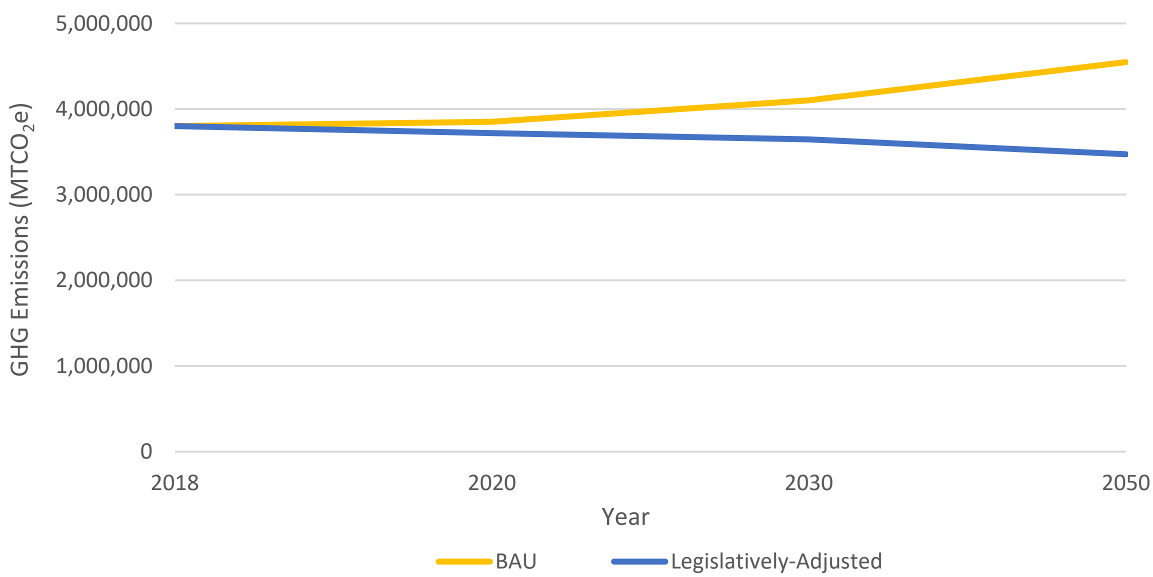

Figure 3-1 Forecasted GHG Emissions in Imperial Valley

3.5 Greenhouse Gas Reduction Targets

The primary objective of the Regional CAP is to identify strategies and measures that would assist local agencies in reducing GHG emissions to levels consistent with State targets and goals. CARB's *California 2017 Climate Change Scoping Plan* (2017 Scoping Plan) provides a pathway to achieving State targets as directed by 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. The State's legislative 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.

The 2017 Scoping Plan estimates sector-specific emissions targets, such as for the transportation and energy sectors, based on CARB's planned legislation for those sectors and CARB's statewide emissions forecasts. At the state level, the cumulative effect of these targets is anticipated to achieve the 2030 statewide target and put the state on a pathway to achieving the 2050 targets. CARB recommends that local governments evaluate and adopt robust quantitative and locally-appropriate goals that align with the State's sustainable development objectives. As a largely agricultural community, the relative contributions of the emissions sectors in Imperial Valley are not reflective of the state as a whole. Therefore, the 2030 targets for the agricultural sector and non-agricultural sectors were extracted from the 2017 Scoping Plan. For agricultural emissions, CARB targets an average of a six percent reduction between 1990 and 2030. For non-agricultural emissions (excluding contributions from the Cap-and-Trade Program), CARB targets an average of a 29 percent reduction between 1990 and 2030. These targets were respectively applied to the agricultural and non-agricultural emissions for each jurisdiction in the Imperial Valley. This means that communities that have a greater percentage of agricultural emissions will tend to have lower GHG emissions reduction targets due to the lower reduction anticipated from agriculture compared to other sectors at the state level. This methodology updates and refines the target estimates included in Appendix B.

The 2030 targets were scaled to 2050 based on the relative increase in stringency of the statewide GHG target (e.g., At the state level, 2050 targets [80% below 1990] are twice as stringent as the 2030 targets [40% below 1990], so the agricultural sector emissions targets are 12 percent below 1990 levels by 2050). To establish the 1990 baseline from which to quantify the numerical targets, the 1990 GHG emissions estimates were assumed to be 85 percent of 2005 emissions for all jurisdictions and sectors.

No separate regional reduction targets or goals are set within the Regional CAP as implementation of GHG reduction measures would primarily occur at the local level. GHG reduction targets in this Regional CAP are identified for each individual jurisdiction, and are set as reduction targets and goals from 2005 levels. The purpose of identifying jurisdiction-specific GHG reduction targets is to properly allocate the level of investment that would be needed to reduce emissions based on local activities. Locally-specific GHG emissions reduction targets are described for each jurisdiction in Chapter 4, along with a summary of the local emissions gap required to meet these targets.

3.6 Regional GHG Reduction Measures

To achieve GHG reduction targets and goals, jurisdictions within the Imperial Valley can implement a variety of reduction measures. To assist local agencies in identifying and quantifying reduction measures, ICTC, in partnership with local agencies, identified measures for each emissions sector that could be implemented regionally. These measures are focused on reducing emissions on the local scale and to close the emissions gaps (i.e., the amount of GHG emissions that would need to be reduced to achieve reduction targets and goals) for each jurisdiction. This Regional CAP includes 46 locally-based strategies, under five emissions sectors. These local measures are intended to serve as the foundation for identifying and addressing ways in which the region can reduce GHG emissions. Table 3-4 provides the list of regional reduction measures from which local jurisdictions were able to identify which measures would be feasible for implementation. Reduction measures identified for implementation in each jurisdiction are outlined in Chapter 4. Although all measures shown in Table 3-4 would result in GHG reductions, Chapter 4 only includes measures that were quantifiable based on available data. These measures were quantified based on best available data, though the assumptions behind these calculations may be further confirmed by each jurisdiction. Many of the measures not shown in Chapter 4, but included in Table 3-4, can be further quantified if the relevant data and research are available or if measure inputs can be validated by the jurisdictions.

Table 3-4 Greenhouse Gas Reduction Measures

Measure Number	Measure Description
Transportation	
Strategy: T-1 Reduce Vehicle Miles Travelled	
T-1.1	Create a ridesharing program for agricultural workers modeled after the Green Raiterios program in the San Joaquin Valley.

Table 3-4	Greenhouse Gas Reduction Measures
Measure Number	Measure Description
T-1.2	Plan and implement a system of bicycle lanes and multi-use trails that link the cities, unincorporated communities, schools, commercial/retail, employment centers, health care service facilities, public transportation, and other points of interest.
T-1.3	Develop and implement active transportation projects such as roadway modifications to install bike lanes, sidewalks, pathways and other infrastructure that encourages and facilitates walking and bicycling.
T-1.4	Adopt Complete Street Ordinances to ensure that streets and roads are designed and operated as a balanced, multimodal transportation network that enables safe access for all users.
T-1.5	Adopt zoning changes that encourage higher density mixed use development in incorporated cities.
T-1.6	Develop an inter-city shuttle program.
T-1.7	Support education programs that emphasize the health benefits of walking and bicycling.
Strategy: T-2 Reduce Fuel Consumption	
T-2.1	Require projects with loading docks to provide electric outlets to power truck refrigeration units rather than allow trucks to idle while unloading.
T-2.2	Synchronize traffic signals to reduce idling.
T-2.3	Require new development projects to use EPA-rated Tier 4 final off-road diesel engines when electric-powered construction equipment is infeasible or unavailable.
T-2.4	Work with the air district to establish an incentive program to trade in fossil fuel-powered landscaping equipment with electric versions.
Strategy: T-3 Increase Use of Zero Emission/Alternative Fuel Vehicles	
T-3.1	Transition to a more fuel-efficient municipal vehicle fleet.
T-3.2	Install public electric vehicle charging stations.
T-3.3	Require electric vehicle charging stations at new non-residential developments.
T-3.4	Explore local "cash for clunkers" or similar incentive programs that provide access to new or used zero emission on-road vehicles.
Energy	
Strategy E-1: Increase Energy Efficiency	
E-1.1	Require new residential developments to install alternatively powered water heaters
E-1.2	Encourage the design of new construction projects to be oriented and landscaped to enhance natural lighting, solar access, and passive heating or cooling opportunities
E-1.3	Reduce or eliminate natural gas and propane consumption in new and existing residential buildings
E-1.4	Incorporate cool pavements into the design of municipal buildings and code requirements for private developments projects. (e.g., parking lots, driveways, other hardscapes).
E-1.5	Require major renovations to incorporate energy efficiency measures
E-1.6	Retrofit streetlights with LEDs.
E-1.7	Develop a behavior change program for energy efficiency and conservation. This program would provide energy literacy training for low-income customers on buying energy-efficient products or using energy more efficiently; develop and offer digital applications offering real-time energy use information to residents and businesses; offer anonymized data on community energy use for

Table 3-4	Greenhouse Gas Reduction Measures
Measure Number	Measure Description
	residents to compare performance; and provide rewards or rebates for improved energy conservation.
Strategy E-2: Increase Renewable and Zero-Carbon Energy Generation	
E-2.1	Identify County and city owned land near existing transmission lines that can be leased to third parties to install and operate ground mounted solar photovoltaic projects.
E-2.2	Create renewable energy zones that identify preferred areas for utility-scale energy development, similar to that currently under development in San Diego County as part of their CAP. Solar, Wind, and Geothermal energy could be a particular focus.
E-2.3	Require large parking lots for new commercial development projects to include solar canopies to produce on-site renewable energy, and provide shading for energy efficiency benefits.
E-2.4	Supply municipal facilities with on-site renewable electricity.
E-2.5	Adopt a reach code to require new commercial developments to achieve zero net energy.
E-2.6	Establish or join program to increase grid-supply renewable and zero-carbon electricity.
E-2.7	Support local school district's efforts to install solar PV systems.
Strategy E-3: Develop Clean Energy Jobs	
E-3.1	Explore attracting clean energy manufacturing and/or final product assembly to Imperial Valley Foreign Trade Zone #257. This may allow foreign and domestic clean energy businesses to take advantage of tax and tariff incentives for products sold into the international market. Photovoltaic solar panels and lithium-ion batteries sourced from locally extracted mineral deposits are technologies that could be considered.
E-3.2	Publish information on clean energy training opportunities on County and city websites.

Table 3-4	Greenhouse Gas Reduction Measures
Measure Number	Measure Description
Water	
Strategy WT: Increase Water Use Efficiency	
WT-1.1	Encourage the use of non-potable water, such as tertiary treated wastewater and household graywater, for industrial, agricultural, and landscaping needs
WT-1.2	Develop and adopt LID standards, policies, and update codes and ordinances to require LID for new development and redevelopment priority projects to reduce stormwater.
WT-1.3	Coordinate with water districts to develop region-specific incentives for drought-tolerant landscaping in new and existing residential developments.
Waste	
Strategy WS: Reduce and Recycle Solid and Organic Wastes	
WS-1.1	Provide recycling and composting receptacles and use of biodegradable or recycled-material products at municipal facilities and events, where feasible.
WS-1.2	Promote alternative uses of agricultural and organic waste by promoting the construction of composting and anaerobic digestion facilities.
WS-1.3	Create waste diversion ordinances for construction projects.
Agriculture and Conservation	
Strategy AG: Improve Farming and Grazing Practices	
AG-1.1	Work with utilities and/or air districts to provide incentives such as CARB's FARMER program to convert stationary diesel- or gas-powered irrigation pumps to electric pumps that are connected to the grid or use off-grid alternative/renewable energy sources, such as solar.
AG-1.2	Work with utilities, dairies, ranches, and others to expedite permitting and promote energy generation, flaring, and methane capture systems at manure management facilities at cattle ranches and dairy farms.
AG-1.3	Provide incentives for replacing gas- or diesel-powered agricultural equipment with electric or alternatively-fueled equivalents.
AG-1.4	Work with local grocers to encourage the sale of locally-grown produce.
AG-1.5	Work with farmers to either reduce or replace the use of synthetic nitrogen-based fertilizers with compost alternatives.
Strategy AG: Promote Carbon Sequestration and Land Conservation	
AG-2.1	Consider various agricultural land and open space conservation strategies that allow developers to preserve lands and/or increase residential development density in smart growth infill areas by removing development potential of lands.
AG-2.2	Target stream restoration programs and riparian restoration strategies for carbon sequestration, natural heat relief, water quality improvements, and/or wildlife habitat mitigation.
AG-2.3	Plant trees at parks and public rights-of-way.
AG-2.4	Develop and enforce landscape tree requirement for new developments.

CAP = Climate Action Plan; CARB = California Air Resources Board; EPA = U.S. Environmental Protection Agency; FARMER = Funding Agricultural Replacement Measures for Emissions Reductions; LED = light emitting diode; LID = low impact development; PV = photovoltaic

3.7 Co-Benefits of Reduction Measures

While the strategies and measures included in the Regional CAP are generally geared towards reducing GHG emissions at the local level, many also result in environmental or economic "co-benefits." Environmental co-benefits include improvements to air quality, water supply, or biological resources, and improved public health outcomes. Economic co-benefits include reduced energy costs and improved community character. The GHG reduction strategies identified in Table 3-4, and identified for each jurisdiction in Chapter 4, provide a range of co-benefits locally and throughout the region. Co-benefits associated with strategies and measures in the Regional CAP include:

- Improved Air Quality
- Improved Energy Efficiency
- Enhanced Community Character
- Improved Land Use Efficiency
- Improved Public Health
- Restored Natural Ecosystems
- Increased Renewable Energy
- Enhanced Mobility
- Reduced Waste
- Improved Water Quality
- Increased Water Efficiency
- Improved Resiliency to Climate Change Impacts

In addition to these co-benefits, the Regional CAP would provide other local and regional benefits. The Regional CAP allows each jurisdiction to identify and implement GHG reduction strategies and measures that are most advantageous to the community, while also demonstrating consistency with State targets and goals for achieving GHG reductions.

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Chapter 4

Local Profiles

As described in Chapter 3, reductions of greenhouse gas (GHG) emissions would be achieved through local implementation of the measures identified in the Imperial Valley Regional Climate Action Plan (Regional CAP). This chapter presents the GHG inventory, forecasts, and emissions reductions for each jurisdiction in the Imperial Valley, including the County of Imperial (County) and seven cities: Brawley, Calexico, Holtville, El Centro, Imperial, and Westmorland.

This chapter is organized into separate subchapters for each jurisdiction in the Imperial Valley. Each subchapter includes:

- Jurisdiction Background: A brief description of each jurisdiction including location and existing climate action planning efforts.
- Emissions Inventory and Forecasts: A jurisdiction-specific summary of GHG emissions generated from communitywide activities and emissions forecasts consistent with Chapter 3. Communitywide emissions inventories and forecasts were developed using the same methodology as the regional inventory and forecast, including breakdown by emissions sector. Federal, State, and regional efforts or programs that would result in local emissions reductions are included in these forecasts.
- Reduction Targets: A description of the GHG reduction targets for each jurisdiction to be achieved to demonstrate consistency with State reduction targets and goals. Local reduction targets are based on jurisdiction-specific inventories and forecasts and used to identify the emissions gap required to achieve these targets.
- Reduction Measures: A list of the GHG reduction measures, based on those identified in Chapter 3, that would be implemented in each jurisdiction to reduce communitywide emissions. Reduction measures for each community were selected in coordination with agency staff through the engagement process and identified as effective measures for implementation based on local conditions within each agency.

As described previously, the intent of this chapter is to provide each jurisdiction in Imperial Valley with a baseline GHG inventory and forecast and identify reduction measures that could be implemented to achieve local reduction targets and goals. Each jurisdiction will have the option, following the adoption of the Regional CAP to integrate the inventory, forecast, and reduction measures identified herein into existing or future climate action planning efforts. This approach is intended to offer flexibility to jurisdictions in the Imperial Valley to participate in the Regional CAP at a level that is feasible and practical for each community.

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4.1 Imperial County

Imperial County (County) includes the unincorporated areas and communities within the county. As of 2018, approximately 21 percent of the county's population (40,007 residents) lived in unincorporated areas. The County is located in the southeast corner of California, and bordered by San Diego County to the west, Riverside County to the north, the Colorado River/State of Arizona to the east, and Mexico to the south. Nearly half of the lands in the unincorporated county are undeveloped and under federal ownership and jurisdiction. The County includes eight unincorporated communities of Bombay Beach, Heber, Niland, Ocotillo, Palo Verde, Salton City, Seeley, and Winterhaven.

4.1.1 Emissions Inventory and Forecasts

As part of the Imperial Valley Regional Climate Action Plan (Regional CAP), a greenhouse gas (GHG) emissions inventory and forecast were prepared for the region and each individual jurisdiction in Imperial Valley. This inventory and forecast estimate GHG emissions from communitywide activities, organized by emissions sector (i.e., energy, transportation, water, waste, and agriculture). GHG emissions quantities are expressed in terms of metric ton of carbon dioxide equivalent ($MTCO_2e$). The regional and local inventories include GHG emissions estimates for the years 2005, 2012, and 2018. GHG emission forecasts provide an estimate of future emissions levels based on current trends and activities. The Regional CAP includes two emissions forecast scenarios for regional and local emissions: the business-as-usual (BAU) scenario, and the Legislatively-Adjusted BAU scenario. A summary for the methodologies and regional estimates is provided in Chapter 3. Additional details for inventory and forecast assumptions and data are provided in Appendices A and B.

In 2018, it is estimated that communitywide activities in the County generated approximately 2,840,144$MTCO_2e$. Emissions from on-road and off-road transportation, which include emissions associated with fuel combustion in vehicles, account for the greatest contribution to emissions generated in the unincorporated county. Emissions from energy, which includes electricity and natural gas consumption, accounted for the second largest contribution to emissions. Generally, overall emissions have decreased since 2005, including emissions from the energy, water, and waste sectors. However, emissions from on- and off-road transportation have increased by approximately 22 percent between 2005 and 2018. The 2005, 2012, and 2018 inventories by emissions sector for the County are summarized in Table 4.1-1.

Table 4.1-1 Imperial County Greenhouse Gas Emissions Inventory

Emissions Sector	GHG Emissions ($MTCO_2e$)		
	2005	2012	2018
Energy	217,854	160,494	98,708
Transportation	278,059	280,188	339,132
Water	8,106	8,850	9,694
Waste	98,583	55,249	49,635
Agriculture	2,071,585	2,145,078	2,342,975
Total	2,674,188	2,649,858	2,840,144

Table 4.1-1	Imperial County Greenhouse Gas Emissions Inventory		
% Change from 2005	--	-1%	6%
Wastewater Collection[1]	3,518	2,887	1,880
Potable Water Consumption[1]	N/A	N/A	N/A

Notes: Columns may not add due to rounding. N/A = not available

[1] Presented for informational purposes only. Potable water consumption activity for the unincorporated County was not available.

GHG = greenhouse gas(es); $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020.

Emissions forecasts were prepared for the County under BAU and Legislatively-Adjusted BAU conditions. Forecasts were prepared to estimate future emissions from communitywide activities in 2020, 2030, and 2050. These forecasts were prepared consistent to the regional BAU and Legislatively-Adjusted BAU forecasts presented in Chapter 3. Additional details for forecast methodology and assumptions are provided in Appendix B. The 2020, 2030, and 2050 forecasts for the County are summarized in Table 4.1-2.

Table 4.1-2 Imperial County Greenhouse Gas Emissions Forecasts

Emissions Sector	GHG Emissions ($MTCO_2e$)					
	2020		2030		2050	
	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted
Energy	103,179	83,395	125,536	77,273	170,250	18,904
Transportation	380,629	364,994	428,375	325,380	494,343	342,379
Water	10,149	10,149	12,422	12,422	16,967	16,967
Waste	51,962	51,962	63,600	63,600	86,875	86,875
Agriculture	2,307,586	2,306,727	2,306,727	2,304,897	2,304,897	2,307,586
Total	2,818,086	2,936,660	2,785,401	3,073,333	2,770,022	2,818,086
% Change from 2005	5%	10%	4%	15%	4%	5%

Notes: Columns may not add due to rounding.

GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020

4.1.2 Reduction Targets

Reduction targets for the County were established in alignment with Senate Bill (SB) 32 and Executive Order S-3-05, based on the 2005 GHG inventory and sector-specific targets in the 2017 Scoping Plan. Consistent with the reduction targets and methods for determine targets described in Chapter 3, the reduction targets for the County are:

- Reduce emissions 24 percent below 2005 levels by 2030; and
- Reduce emissions 34 percent below 2005 levels by 2050.

To meet these targets, the County will need to reduce communitywide emissions to 2,022,285 $MTCO_2e$ in 2030, and 1,771,509 $MTCO_2e$ in 2050.

The GHG emissions reduction that would need to be accomplished to achieve these targets are based on the “emissions gap” remaining between the Legislatively-Adjusted BAU forecast and the reduction targets. Reliance on federal, State, and regional policies and legislative actions alone would not achieve these targets, and the County will need to implement local reduction measures to reduce the emissions gap to demonstrate consistency with State targets and goals. The emissions inventory, forecast, targets, and emissions gap are shown in Figure 4.1-1.

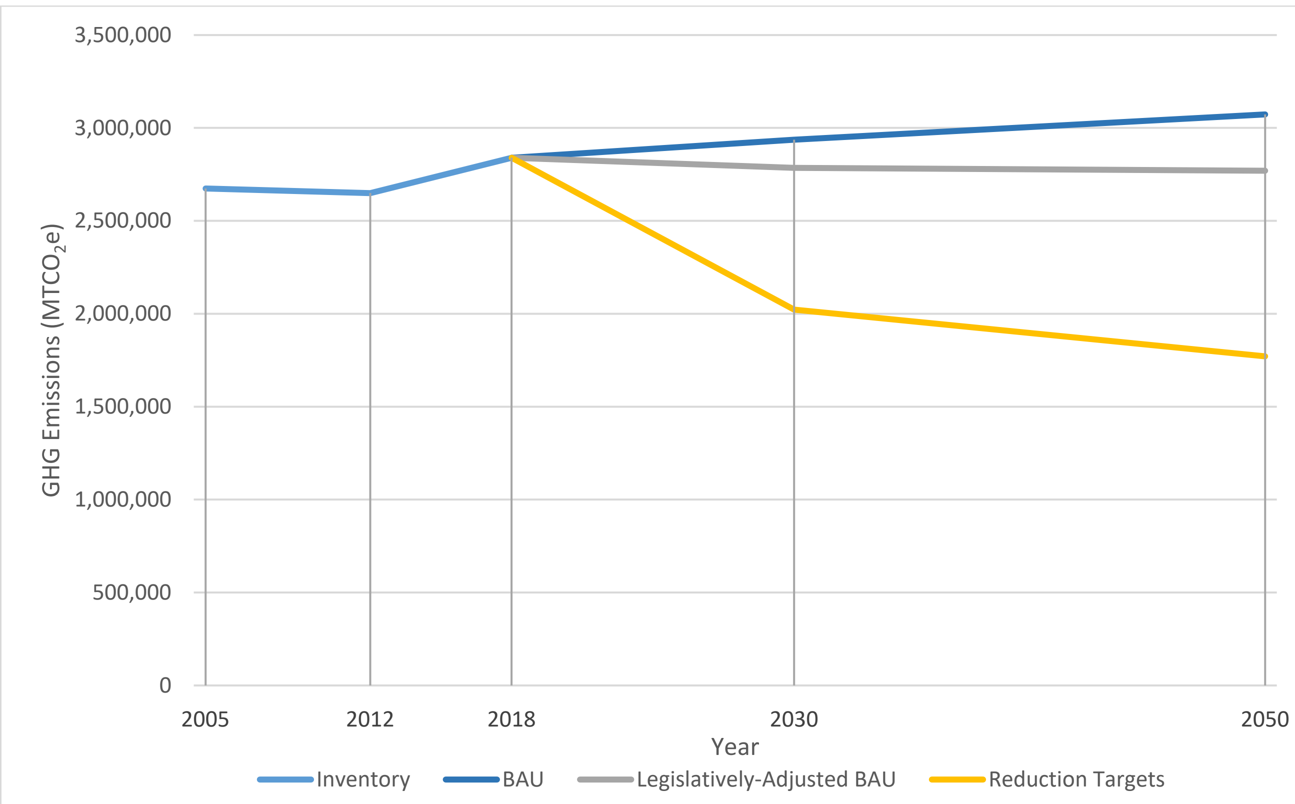

Figure 4.1-1 Imperial County Greenhouse Gas Emissions, Forecasts, and Targets

4.1.3 Reduction Measures

In order to close the gap between the Legislatively-Adjusted BAU emissions forecast and the 2030 and 2050 emissions reduction targets, the County would implement GHG reduction measures, based on the measures identified in Chapter 3. Each measure is a program, policy, or project the County could implement that would result in a reduction in GHG emissions. Reduction measures were identified to reduce emissions from all sectors. The quantified emissions reduction measures, based on the list of regionally applicable measures, are summarized below in Table 4.1-3.

Table 4.1-3 Imperial County Greenhouse Gas Reduction Measures

Measure Number	Measure Description	GHG Reduction Potential ($MTCO_2e$)	
		2030	2050
Transportation Measures			
T-1.1	Create a ridesharing program for agricultural workers modeled after the Green Raiterios program in the San Joaquin Valley.	41	68
T-1.2	Plan and implement a system of bicycle lanes and multi-use trails that link the cities, unincorporated communities, schools, commercial/retail, employment centers, health care service facilities, public transportation, and other points of interest.	15	18
T-1.4	Adopt Complete Street Ordinances to ensure streets and roads are designed and operated as a balanced, multimodal transportation network that enables safe access for all users.	1,682	1,440
T-1.5	Adopt zoning changes that encourage higher density mixed use development in incorporated cities.	1,682	1,440
T-2.2	Synchronize traffic signals to reduce idling	11,774	10,085
T-2.4	Work with the air district to establish an incentive program to trade in fossil fuel-powered landscaping equipment with electric versions.	421	1,360
T-3.1	Transition to a more fuel-efficient municipal vehicle fleet	1,359	1,869
T-3.2	Install public electric vehicle charging stations.	278	391
T-3.3	Require electric vehicle charging stations at new non-residential developments	207	291
T-3.4	Explore local "cash for clunkers" or similar incentive programs that provide access to new or used zero emission on-road vehicles	790	476
Energy Measures			
E-1.1	Require new residential developments to install alternatively powered water heaters	272	1,525
E-1.3	Reduce or eliminate natural gas and propane consumption in new and existing residential buildings	791	7,117
E-1.5	Require major renovations to incorporate energy efficiency measures	2,532	248
E-2.3	Require large parking lots for new commercial development projects to include solar canopies to produce on-site renewable energy, and provide shading for energy efficiency benefits.	See E-2.5	See E-2.5
E-2.4	Supply municipal facilities with on-site renewable electricity	658	-
E-2.5	Adopt a reach code to require new commercial developments to achieve zero net energy	5,501	2,840
E-2.6	Establish or join program to increase grid-supply renewable and zero-carbon electricity	28,389	-
Waste Measures			

Table 4.1-3	Imperial County Greenhouse Gas Reduction Measures		
Measure Number	Measure Description	GHG Reduction Potential ($MTCO_2e$)	
		2030	2050
WS-1.1	Provide recycling and composting receptacles and use of biodegradable or recycled-material products at municipal facilities and events, where feasible.	4,963	14,890
WS-1.2	Promote alternative uses of agricultural and organic waste by promoting the construction of composting and anaerobic digestion facilities.		
WS-1.3	Create waste diversion ordinances for construction projects.		
Agriculture Measures			
AG-1.1	Work with utilities and/or air districts to provide incentives such as CARB's FARMER program to convert stationary diesel- or gas-powered irrigation pumps to electric pumps that are connected to the grid or use off-grid alternative/renewable energy sources, such as solar.	3,303	3,325
AG-1.2	Work with utilities, dairies, ranches, and others to expedite permitting and promote energy generation, flaring, and methane capture systems at manure management facilities at cattle ranches and dairy farms.	203,123	401,683
AG-1.3	Provide incentives for replacing gas- or diesel-powered agricultural equipment with electric or alternatively-fueled equivalents.	29,777	60,252
AG-1.5	Work with farmers to either reduce or replace the use of synthetic nitrogen-based fertilizers with compost alternatives.	239,120	478,240
AG-2.1	Consider various agricultural land and open space conservation strategies that allow developers to preserve lands and/or increase residential development density in smart growth infill areas by removing development potential of lands;	40,969	107,988
AG-2.2	Target stream restoration programs and riparian restoration strategies for carbon sequestration, natural heat relief, water quality improvements, and/or wildlife habitat mitigation.	183,040	183,040
AG-2.4	Develop and enforce landscape tree requirement for new developments	351	936

Notes: CAP = climate action plan; CARB = California Air Resources Board; EPA = U.S. Environmental Protection Agency; FARMER = Funding Agricultural Replacement Measures for Emissions Reductions; GHG = greenhouse gas; LED = light emitting diode; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not enough data available to quantify potential GHG reductions

Based on the implementation of the measures identified in the County, communitywide emissions would be reduced by approximately 761,037 $MTCO_2e$ in 2030 and 1,279,524 $MTCO_2e$ in 2050. These emissions reduction measures would exceed the local emissions reduction targets by 2030, and demonstrate a trajectory towards achievement of the reduction goal by 2050.

Tables

Figures

Acro

business-as-usual (BAU
greenhouse gas (GHG
Imperial County (County
Imperial Valley Regional Climate Action Plan (Regional CAP
metric ton of carbon dioxide equivalent (MTCO_2e
Senate Bill (SB

4.2 City of Brawley

The City of Brawley (Brawley) is located in central Imperial County, approximately 12 miles north of the City of El Centro and 21 miles north of Calexico and the U.S./Mexico International border, and approximately 13 miles south of the Salton Sea. Brawley is located at the intersection of State Route (SR) 78 with SR 86 and SR 111.

Brawley adopted a local Climate Action Plan in 2015, which includes strategies to reduce greenhouse gas (GHG) emissions consistent with Assembly Bill (AB) 32 to reduce emissions to 15 percent below 2005 levels by 2020. The inventory, forecasts, and targets identified herein are intended to support the update of Brawley's current Climate Action Plan, and recommend GHG reduction measures to incorporate into an update. These updates are intended to provide Brawley with a Climate Action Plan that demonstrates consistency with more recent State reduction targets and goals as described below.

4.2.1 Emissions Inventory and Forecasts

As part of the Imperial Valley Regional Climate Action Plan (Regional CAP), a GHG emissions inventory and forecast were prepared for the region and each individual jurisdiction in Imperial Valley. This inventory and forecast estimate GHG emissions from communitywide activities, organized by emissions sector (i.e., energy, transportation, water, waste, and agriculture). GHG emissions quantities are expressed in terms of metric ton of carbon dioxide equivalent ($MTCO_2e$). The regional and local inventories include GHG emissions estimates for the years 2005, 2012, and 2018. GHG emission forecasts provide an estimate of future emissions levels based on current trends and activities. The Regional CAP includes two emissions forecast scenarios for regional and local emissions: the business-as-usual (BAU) scenario, and the Legislatively-Adjusted BAU scenario. A summary for the methodologies and regional estimates is provided in Chapter 3. Additional details for inventory and forecast assumptions and data are provided in Appendices A and B.

In 2018, it is estimated that communitywide activities in Brawley generated approximately 190,778 $MTCO_2e$. Emissions from on- and off-road transportation, which include emissions associated with fuel combustion in vehicles, account for the greatest contribution to communitywide emissions. Emissions from energy, which includes electricity and natural gas consumption, account for the second largest contribution to communitywide GHG emissions. Emissions from communitywide activities, associated with all emissions sectors, have decreased since 2005. The 2005, 2012, and 2018 inventories by emissions sector for Brawley are summarized in Table 4.2-1.

Table 4.2-1 City of Brawley Greenhouse Gas Emissions Inventory

Emissions Sector	GHG Emissions ($MTCO_2e$)		
	2005	2012	2018
Energy	155,426	124,006	77,478
Transportation	71,858	75,409	86,201
Water	3,754	4,172	4,492
Waste	20,534	15,902	22,607

Table 4.2-1 City of Brawley Greenhouse Gas Emissions Inventory

Emissions Sector	GHG Emissions ($MTCO_2e$)		
	2005	2012	2018
Agriculture	3,540	3,666	4,004
Total	**255,111**	**223,155**	**194,782**
Wastewater Collection[1]	3,623	3,018	1,018
Potable Water[1]	1,841	1,543	720
% Change from 2005	--	-13%	-24%

Notes: Columns may not add due to rounding.

[1] Presented for informational purposes only.

GHG = greenhouse gas(es); $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020.

Emissions forecasts were prepared for Brawley under BAU and Legislatively-Adjusted BAU conditions. Forecasts were prepared to estimate future emissions from communitywide activities in 2020, 2030, and 2050. These forecasts were prepared consistent with the regional BAU and Legislatively-Adjusted BAU forecasts presented in Chapter 3. Additional details for forecast methodology and assumptions are provided in Appendix B. The 2020, 2030, and 2050 forecasts for Brawley are summarized in Table 4.2-2.

Table 4.6-2 City of Brawley Greenhouse Gas Emissions Forecasts

Emissions Sector	GHG Emissions ($MTCO_2e$)					
	2020		2030		2050	
	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted
Energy	80,272	65,373	94,243	59,712	122,183	17,099
Transportation	86,986	83,402	97,394	74,109	133,627	89,681
Water	4,656	4,656	5,477	5,477	7,117	7,117
Waste	23,433	23,433	27,561	27,561	35,818	35,818
Agriculture	3,943	3,943	3,942	3,942	3,939	3,939
Total	199,290	180,806	228,616	170,801	302,684	153,655
% Change from 2005	-22%	-29%	-10%	-33%	19%	-40%

Notes: Columns may not add due to rounding.

GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020

4.2.2 Greenhouse Gas Emissions Forecasts

Reduction targets for Brawley were established in alignment with Senate Bill (SB) 32 and Executive Order S-3-05, based on the 2005 GHG inventory. Consistent with the reduction targets and methods for determine targets described in Chapter 3, the reduction targets for Brawley are:

- Reduce emissions 39 percent below 2005 levels by 2030; and
- Reduce emissions 64 percent below 2005 levels by 2050.

To meet these targets, Brawley will need to reduce communitywide emissions to 154,389MTCO$_2$e in 2030, and 91,933 MTCO$_2$e in 2050.

The GHG emissions reduction that would need to be accomplished to achieve these targets are based on the “emissions gap” remaining between the Legislatively-Adjusted BAU forecast and the reduction targets. Reliance on federal, State, and regional policies and legislative actions alone would not achieve these targets, and Brawley will need to implement local reduction measures to reduce the emissions gap to demonstrate consistency with State targets and goals. The emissions inventory, forecast, targets, and emissions gap are shown in Figure 4.6-1.

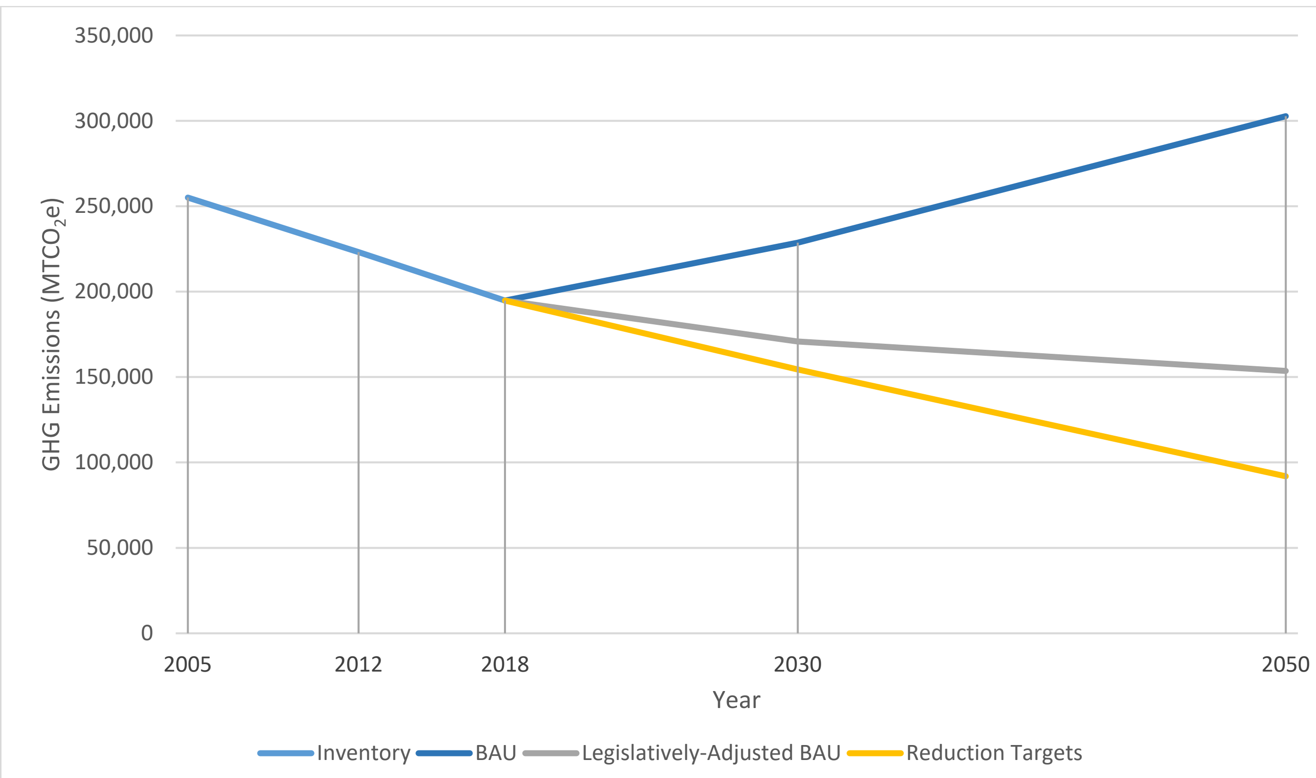

Figure 4.2-1 City of Brawley Greenhouse Gas Emissions, Forecasts, and Targets

4.2.3 Reduction Measures

In order to close the gap between the Legislatively-Adjusted BAU emissions forecast and the 2030 and 2050 emissions targets, Brawley would implement GHG reduction measures, based on the measures identified in Chapter 3. Each measure is a program, policy, or project the City could implement that would result in a reduction in GHG emissions. Reduction measures were identified to reduce emissions from all sectors. The quantified emissions reduction measures, based on the list of regionally applicable measures, are summarized below in Table 4.2-3.

Table 4.2-3 City of Brawley Greenhouse Gas Reduction Measures

Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
Transportation Measures			
T-1.1	Create a ridesharing program for agricultural workers modeled after the Green Raiterios program in the San Joaquin Valley.[1]	41	68
T-1.2	Plan and implement a system of bicycle lanes and multi-use trails that link the cities, unincorporated communities, schools, commercial/retail, employment centers, health care service facilities, public transportation, and other points of interest.	28	34
T-1.4	Adopt Complete Street Ordinances to ensure streets and roads are designed and operated as a balanced, multimodal transportation network that enables safe access for all users.	384	458
T-1.5	Adopt zoning changes that encourage higher density mixed use development in incorporated cities.	384	458
T-2.1	Require projects with loading docks to provide electric outlets to power truck refrigeration units rather than allow trucks to idle while unloading.	<1	<1
T-2.2	Synchronize traffic signals to reduce idling	2,690	3,213
T-2.4	Work with the air district to establish an incentive program to trade in fossil fuel-powered landscaping equipment with electric versions.	305	984
T-3.1	Transition to a more fuel-efficient municipal vehicle fleet	203	265
T-3.2	Install public electric vehicle charging stations	163	216
T-3.3	Require electric vehicle charging stations at new non-residential developments	134	137
T-3.4	Explore local "cash for clunkers" or similar incentive programs that provide access to new or used zero emission on-road vehicles	181	130
Energy Measures			
E-1.1	Require new residential developments to install alternatively powered water heaters	319	1,902
E-1.3	Reduce or eliminate natural gas and propane consumption in new and existing residential buildings	928	10,553
E-1.5	Require major renovations to incorporate energy efficiency measures	2,804	414
E-2.3	Require large parking lots for new commercial development projects to include solar canopies to produce on-site	See E-2.5	See E-2.5

Table 4.2-3	City of Brawley Greenhouse Gas Reduction Measures		
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
	renewable energy, and provide shading for energy efficiency benefits.		
E-2.4	Supply municipal facilities with on-site renewable electricity	425	-
E-2.5	Adopt a reach code to require new commercial developments to achieve zero net energy	2,785	1,124
E-2.6	Establish or join program to increase grid-supply renewable and zero-carbon electricity	35,437	-
Waste Measures			
WS-1.1	Encourage the use of non-potable water, such as tertiary treated wastewater and household graywater, for industrial, agricultural, and landscaping needs	4,521	9,043
WS-1.2	Promote alternative uses of agricultural and organic waste by promoting the construction of composting and anaerobic digestion facilities.		
WS-1.3	Create waste diversion ordinances for construction projects.		
Agriculture Measures			
AG-1.1	Work with utilities and/or air districts to provide incentives such as CARB's FARMER program to convert stationary diesel- or gas-powered irrigation pumps to electric pumps that are connected to the grid or use off-grid alternative/renewable energy sources, such as solar.	6	6
AG-1.2	Work with utilities, dairies, ranches, and others to expedite permitting and promote energy generation, flaring, and methane capture systems at manure management facilities at cattle ranches and dairy farms.	347	686
AG-1.3	Provide incentives for replacing gas- or diesel-powered agricultural equipment with electric or alternatively-fueled equivalents.	51	103
AG-1.5	Work with farmers to either reduce or replace the use of synthetic nitrogen-based fertilizers with compost alternatives.	409	817
AG-2.2	Target stream restoration programs and riparian restoration strategies for carbon sequestration, natural heat relief, water quality improvements, and/or wildlife habitat mitigation.	170	170
AG-2.4	Develop and enforce landscape tree requirement for new developments	160	428

Notes: CAP = climate action plan; CARB = California Air Resources Board; EPA = U.S. Environmental Protection Agency; FARMER = Funding Agricultural Replacement Measures for Emissions Reductions; GHG = greenhouse gas; LED = light emitting diode; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not enough data available to quantify potential GHG reductions

Based on the implementation of the measures identified in Brawley, communitywide emissions would be reduced by approximately 52,875 $MTCO_2e$ by 2030 and 31,214 $MTCO_2e$ by 2050. These emissions reduction measures would meet Brawley's 2030 reduction target, but would fall short of the 2050 reduction goal.

Tables

Figures

Acro

Assembly Bill (AB
business-as-usual (BAU
City of Brawley (Brawley
greenhouse gas (GHG
Imperial Valley Regional Climate Action Plan (Regional CAP
metric ton of carbon dioxide equivalent (MTCO$_2$e
Senate Bill (SB
State Route (SR

4.3 City of Calexico

The City of Calexico (Calexico) is located in southern Imperial County situated along the U.S./Mexico international border. Calexico contains appproximately 22 percent of the region's total population, and 16 percent of the region's total jobs. As of 2018, Calexico's population was 41,199 persons.

Calexico adopted a local Climate Action Plan in 2015, which includes strategies to reduce greenhouse gas (GHG) emissions consistent with Assembly Bill (AB) 32. The inventory, forecasts, and targets identified herein are intended to support the update of Brawley's current Climate Action Plan, and recommend GHG reduction measures to incorporate into an update. These updates are intended to provide Calexico with a Climate Action Plan that demonstrates consistency with more recent State reduction targets and goals as described below.

4.3.1 Emissions Inventory and Forecasts

As part of the Imperial Valley Regional Climate Action Plan (Regional CAP), a GHG emissions inventory and forecast were prepared for the region and each individual jurisdiction in Imperial Valley. This inventory and forecast estimate GHG emissions from communitywide activities, organized by emissions sector (i.e., energy, transportation, water, waste, and agriculture). GHG emissions quantities are expressed in terms of metric ton of carbon dioxide equivalent ($MTCO_2e$). The regional and local inventories include GHG emissions estimates for the years 2005, 2012, and 2018. GHG emission forecasts provide an estimate of future emissions levels based on current trends and activities. The Regional CAP includes two emissions forecast scenarios for regional and local emissions: the business-as-usual (BAU) scenario, and the Legislatively-Adjusted BAU scenario. A summary for the methodologies and regional estimates is provided in Chapter 3. Additional details for inventory and forecast assumptions and data are provided in Appendices A and B.

In 2018, it is estimated that communitywide activities in Calexico generated approximately 615,578 $MTCO_2e$. Emissions from energy account for the greatest contribution to communitywide emissions, which includes electricity and natural gas consumption. Emissions from on-road and off-road transportation, which include emissions associated with fuel combustion in vehicles, accounted for the second largest contribution to communitywide GHG emissions. Generally, emissions from all sectors have decreased since 2005. The 2005, 2012, and 2018 inventories by emissions sector for Calexico are summarized in Table 4.3-1.

Table 4.3-1 City of Calexico Greenhouse Gas Emissions Inventory

Emissions Sector	GHG Emissions ($MTCO_2e$)		
	2005	2012	2018
Energy	163,290	122,163	88,774
Transportation	97,757	81,409	96,471
Water	5,651	4,839	6,750
Waste	24,474	14,388	25,479
Agriculture	2,020	2,092	2,284

Table 4.3-1 City of Calexico Greenhouse Gas Emissions Inventory			
Total	293,192	224,890	219,758
% Change from 2005	--	-23%	-25%
Wastewater Collection and Treatment [1]	2,846	1,826	1,160
Potable Water Consumption [1]	1,654	1,181	769

Notes: Columns may not add due to rounding.

[1] Presented for informational purposes only

GHG = greenhouse gas(es); $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020.

Emissions forecasts were prepared for Calexico under BAU and Legislatively-Adjusted BAU conditions. Forecasts were prepared to estimate future emissions from communitywide activities in 2020, 2030, and 2050. These forecasts were prepared consistent with the regional BAU and Legislatively-Adjusted BAU forecasts presented in Chapter 3. Additional details for forecast methodology and assumptions are provided in Appendix B. The 2020, 2030, and 2050 forecasts for Calexico are summarized in Table 4.3-2.

Table 4.3-2 City of Calexico Greenhouse Gas Emissions Forecasts

Emissions Sector	GHG Emissions ($MTCO_2e$)					
	2020		2030		2050	
	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted
Energy	93,242	76,110	115,584	72,617	160,268	24,076
Transportation	99,370	95,463	115,261	88,605	139,150	96,300
Water	7,079	7,079	8,720	8,720	12,003	12,003
Waste	26,718	26,718	32,913	32,913	45,303	45,303
Agriculture	2,250	2,250	2,249	2,249	2,247	2,247
Total	228,658	207,619	274,727	205,105	358,970	179,929
% Change from 2005	-22%	-29%	-6%	-30%	22%	-39%

Notes: Columns may not add due to rounding.

GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020

4.3.2 Reduction Targets

Reduction targets for Calexico were established in alignment with Senate Bill (SB) 32 and Executive Order S-3-05, based on the 2005 GHG inventory. Consistent with the reduction targets and methods for determine targets described in Chapter 3, the reduction targets for Calexico are:

- Reduce emissions 40 percent below 2005 levels by 2030; and
- Reduce emissions 64 percent below 2005 levels by 2050.

To meet these targets, Calexico will need to reduce communitywide emissions to 177,028 $MTCO_2e$ in 2030, and 104,843 $MTCO_2e$ in 2050.

The GHG emissions reduction that would need to be accomplished to achieve these targets are based on the "emissions gap" remaining between the Legislatively-Adjusted BAU forecast and the reduction targets. Reliance on federal, State, and regional policies and legislative actions alone would not achieve these targets, and Calexico will need to implement local reduction measures to reduce the emissions gap to demonstrate consistency with State targets and goals. The emissions inventory, forecast, targets, and emissions gap are shown in Figure 4.3-1.

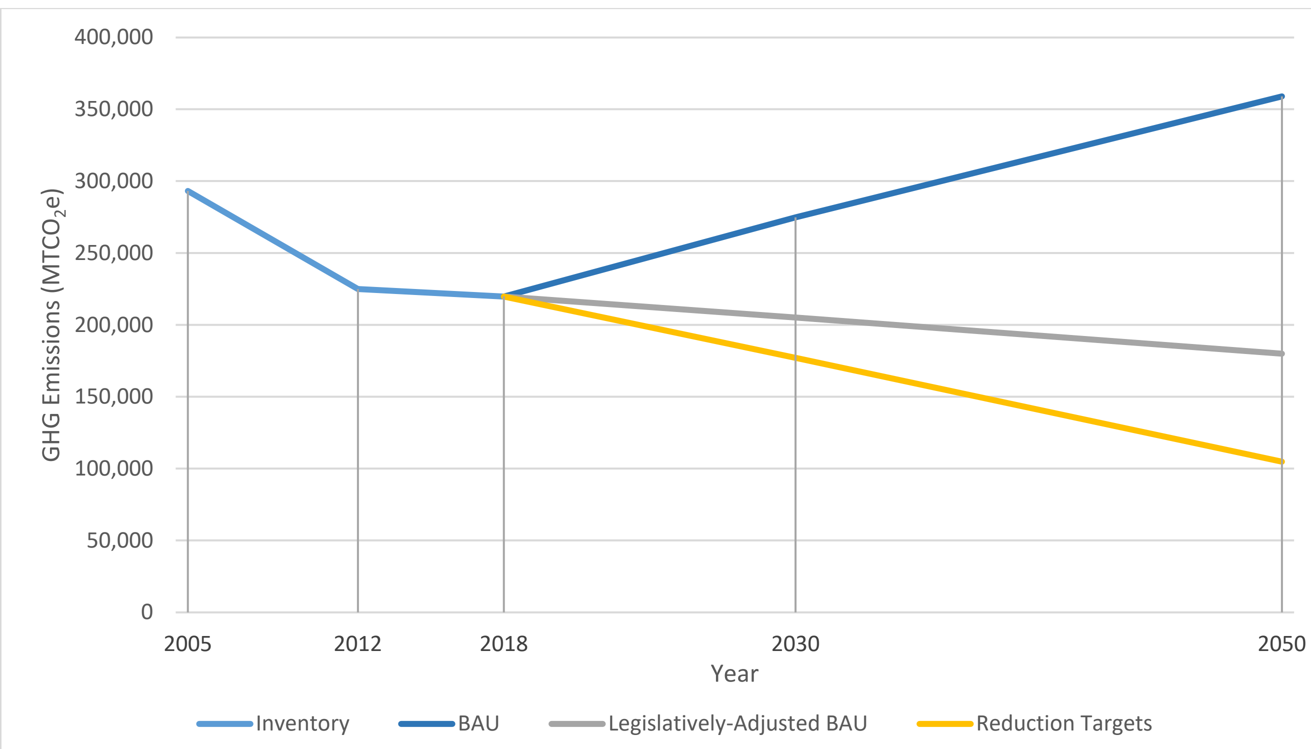

Figure 4.3-1 City of Calexico Greenhouse Gas Emissions, Forecasts, and Targets

4.3.3 Reduction Measures

In order to close the gap between the Legislatively-Adjusted BAU emissions forecast and the 2030 and 2050 emissions targets, Calexico would implement GHG reduction measures, based on the measures identified in Chapter 3. Each measure is a program, policy, or project the City could implement that would result in a reduction in GHG emissions. Reduction measures were identified to reduce emissions from all emissions sectors. The quantified emissions reduction measures, based on the list of regionally applicable measures, are summarized below in Table 4.3-3.

Table 4.3-3 City of Calexico Greenhouse Gas Reduction Measures

Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
Transportation Measures			
T-1.1	Create a ridesharing program for agricultural workers modeled after the Green Raiterios program in the San Joaquin Valley.[1]	41	68
T-1.2	Plan and implement a system of bicycle lanes and multi-use trails that link the cities, unincorporated communities, schools, commercial/retail, employment centers, health care service facilities, public transportation, and other points of interest.	11	37
T-1.4	Adopt Complete Street Ordinances to ensure streets and roads are designed and operated as a balanced, multimodal transportation network that enables safe access for all users.	424	415
T-1.5	Adopt zoning changes that encourage higher density mixed use development in incorporated cities.	424	415
T-2.1	Require projects with loading docks to provide electric outlets to power truck refrigeration units rather than allow trucks to idle while unloading.	<1	<1
T-2.2	Synchronize traffic signals to reduce idling	2,972	2,912
T-2.4	Work with the air district to establish an incentive program to trade in fossil fuel-powered landscaping equipment with electric versions.	393	1,269
T-3.1	Transition to a more fuel-efficient municipal vehicle fleet	207	283
T-3.2	Install public electric vehicle charging stations	285	399
T-3.3	Require electric vehicle charging stations at new non-residential developments	212	297
T-3.4	Explore local "cash for clunkers" or similar incentive programs that provide access to new or used zero emission on-road vehicles	200	129
Energy Measures			
E-1.1	Require new residential developments to install alternatively powered water heaters	510	3,037
E-1.3	Reduce or eliminate natural gas and propane consumption in new and existing residential buildings	1,244	14,661
E-1.5	Require major renovations to incorporate energy efficiency measures	3,263	517

Table 4.3-3 City of Calexico Greenhouse Gas Reduction Measures			
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
E-2.3	Require large parking lots for new commercial development projects to include solar canopies to produce on-site renewable energy, and provide shading for energy efficiency benefits.	See E-2.5	See E-2.5
E-2.4	Supply municipal facilities with on-site renewable electricity	511	-
E-2.5	Adopt a reach code to require new commercial developments to achieve zero net energy	4,861	2,234
E-2.6	Establish or join program to increase grid-supply renewable and zero-carbon electricity	25,785	-
Waste Measures			
WS-1.1	Provide recycling and composting receptacles and use of biodegradable or recycled-material products at municipal facilities and events, where feasible.	2,548	7,644
WS-1.2	Promote alternative uses of agricultural and organic waste by promoting the construction of composting and anaerobic digestion facilities.		
WS-1.3	Create waste diversion ordinances for construction projects.		
Agriculture Measures			
AG-1.1	Work with utilities and/or air districts to provide incentives such as CARB's FARMER program to convert stationary diesel- or gas-powered irrigation pumps to electric pumps that are connected to the grid or use off-grid alternative/renewable energy sources, such as solar.	3	3
AG-1.2	Work with utilities, dairies, ranches, and others to expedite permitting and promote energy generation, flaring, and methane capture systems at manure management facilities at cattle ranches and dairy farms.	198	392
AG-1.3	Provide incentives for replacing gas- or diesel-powered agricultural equipment with electric or alternatively-fueled equivalents.	29	59
AG-1.5	Work with farmers to either reduce or replace the use of synthetic nitrogen-based fertilizers with compost alternatives.	233	466
AG-2.2	Target stream restoration programs and riparian restoration strategies for carbon sequestration, natural heat relief, water quality improvements, and/or wildlife habitat mitigation.	50	50
AG-2.4	Develop and enforce landscape tree requirement for new developments	389	1,038

Notes: CAP = climate action plan; CARB = California Air Resources Board; EPA = U.S. Environmental Protection Agency; FARMER = Funding Agricultural Replacement Measures for Emissions Reductions; GHG = greenhouse gas; LED = light emitting diode; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not enough data available to quantify potential GHG reductions

Based on the implementation of the measures identified in Calexico, communitywide emissions would be reduced by approximately 44,793 $MTCO_2e$ in 2030 and 36,326 $MTCO_2e$ in 2050. These emissions reduction measures would meet Calexico's 2030 reduction target, but would fall short of the 2050 reduction goal.

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4.4 City of Calipatria

The City of Calipatria (Calipatria) is located along California State Route 111 and is approximately 30 miles north of Calexico and the U.S./Mexico international border. Calipatria is one of the smallest incorporated cities in Imperial County, containing appproximately four percent of the region's total population, and three percent of the region's total jobs. As of 2018, Calipatria's population was 7,488 persons.

4.4.1 Emissions Inventory and Forecasts

As part of the Imperial Valley Regional Climate Action Plan (Regional CAP), a greenhouse gas (GHG) emissions inventory and forecast were prepared for the region and each individual jurisdiction in Imperial Valley. This inventory and forecast estimate GHG emission from communitywide activities, organized by emissions sector (i.e., energy, transportation, water, waste, and agriculture). GHG emissions quantities are expressed in terms of metric ton of carbon dioxide equivalent ($MTCO_2e$). The regional and local inventories include GHG emissions estimates for the years 2005, 2012, and 2018. GHG emission forecasts provide an estimate of future emissions levels based on current trends and activities. The Regional CAP includes two emissions forecast scenarios for regional and local emissions: the business-as-usual (BAU) scenario, and the Legislatively-Adjusted BAU scenario. A summary for the methodologies and regional estimates is provided in Chapter 3. Additional details for inventory and forecast assumptions and data are provided in Appendices A and B.

Table 4.4-1 City of Calipatria Greenhouse Gas Emissions Inventory

Emissions Sector	GHG Emissions ($MTCO_2e$)		
	2005	2012	2018
Energy	56,836	27,641	16,150
Transportation	24,343	20,162	19,590
Water	1,238	1,308	1,227
Waste	3,186	1,730	1,759
Agriculture	737	763	833
Total	86,340	51,603	39,559
% Change from 2005	--	-40%	-54%
Wastewater Collection and Treatment [1]	728	576	329
Potable Water Consumption [1]	577	219	103

Notes: Columns may not add due to rounding.

[1] Presented for informational purposes only

GHG = greenhouse gas(es); $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020.

In 2018, it is estimated that communitywide activities in Calipatria generated approximately 59,747 $MTCO_2e$. Emissions from energy account for the greatest contribution to communitywide emissions, which includes electricity and natural gas consumption. Emissions from on-road and off-road transportation, which include emissions associated with fuel combustion in vehicles, accounted for the second largest contribution to communitywide GHG emissions. Generally, emissions from all sectors have decreased since 2005. The 2005, 2012, and 2018 inventories by emissions sector for Calipatria are summarized in Table 4.4-1.

Emissions forecasts were prepared for Calipatria under BAU and Legislatively-Adjusted BAU conditions. Forecasts were prepared to estimate future emissions from communitywide activities in 2020, 2030, and 2050. These forecasts were prepared consistent with the regional BAU and Legislatively-Adjusted BAU forecasts presented in Chapter 3. Additional details for forecast methodology and assumptions are provided in Appendix B. The 2020, 2030, and 2050 forecasts for Calipatria are summarized in Table 4.4-2.

Table 4.4-2 City of Calipatria Greenhouse Gas Emissions Forecasts

Emissions Sector	GHG Emissions ($MTCO_2e$)					
	2020		2030		2050	
	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted
Energy	16,722	13,383	19,584	11,995	25,307	1,864
Transportation	26,374	25,086	28,409	20,904	21,224	14,809
Water	1,259	1,259	1,420	1,420	1,741	1,741
Waste	1,805	1,805	2,036	2,036	2,497	2,497
Agriculture	821	821	820	820	820	820
Total	46,981	42,354	52,269	37,174	51,589	21,731
% Change from 2005	-46%	-51%	-39%	-57%	-40%	-75%

Notes: Columns may not add due to rounding.

GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020

4.4.2 Reduction Targets

Reduction targets for Calipatria were established in alignment with Senate Bill (SB) 32 and Executive Order S-3-05, based on the 2005 GHG inventory. Consistent with the reduction targets and methods for determine targets described in Chapter 3, the reduction targets for Calipatria are:

- Reduce emissions 40 percent below 2005 levels by 2030; and
- Reduce emissions 64 percent below 2005 levels by 2050.

To meet these targets, Calipatria will need to reduce communitywide emissions to 52,160 $MTCO_2e$ in 2030, and 30,930 $MTCO_2e$ in 2050. As shown in Table 4.4-2, the Legislatively-Adjusted BAU forecasts would exceed these targets without any additional action from the City. Although reliance on federal, State, and regional policies and legislative actions alone would achieve these targets, Calipatria may choose to implement local reduction measures to further reduce emissions to demonstrate consistency with regional efforts . The emissions inventory, forecast, and targets are shown in Figure 4.4-1.

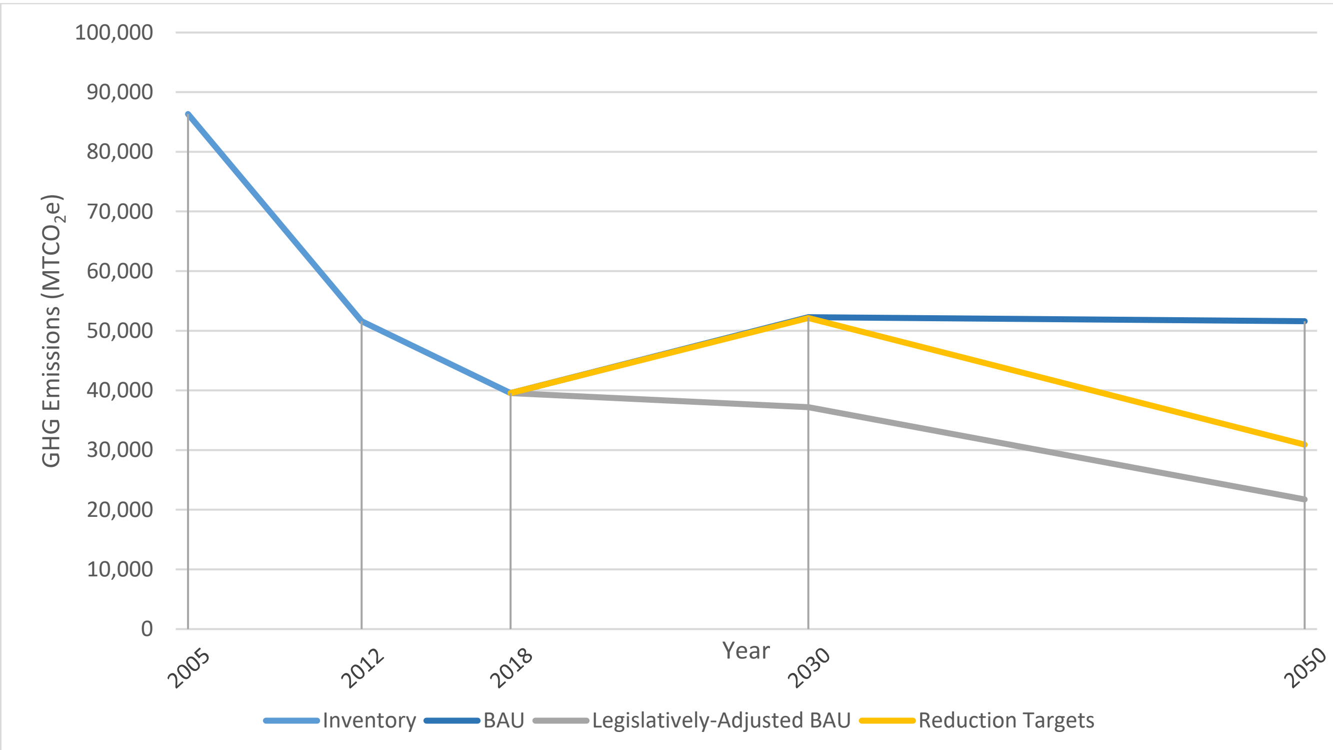

Figure 4.4-1 City of Calipatria Greenhouse Gas Emissions, Forecasts, and Targets

4.4.3 Reduction Measures

Although the Legislatively-Adjusted BAU emissions forecast would meet the City's 2030 and 2050 emissions reduction targets, Calipatria may choose to implement additional GHG reduction measures, based on the measures identified in Chapter 3. Each measure is a program, policy, or project the City could implement that would result in a reduction in GHG emissions. Reduction measures were identified to reduce emissions from all emissions sectors. The quantified emissions reduction measures, based on the list of regionally applicable measures, are summarized below in Table 4.4-3.

Table 4.4-3 City of Calipatria Greenhouse Gas Reduction Measures

Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
Transportation Measures			

Table 4.4-3 City of Calipatria Greenhouse Gas Reduction Measures			
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
T-1.1	Create a ridesharing program for agricultural workers modeled after the Green Raiterios program in the San Joaquin Valley.[1]	32	41
T-1.2	Plan and implement a system of bicycle lanes and multi-use trails that link the cities, unincorporated communities, schools, commercial/retail, employment centers, health care service facilities, public transportation, and other points of interest.	3	5
T-1.4	Adopt Complete Street Ordinances to ensure streets and roads are designed and operated as a balanced, multimodal transportation network that enables safe access for all users.	138	59
T-1.5	Adopt zoning changes that encourage higher density mixed use development in incorporated cities.	138	59
T-2.1	Require projects with loading docks to provide electric outlets to power truck refrigeration units rather than allow trucks to idle while unloading.	<1	<1
T-2.2	Synchronize traffic signals to reduce idling	972	415
T-2.4	Work with the air district to establish an incentive program to trade in fossil fuel-powered landscaping equipment with electric versions.	39	125
T-3.1	Transition to a more fuel-efficient municipal vehicle fleet	16	22
T-3.2	Install public electric vehicle charging stations	46	56
T-3.3	Require electric vehicle charging stations at new non-residential developments	34	41
T-3.4	Explore local "cash for clunkers" or similar incentive programs that provide access to new or used zero emission on-road vehicles	65	29
Energy Measures			
E-1.1	Require new residential developments to install alternatively powered water heaters	25	123
E-1.3	Reduce or eliminate natural gas and propane consumption in new and existing residential buildings	90	960
E-1.5	Require major renovations to incorporate energy efficiency measures	418	45
E-2.3	Require large parking lots for new commercial development projects to include solar canopies to produce on-site renewable energy, and provide shading for energy efficiency benefits.	See E-2.5	See E-2.5
E-2.4	Supply municipal facilities with on-site renewable electricity	116	-
E-2.5	Adopt a reach code to require new commercial developments to achieve zero net energy	899	276
E-2.6	Establish or join program to increase grid-supply renewable and zero-carbon electricity	4,755	-
Waste Measures			

Table 4.4-3 City of Calipatria Greenhouse Gas Reduction Measures			
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
WS-1.1	Provide recycling and composting receptacles and use of biodegradable or recycled-material products at municipal facilities and events, where feasible.	176	528
WS-1.2	Promote alternative uses of agricultural and organic waste by promoting the construction of composting and anaerobic digestion facilities.		
WS-1.3	Create waste diversion ordinances for construction projects.		
Agriculture Measures			
AG-1.1	Work with utilities and/or air districts to provide incentives such as CARB's FARMER program to convert stationary diesel- or gas-powered irrigation pumps to electric pumps that are connected to the grid or use off-grid alternative/renewable energy sources, such as solar.	1	1
AG-1.2	Work with utilities, dairies, ranches, and others to expedite permitting and promote energy generation, flaring, and methane capture systems at manure management facilities at cattle ranches and dairy farms.	72	143
AG-1.3	Provide incentives for replacing gas- or diesel-powered agricultural equipment with electric or alternatively-fueled equivalents.	11	21
AG-1.5	Work with farmers to either reduce or replace the use of synthetic nitrogen-based fertilizers with compost alternatives.	85	170
AG-2.2	Target stream restoration programs and riparian restoration strategies for carbon sequestration, natural heat relief, water quality improvements, and/or wildlife habitat mitigation.	672	672
AG-2.4	Develop and enforce landscape tree requirement for new developments	23	61

Notes: CAP = climate action plan; CARB = California Air Resources Board; EPA = U.S. Environmental Protection Agency; FARMER = Funding Agricultural Replacement Measures for Emissions Reductions; GHG = greenhouse gas; LED = light emitting diode; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not enough data available to quantify potential GHG reductions

Based on the implementation of the measures identified in Calipatria, communitywide emissions would be further reduced by approximately 8,828 $MTCO_2e$ in 2030 and 3,855 $MTCO_2e$ in 2050.

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4.5 City of El Centro

The City of El Centro (El Centro) is located in the south-central part of Imperial County along Interstate 8, and approximately 10 miles north of Calexico and the U.S./Mexico international border. El Centro is the largest incorporated city in Imperial County, containing appproximately one quarter of the region's total population, and one third of the region's total jobs. As of 2018, El Centro's population was 46,315 persons.

4.5.1 Emissions Inventory and Forecasts

As part of the Imperial Valley Regional Climate Action Plan (Regional CAP), a greenhouse gas (GHG) emissions inventory and forecast were prepared for the region and each individual jurisdiction in Imperial Valley. This inventory and forecast estimate GHG emissions from communitywide activities, organized by emissions sector (i.e., energy, transportation, water, waste, and agriculture). GHG emissions quantities are expressed in terms of metric ton of carbon dioxide equivalent ($MTCO_2e$). The regional and local inventories include GHG emissions estimates for the years 2005, 2012, and 2018. GHG emission forecasts provide an estimate of future emissions levels based on current trends and activities. The Regional CAP includes two emissions forecast scenarios for regional and local emissions: the business-as-usual (BAU) scenario, and the Legislatively-Adjusted BAU scenario. A summary for the methodologies and regional estimates is provided in Chapter 3. Additional details for inventory and forecast assumptions and data are provided in Appendices A and B.

Table 4.5-1 City of El Centro Greenhouse Gas Emissions Inventory

Emissions Sector	GHG Emissions ($MTCO_2e$)		
	2005	2012	2018
Energy	291,031	226,324	141,428
Transportation	122,627	125,495	135,090
Water	6,435	7,110	7,589
Waste	54,623	32,313	31,450
Agriculture	1,295	1,341	1,465
Total	476,010	392,583	317,021
% Change from 2005	--	-18%	-33%
Wastewater Collection and Treatment [1]	3,288	2,723	2,201
Potable Water Consumption [1]	2,153	1,453	832

Notes: Columns may not add due to rounding.

[1] Presented for informational purposes only

GHG = greenhouse gas(es); $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020.

In 2018, it is estimated that communitywide activities in El Centro generated approximately 423,263 $MTCO_2e$. Emissions from energy account for the greatest contribution to communitywide emissions, which includes electricity and natural gas consumption. Emissions from on-road and off-road transportation, which include emissions associated with fuel combustion in vehicles, accounted for the second largest contribution to communitywide GHG emissions. Generally, emissions from all sectors have decreased since 2005. The 2005, 2012, and 2018 inventories by emissions sector for El Centro are summarized in Table 4.5-1.

Emissions forecasts were prepared for El Centro under BAU and Legislatively-Adjusted BAU conditions. Forecasts were prepared to estimate future emissions from communitywide activities in 2020, 2030, and 2050. These forecasts were prepared consistent with the regional BAU and Legislatively-Adjusted BAU forecasts presented in Chapter 3. Additional details for forecast methodology and assumptions are provided in Appendix B. The 2020, 2030, and 2050 forecasts for El Centro are summarized in Table 4.5-2.

Table 4.5-2 City of El Centro Greenhouse Gas Emissions Forecasts

Emissions Sector	GHG Emissions ($MTCO_2e$)					
	2020		2030		2050	
	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted
Energy	148,004	121,259	180,887	114,446	246,654	34,549
Transportation	143,427	137,872	160,313	125,127	183,638	132,660
Water	7,852	7,852	9,172	9,172	11,810	11,810
Waste	32,543	32,543	38,011	38,011	48,945	48,945
Agriculture	1,442	1,442	1,442	1,442	1,441	1,441
Total	333,269	300,969	389,825	288,197	492,488	229,405
% Change from 2005	-30%	-37%	-18%	-39%	3%	-52%

Notes: Columns may not add due to rounding.

GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020

4.5.2 Reduction Targets

Reduction targets for El Centro were established in alignment with Senate Bill (SB) 32 and Executive Order S-3-05, based on the 2005 GHG inventory. Consistent with the reduction targets and methods for determine targets described in Chapter 3, the reduction targets for El Centro are:

- Reduce emissions 40 percent below 2005 levels by 2030; and
- Reduce emissions 64 percent below 2005 levels by 2050.

To meet these targets, El Centro will need to reduce communitywide emissions to 287,019 $MTCO_2e$ in 2030, and 169,429 $MTCO_2e$ in 2050.

The GHG emissions reduction that would need to be accomplished to achieve these targets are based on the “emissions gap” remaining between the Legislatively-Adjusted BAU forecast and the reduction targets. Reliance on federal, State, and regional policies and legislative actions alone would not achieve these targets, and El Centro will need to implement local reduction measures to reduce the emissions gap to demonstrate consistency with State targets and goals. The emissions inventory, forecast, targets, and emissions gap are shown in Figure 4.5-1.

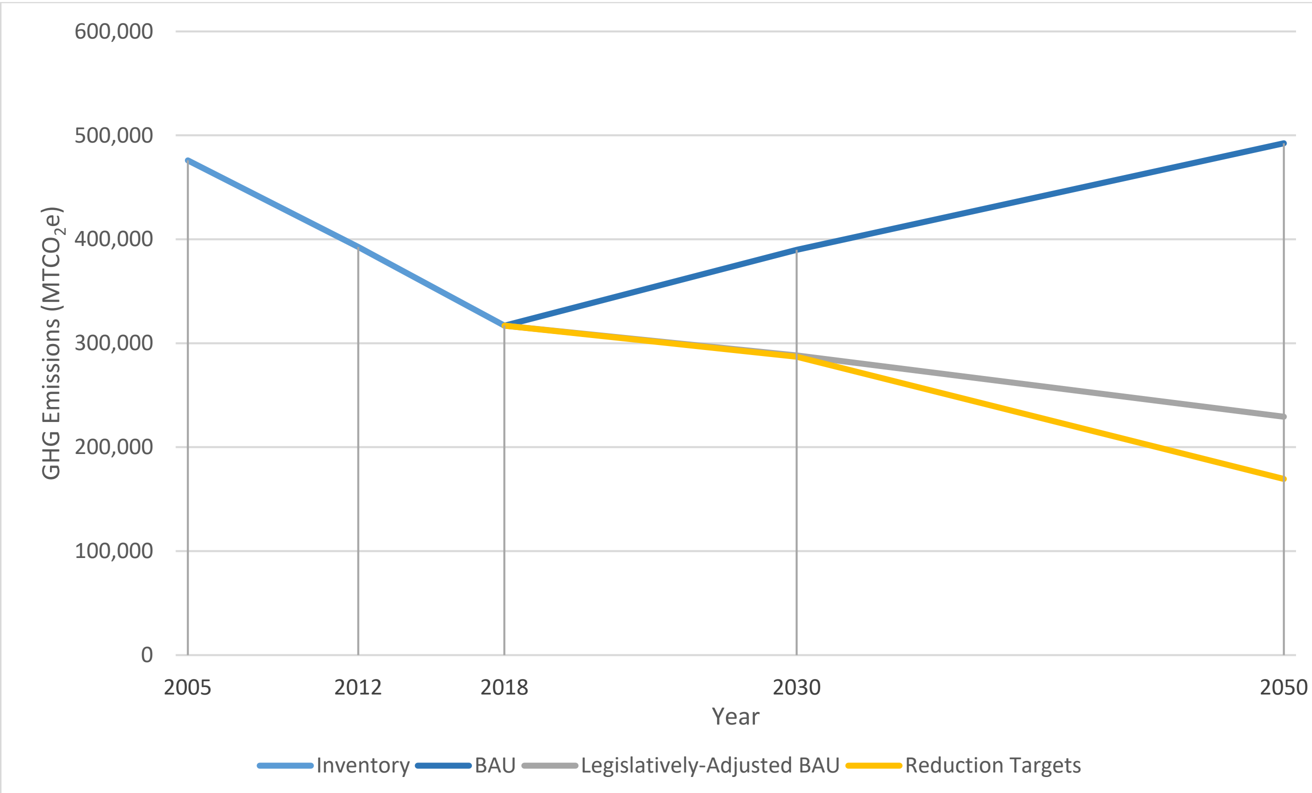

Figure 4.5-1 City of El Centro Greenhouse Gas Emissions, Forecasts, and Targets

4.5.3 Reduction Measures

In order to close the gap between the Legislatively-Adjusted BAU emissions forecast and the 2030 and 2050 emissions reduction targets, El Centro would implement GHG reduction measures, based on the measures identified in Chapter 3. Each measure is a program, policy, or project the City could implement that would result in a reduction in GHG emissions. Reduction measures were identified to reduce emissions from all sectors. The quantified emissions reduction measures, based on the list of regionally applicable measures, are summarized below in Table 4.5-3.

Table 4.5-3 City of El Centro Greenhouse Gas Reduction Measures

Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
Transportation Measures			
T-1.1	Create a ridesharing program for agricultural workers modeled after the Green Raiterios program in the San Joaquin Valley.[1]	24	34

Table 4.5-3 City of El Centro Greenhouse Gas Reduction Measures			
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
T-1.2	Plan and implement a system of bicycle lanes and multi-use trails that link the cities, unincorporated communities, schools, commercial/retail, employment centers, health care service facilities, public transportation, and other points of interest.	33	48
T-1.4	Adopt Complete Street Ordinances to ensure streets and roads are designed and operated as a balanced, multimodal transportation network that enables safe access for all users.	601	512
T-1.5	Adopt zoning changes that encourage higher density mixed use development in incorporated cities.	601	512
T-2.1	Require projects with loading docks to provide electric outlets to power truck refrigeration units rather than allow trucks to idle while unloading.	<1	<1
T-2.2	Synchronize traffic signals to reduce idling	4,212	3,586
T-2.4	Work with the air district to establish an incentive program to trade in fossil fuel-powered landscaping equipment with electric versions.	519	1,676
T-3.1	Transition to a more fuel-efficient municipal vehicle fleet	303	357
T-3.2	Install public electric vehicle charging stations	271	327
T-3.3	Require electric vehicle charging stations at new non-residential developments	208	251
T-3.4	Explore local "cash for clunkers" or similar incentive programs that provide access to new or used zero emission on-road vehicles	283	170
Energy Measures			
E-1.1	Require new residential developments to install alternatively powered water heaters	243	1,438
E-1.3	Reduce or eliminate natural gas and propane consumption in new and existing residential buildings	1,138	11,960
E-1.5	Require major renovations to incorporate energy efficiency measures	3,630	578
E-2.3	Require large parking lots for new commercial development projects to include solar canopies to produce on-site renewable energy, and provide shading for energy efficiency benefits.	See E-2.5	See E-2.5
E-2.4	Supply municipal facilities with on-site renewable electricity	975	-
E-2.5	Adopt a reach code to require new commercial developments to achieve zero net energy	10,895	5,669
E-2.6	Establish or join program to increase grid-supply renewable and zero-carbon electricity	38,255	-
Waste Measures			
WS-1.1	Provide recycling and composting receptacles and use of biodegradable or recycled-material products at municipal facilities and events, where feasible.	3,145	9,435

Table 4.5-3	City of El Centro Greenhouse Gas Reduction Measures		
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
WS-1.2	Promote alternative uses of agricultural and organic waste by promoting the construction of composting and anaerobic digestion facilities.		
WS-1.3	Create waste diversion ordinances for construction projects.		
Agriculture Measures			
AG-1.1	Work with utilities and/or air districts to provide incentives such as CARB's FARMER program to convert stationary diesel- or gas-powered irrigation pumps to electric pumps that are connected to the grid or use off-grid alternative/renewable energy sources, such as solar.	2	2
AG-1.2	Work with utilities, dairies, ranches, and others to expedite permitting and promote energy generation, flaring, and methane capture systems at manure management facilities at cattle ranches and dairy farms.	127	251
AG-1.3	Provide incentives for replacing gas- or diesel-powered agricultural equipment with electric or alternatively-fueled equivalents.	19	38
AG-1.5	Work with farmers to either reduce or replace the use of synthetic nitrogen-based fertilizers with compost alternatives.	149	299
AG-2.2	Target stream restoration programs and riparian restoration strategies for carbon sequestration, natural heat relief, water quality improvements, and/or wildlife habitat mitigation.	556	556
AG-2.4	Develop and enforce landscape tree requirement for new developments	232	620

Notes: CAP = climate action plan; CARB = California Air Resources Board; EPA = U.S. Environmental Protection Agency; FARMER = Funding Agricultural Replacement Measures for Emissions Reductions; GHG = greenhouse gas; LED = light emitting diode; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not enough data available to quantify potential GHG reductions

Based on the implementation of the measures identified in El Centro, communitywide emissions would be reduced by approximately 66,422 $MTCO_2e$ in 2030 and 38,318 $MTCO_2e$ in 2050. These emissions reduction measures would meet El Centro's 2030 reduction target, but would fall short of the 2050 reduction goal.

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4.6 City of Holtville

The City of Holtville (Holtville) is located long California State Route 115 and is approximately 10 miles north of Calexico and the U.S./Mexico international border. Holtville is the second smallest incorporated city in Imperial County, containing appproximately three percent of the region's total population, and three percent of the region's total jobs. As of 2018, Holtville's population was 6,501 persons.

4.6.1 Emissions Inventory and Forecasts

As part of the Imperial Valley Regional Climate Action Plan (Regional CAP), a greenhouse gas (GHG) emissions inventory and forecast were prepared for the region and each individual jurisdiction in Imperial Valley. This inventory and forecast estimate GHG emissions from communitywide activities, organized by emissions sector (i.e., energy, transportation, water, waste, and agriculture). GHG emissions quantities are expressed in terms of metric ton of carbon dioxide equivalent ($MTCO_2e$). The regional and local inventories include GHG emissions estimates for the years 2005, 2012, and 2018. GHG emission forecasts provide an estimate of future emissions levels based on current trends and activities. The Regional CAP includes two emissions forecast scenarios for regional and local emissions: the business-as-usual (BAU) scenario, and the Legislatively-Adjusted BAU scenario. A summary for the methodologies and regional estimates is provided in Chapter 3. Additional details for inventory and forecast assumptions and data are provided in Appendices A and B.

Table 4.6-1 City of Holtville Greenhouse Gas Emissions Inventory

Emissions Sector	GHG Emissions ($MTCO_2e$)		
	2005	2012	2018
Energy	48,136	34,478	22,948
Transportation	19,925	19,278	19,015
Water	886	991	983
Waste	5,523	2,988	2,667
Agriculture	39	40	44
Total	74,509	57,776	45,657
% Change from 2005	--	-22%	-39%
Wastewater Collection and Treatment [1]	555	465	304
Potable Water Consumption [1]	398	236	119

Notes: Columns may not add due to rounding.

GHG = greenhouse gas(es); $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020.

[1] For informational purpose only

In 2018, it is estimated that communitywide activities in Holtville generated approximately 135,333 $MTCO_2e$. Emissions from energy account for the greatest contribution to communitywide emissions, which includes electricity and natural gas consumption. Emissions from on-road and off-road transportation, which include emissions associated with fuel combustion in vehicles, accounted for the second largest contribution to communitywide GHG emissions. Generally, emissions from all sectors have decreased since 2005. The 2005, 2012, and 2018 inventories by emissions sector for Holtville are summarized in Table 4.6-1.

Emissions forecasts were prepared for Holtville under BAU and Legislatively-Adjusted BAU conditions. Forecasts were prepared to estimate future emissions from communitywide activities in 2020, 2030, and 2050. These forecasts were prepared consistent with the regional BAU and Legislatively-Adjusted BAU forecasts presented in Chapter 3. Additional details for forecast methodology and assumptions are provided in Appendix B. The 2020, 2030, and 2050 forecasts for Holtville are summarized in Table 4.6-2.

Table 4.6-2 City of Holtville Greenhouse Gas Emissions Forecasts

Emissions Sector	GHG Emissions ($MTCO_2e$)					
	2020		2030		2050	
	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted
Energy	23,468	18,783	26,067	16,134	31,265	2,157
Transportation	20,419	19,558	22,808	17,284	23,415	16,303
Water	1,001	1,001	1,091	1,091	1,270	1,270
Waste	2,716	2,716	2,958	2,958	3,444	3,444
Agriculture	43	43	43	43	43	43
Total	47,647	42,101	52,967	37,510	59,436	23,216
% Change from 2005	-36%	-43%	-29%	-50%	-20%	-69%

Notes: Columns may not add due to rounding.

GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020

4.6.2 Reduction Targets

Reduction targets for Holtville were established in alignment with Senate Bill (SB) 32 and Executive Order S-3-05, based on the 2005 GHG inventory. Consistent with the reduction targets and methods for determine targets described in Chapter 3, the reduction targets for Holtville are:

- Reduce emissions 40 percent below 2005 levels by 2030; and
- Reduce emissions 64 percent below 2005 levels by 2050.

To meet these targets, Holtville will need to reduce communitywide emissions to 44,894 $MTCO_2e$ in 2030, and 26,455 $MTCO_2e$ in 2050.

The GHG emissions reduction that would need to be accomplished to achieve these targets are based on the "emissions gap" remaining between the Legislatively-Adjusted BAU forecast and the reduction targets. Reliance on federal, State, and regional policies and legislative actions alone would not achieve these targets, and Holtville will need to implement local reduction measures to reduce the emissions gap to demonstrate consistency with State targets and goals. The emissions inventory, forecast, targets, and emissions gap are shown in Figure 4.6-1.

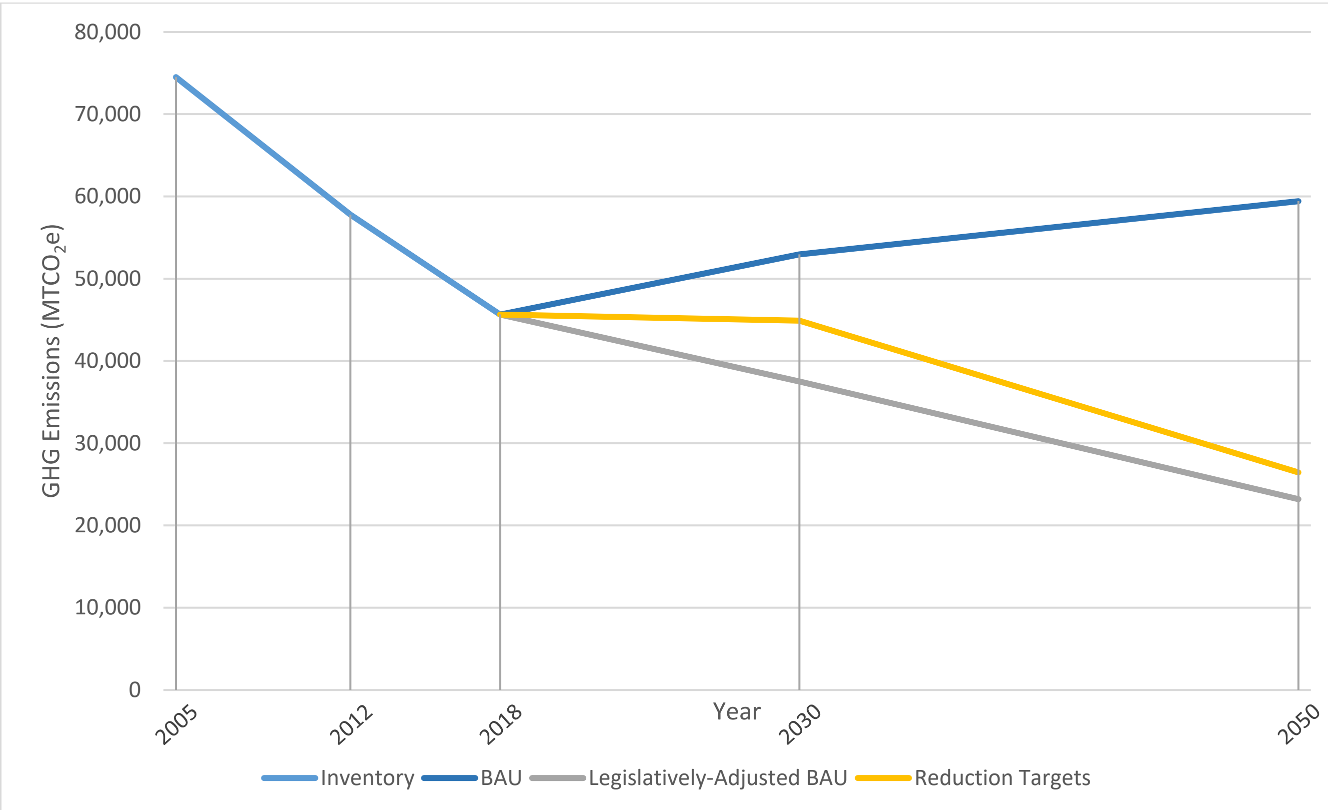

Figure 4.6-1 City of Holtville Greenhouse Gas Emissions, Forecasts, and Targets

4.6.3 Reduction Measures

Although the Legislatively-Adjusted BAU emissions forecast would meet the City's 2030 and 2050 emissions reduction targets, Holtville may choose to implement GHG reduction measures, based on the measures identified in Chapter 3. Each measure is a program, policy, or project the City could implement that would result in a reduction in GHG emissions. Reduction measures were identified to reduce emissions from all emissions sectors. The quantified emissions reduction measures, based on the list of regionally applicable measures, are summarized below in Table 4.6-3.

Table 4.6-3 City of Holtville Greenhouse Gas Reduction Measures

Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
Transportation Measures			

Table 4.6-3 City of Holtville Greenhouse Gas Reduction Measures			
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
T-1.1	Create a ridesharing program for agricultural workers modeled after the Green Raiterios program in the San Joaquin Valley.	41	68
T-1.2	Plan and implement a system of bicycle lanes and multi-use trails that link the cities, unincorporated communities, schools, commercial/retail, employment centers, health care service facilities, public transportation, and other points of interest.	10	19
T-1.4	Adopt Complete Street Ordinances to ensure streets and roads are designed and operated as a balanced, multimodal transportation network that enables safe access for all users.	91	64
T-1.5	Adopt zoning changes that encourage higher density mixed use development in incorporated cities.	91	64
T-2.1	Require projects with loading docks to provide electric outlets to power truck refrigeration units rather than allow trucks to idle while unloading.	<1	<1
T-2.2	Synchronize traffic signals to reduce idling	641	455
T-2.4	Work with the air district to establish an incentive program to trade in fossil fuel-powered landscaping equipment with electric versions.	71	231
T-3.1	Transition to a more fuel-efficient municipal vehicle fleet	40	46
T-3.2	Install public electric vehicle charging stations	38	44
T-3.3	Require electric vehicle charging stations at new non-residential developments	28	33
T-3.4	Explore local "cash for clunkers" or similar incentive programs that provide access to new or used zero emission on-road vehicles	43	24
Energy Measures			
E-1.1	Require new residential developments to install alternatively powered water heaters	18	104
E-1.3	Reduce or eliminate natural gas and propane consumption in new and existing residential buildings	108	1099
E-1.5	Require major renovations to incorporate energy efficiency measures	770	57
E-2.3	Require large parking lots for new commercial development projects to include solar canopies to produce on-site renewable energy, and provide shading for energy efficiency benefits.	See E-2.5	See E-2.5
E-2.4	Supply municipal facilities with on-site renewable electricity	130	-
E-2.5	Adopt a reach code to require new commercial developments to achieve zero net energy	716	206
E-2.6	Establish or join program to increase grid-supply renewable and zero-carbon electricity	6580	-
Waste Measures			

Table 4.6-3 City of Holtville Greenhouse Gas Reduction Measures			
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
WS-1.1	Provide recycling and composting receptacles and use of biodegradable or recycled-material products at municipal facilities and events, where feasible.	8322	1467
WS-1.2	Promote alternative uses of agricultural and organic waste by promoting the construction of composting and anaerobic digestion facilities.		
WS-1.3	Create waste diversion ordinances for construction projects.		
Agriculture Measures			
AG-1.1	Work with utilities and/or air districts to provide incentives such as CARB's FARMER program to convert stationary diesel- or gas-powered irrigation pumps to electric pumps that are connected to the grid or use off-grid alternative/renewable energy sources, such as solar.	-	-
AG-1.2	Work with utilities, dairies, ranches, and others to expedite permitting and promote energy generation, flaring, and methane capture systems at manure management facilities at cattle ranches and dairy farms.	4	7
AG-1.3	Provide incentives for replacing gas- or diesel-powered agricultural equipment with electric or alternatively-fueled equivalents.	1	1
AG-1.5	Work with farmers to either reduce or replace the use of synthetic nitrogen-based fertilizers with compost alternatives.	4	9
AG-2.2	Target stream restoration programs and riparian restoration strategies for carbon sequestration, natural heat relief, water quality improvements, and/or wildlife habitat mitigation.	-	-
AG-2.4	Develop and enforce landscape tree requirement for new developments	25	66

Notes: CAP = climate action plan; CARB = California Air Resources Board; EPA = U.S. Environmental Protection Agency; FARMER = Funding Agricultural Replacement Measures for Emissions Reductions; GHG = greenhouse gas; LED = light emitting diode; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not enough data available to quantify potential GHG reductions

Based on the implementation of the measures identified in Holtville, communitywide emissions would be further reduced by approximately 9,718 $MTCO_2e$ in 2030 and 3,400 $MTCO_2e$ in 2050.

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4.7 City of Imperial

The City of Imperial (Imperial) is located along State Route 86, and approximately 12 miles north of Calexico and the the U.S./Mexico international border. Imperial contains appproximately 10 percent of the region's total population, and seven percent of the region's total jobs. As of 2018, Imperial's population was 19,372 persons.

4.7.1 Emissions Inventory and Forecasts

As part of the Imperial Valley Regional Climate Action Plan (Regional CAP), a greenhouse gas (GHG) emissions inventory and forecast were prepared for the region and each individual jurisdiction in Imperial Valley. This inventory and forecast estimate GHG emissions from communitywide activities, organized by emissions sector (i.e., energy, transportation, water, waste, and agriculture). GHG emissions quantities are expressed in terms of metric ton of carbon dioxide equivalent ($MTCO_2e$). The regional and local inventories include GHG emissions estimates for the years 2005, 2012, and 2018. GHG emission forecasts provide an estimate of future emissions levels based on current trends and activities. The Regional CAP includes two emissions forecast scenarios for regional and local emissions: the business-as-usual (BAU) scenario, and the Legislatively-Adjusted BAU scenario. A summary for the methodologies and regional estimates is provided in Chapter 3. Additional details for inventory and forecast assumptions and data are provided in Appendices A and B.

Table 4.7-1 City of Imperial Greenhouse Gas Emissions Inventory

Emissions Sector	GHG Emissions ($MTCO_2e$)		
	2005	2012	2018
Energy	68,087	65,765	50,392
Transportation	29,950	39,199	44,370
Water	1,686	2,516	3,174
Waste	10,464	9,196	13,295
Agriculture	1,898	1,965	2,146
Total	112,085	118,641	113,377
% Change from 2005	--	6%	1%
Wastewater Collection and Treatment [1]	1,052	1,176	904
Potable Water Consumption [1]	679	503	317

Notes: Columns may not add due to rounding.

[1] Presented for informational purposes only

GHG = greenhouse gas(es); $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020.

In 2018, it is estimated that communitywide activities in Imperial generated approximately 137,670 $MTCO_2e$. Emissions from energy account for the greatest contribution to communitywide emissions, which includes electricity and natural gas consumption. Emissions from on-road and off-road transportation, which include emissions associated with fuel combustion in vehicles, accounted for the second largest contribution to communitywide GHG emissions. Generally, emissions from all sectors have decreased since 2005. The 2005, 2012, and 2018 inventories by emissions sector for Imperial are summarized in Table 4.7-1.

Emissions forecasts were prepared for Imperial under BAU and Legislatively-Adjusted BAU conditions. Forecasts were prepared to estimate future emissions from communitywide activities in 2020, 2030, and 2050. These forecasts were prepared consistent with the regional BAU and Legislatively-Adjusted BAU forecasts presented in Chapter 3. Additional details for forecast methodology and assumptions are provided in Appendix B. The 2020, 2030, and 2050 forecasts for Imperial are summarized in Table 4.7-2.

Table 4.7-2 City of Imperial Greenhouse Gas Emissions Forecasts

Emissions Sector	GHG Emissions ($MTCO_2e$)					
	2020		2030		2050	
	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted
Energy	53,310	43,121	67,903	41,643	97,088	10,991
Transportation	48,252	46,289	54,210	41,417	63,945	44,364
Water	3,314	3,314	4,015	4,015	5,415	5,415
Waste	13,882	13,882	16,815	16,815	22,683	22,683
Agriculture	2,114	2,114	2,113	2,113	2,111	2,111
Total	120,872	108,720	145,056	106,003	191,242	85,565
% Change from 2005	8%	-3%	29%	-5%	71%	-24%

Notes: Columns may not add due to rounding.

GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020

4.7.2 Reduction Targets

Reduction targets for Imperial were established in alignment with Senate Bill (SB) 32 and Executive Order S-3-05, based on the 2005 GHG inventory. Consistent with the reduction targets and methods for determine targets described in Chapter 3, the reduction targets for Imperial are:

- Reduce emissions 39 percent below 2005 levels by 2030; and
- Reduce emissions 64 percent below 2005 levels by 2050.

To meet these targets, Imperial will need to reduce communitywide emissions to 67,900 $MTCO_2e$ in 2030, and 40,527 $MTCO_2e$ in 2050.

The GHG emissions reduction that would need to be accomplished to achieve these targets are based on the "emissions gap" remaining between the Legislatively-Adjusted BAU forecast and the reduction targets. Reliance on federal, State, and regional policies and legislative actions alone would not achieve these targets, and Imperial will need to implement local reduction measures to reduce the emissions gap to demonstrate consistency with State targets and goals. The emissions inventory, forecast, targets, and emissions gap are shown in Figure 4.7-1.

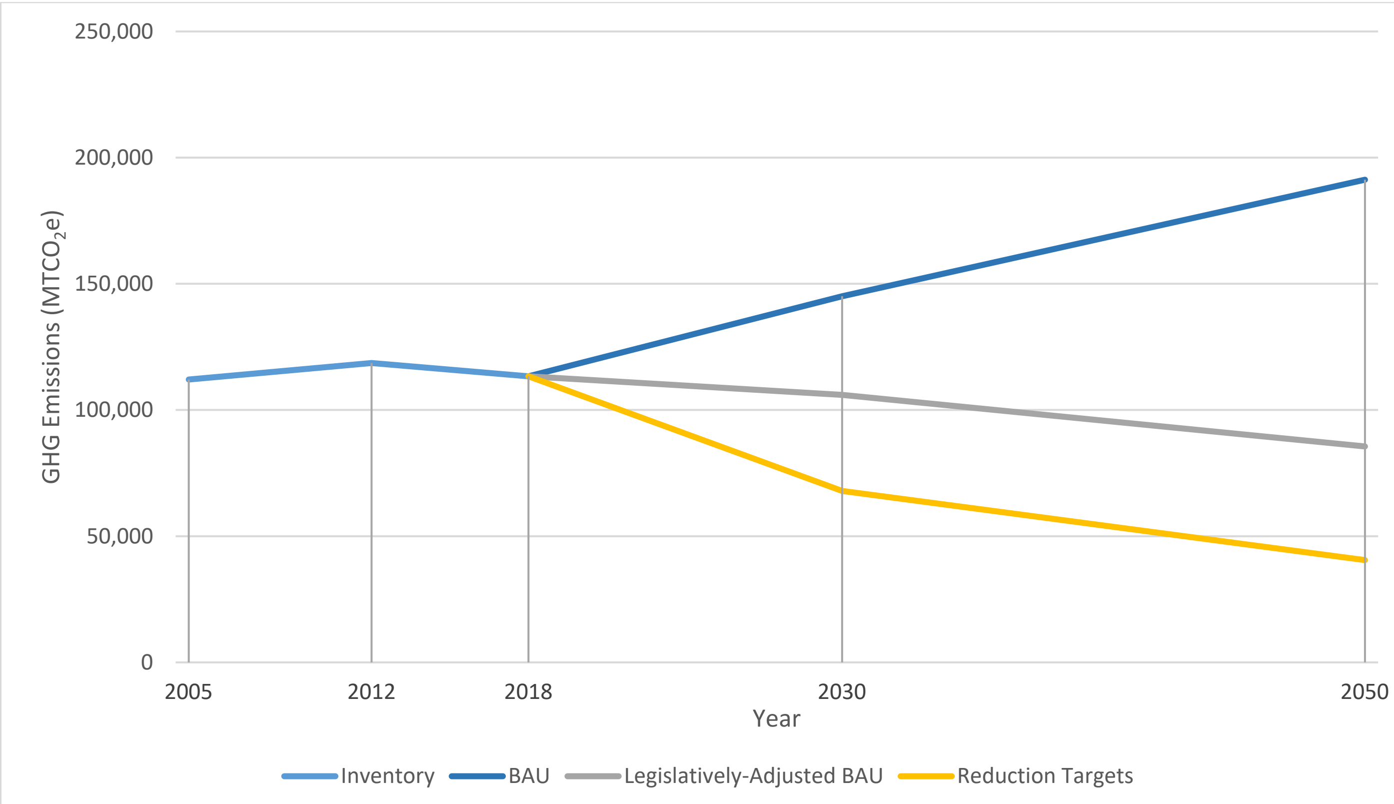

Figure 4.7-1 City of Imperial Greenhouse Gas Emissions, Forecasts, and Targets

4.7.3 Reduction Measures

In order to close the gap between the Legislatively-Adjusted BAU emissions forecast and the 2030 and 2050 emissions reduction targets, Imperial would implement GHG reduction measures, based on the measures identified in Chapter 3. Each measure is a program, policy, or project the City would implement that would result in a direct and measurable reduction in GHG emissions. Reduction measures were identified to reduce emissions from all sectors. The emissions reduction measures, based on the list of regionally applicable measures, are summarized below in Table 4.7-3.

Table 4.7-3 City of Imperial Greenhouse Gas Reduction Measures

Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
Transportation Measures			
T-1.1	Create a ridesharing program for agricultural workers modeled after the Green Raiterios program in the San Joaquin Valley.	8	21

Table 4.7-3 City of Imperial Greenhouse Gas Reduction Measures			
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
T-1.2	Plan and implement a system of bicycle lanes and multi-use trails that link the cities, unincorporated communities, schools, commercial/retail, employment centers, health care service facilities, public transportation, and other points of interest.	4	7
T-1.4	Adopt Complete Street Ordinances to ensure that streets and roads are designed and operated as a balanced, multimodal transportation network that enables safe access for all users.	209	184
T-1.5	Adopt zoning changes that encourage higher density mixed use development in incorporated cities.	209	184
T-2.1	Require projects with loading docks to provide electric outlets to power truck refrigeration units rather than allow trucks to idle while unloading.	<1	<1
T-2.2	Synchronize traffic signals to reduce idling	1,464	1,287
T-2.4	Work with the air district to establish an incentive program to trade in fossil fuel-powered landscaping equipment with electric versions.	210	680
T-3.1	Transition to a more fuel-efficient municipal vehicle fleet	242	315
T-3.2	Install public electric vehicle charging stations	181	240
T-3.3	Require electric vehicle charging stations at new non-residential developments	134	179
T-3.4	Explore local "cash for clunkers" or similar incentive programs that provide access to new or used zero emission on-road vehicles	98	60
Energy Measures			
E-1.1	Require new residential developments to install alternatively powered water heaters	194	1,110
E-1.3	Reduce or eliminate natural gas and propane consumption in new and existing residential buildings	781	6,689
E-1.5	Require major renovations to incorporate energy efficiency measures	1,960	277
E-2.3	Require large parking lots for new commercial development projects to include solar canopies to produce on-site renewable energy, and provide shading for energy efficiency benefits.	See E-2.5	See E-2.5
E-2.4	Supply municipal facilities with on-site renewable electricity	308	-
E-2.5	Adopt a reach code to require new commercial developments to achieve zero net energy	4,156	1,587
E-2.6	Establish or join program to increase grid-supply renewable and zero-carbon electricity	14,820	-
Waste Measures			
WS-1.1	Provide recycling and composting receptacles and use of biodegradable or recycled-material products at municipal facilities and events, where feasible.	1,329	3,988

Table 4.7-3 City of Imperial Greenhouse Gas Reduction Measures			
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
WS-1.2	Promote alternative uses of agricultural and organic waste by promoting the construction of composting and anaerobic digestion facilities.		
WS-1.3	Create waste diversion ordinances for construction projects.		
Agriculture Measures			
AG-1.1	Work with utilities and/or air districts to provide incentives such as CARB's FARMER program to convert stationary diesel- or gas-powered irrigation pumps to electric pumps that are connected to the grid or use off-grid alternative/renewable energy sources, such as solar.	3	3
AG-1.2	Work with utilities, dairies, ranches, and others to expedite permitting and promote energy generation, flaring, and methane capture systems at manure management facilities at cattle ranches and dairy farms.	186	368
AG-1.3	Provide incentives for replacing gas- or diesel-powered agricultural equipment with electric or alternatively-fueled equivalents.	27	55
AG-1.5	Work with farmers to either reduce or replace the use of synthetic nitrogen-based fertilizers with compost alternatives.	219	438
AG-2.2	Target stream restoration programs and riparian restoration strategies for carbon sequestration, natural heat relief, water quality improvements, and/or wildlife habitat mitigation.	190	190
AG-2.4	Develop and enforce landscape tree requirement for new developments	151	402

Notes: CAP = climate action plan; CARB = California Air Resources Board; EPA = U.S. Environmental Protection Agency; FARMER = Funding Agricultural Replacement Measures for Emissions Reductions; GHG = greenhouse gas; LED = light emitting diode; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not enough data available to quantify potential GHG reductions

Based on the implementation of the measures identified in Imperial, communitywide emissions would be reduced by approximately 27,086 $MTCO_2e$ in 2030 and 18,263 $MTCO_2e$ in 2050. These emissions reduction measures would meet Imperial's 2030 reduction target, but would fall short of the 2050 reduction goal.

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4.8 City of Westmorland

The City of Westmorland (Westmorland) is located along State Route 86, and 31 miles north of Calexico and the U.S./Mexico international border. Westmorland is the smallest incorporated city in Imperial County, containing appproximately one percent of the region's total population, and less than one percent of the region's total jobs. As of 2018, Westmorland's population was 2,325 persons.

4.8.1 Emissions Inventory and Forecasts

As part of the Imperial Valley Regional Climate Action Plan (Regional CAP), a greenhouse gas (GHG) emissions inventory and forecast were prepared for the region and each individual jurisdiction in Imperial Valley. This inventory and forecast estimate GHG emissions from communitywide activities, organized by emissions sector (i.e., energy, transportation, water, waste, and agriculture). GHG emissions quantities are expressed in terms of metric ton of carbon dioxide equivalent ($MTCO_2e$). The regional and local inventories include GHG emissions estimates for the years 2005, 2012, and 2018. GHG emission forecasts provide an estimate of future emissions levels based on current trends and activities. The Regional CAP includes two emissions forecast scenarios for regional and local emissions: the business-as-usual (BAU) scenario, and the Legislatively-Adjusted BAU scenario. A summary for the methodologies and regional estimates is provided in Chapter 3. Additional details for inventory and forecast assumptions and data are provided in Appendices A and B.

Table 4.8-1 City of Westmorland Greenhouse Gas Emissions Inventory

Emissions Sector	GHG Emissions ($MTCO_2e$)		
	2005	2012	2018
Energy	20,024	11,023	8,097
Transportation	12,137	9,589	8,244
Water	358	372	381
Waste	1,461	1,007	1,446
Agriculture	368	381	417
Total	34,348	22,373	18,584
% Change from 2005	--	-35%	-46%
Wastewater Collection and Treatment [1]	209	163	101
Potable Water Consumption [1]	259	156	85

Notes: Columns may not add due to rounding.

[1] Presented for informational purposes only

GHG = greenhouse gas(es); $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020.

In 2018, it is estimated that communitywide activities in Westmorland generated approximately 25,102 $MTCO_2e$. Emissions from energy account for the greatest contribution to communitywide emissions, which includes electricity and natural gas consumption. Emissions from on-road and off-road transportation, which include emissions associated with fuel combustion in vehicles, accounted for the second largest contribution to communitywide GHG emissions. Generally, emissions from all sectors have decreased since 2005. The 2005, 2012, and 2018 inventories by emissions sector for Westmorland are summarized in Table 4.8-1.

Emissions forecasts were prepared for Westmorland under BAU and Legislatively-Adjusted BAU conditions. Forecasts were prepared to estimate future emissions from communitywide activities in 2020, 2030, and 2050. These forecasts were prepared consistent with the regional BAU and Legislatively-Adjusted BAU forecasts presented in Chapter 3. Additional details for forecast methodology and assumptions are provided in Appendix B. The 2020, 2030, and 2050 forecasts for Westmorland are summarized in Table 4.8-2.

Table 4.8-2 City of Westmorland Greenhouse Gas Emissions Forecasts

Emissions Sector	GHG Emissions ($MTCO_2e$)					
	2020		2030		2050	
	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted	BAU	Legislatively-Adjusted
Energy	8,084	6,515	8,017	5,205	7,884	700
Transportation	9,724	9,259	10,262	7,494	8,705	5,746
Water	381	381	383	383	386	386
Waste	1,447	1,447	1,453	1,453	1,466	1,466
Agriculture	410	410	410	410	410	410
Total	20,047	18,012	20,525	14,946	18,850	8,707
% Change from 2005	-42%	-48%	-40%	-56%	-45%	-75%

Notes: Columns may not add due to rounding.

GHG = greenhouse gas; $MTCO_2e$ = metric tons of carbon dioxide equivalent

Source: Rincon 2020

4.8.2 Reduction Targets

Reduction targets for Westmorland were established in alignment with Senate Bill (SB) 32 and Executive Order S-3-05, based on the 2005 GHG inventory. Consistent with the reduction targets and methods for determine targets described in Chapter 3, the reduction targets for Westmorland are:

- Reduce emissions 37 percent below 2005 levels by 2030; and
- Reduce emissions 58 percent below 2005 levels by 2050.

To meet these targets, Westmorland will need to reduce communitywide emissions to 25,381 $MTCO_2e$ in 2030, and 16,668 $MTCO_2e$ in 2050. As shown in Table 4.8-2, the Legislatively-Adjusted BAU forecasts would exceed these targets without any additional action from the City. Although reliance on federal, State, and regional policies and legislative actions alone would achieve these targets, Westmorland may choose to implement local reduction measures to further reduce emissions assist the State in meeting to demonstrate consistency with regional efforts. The emissions inventory, forecast, and targets are shown in Figure 4.6-1.

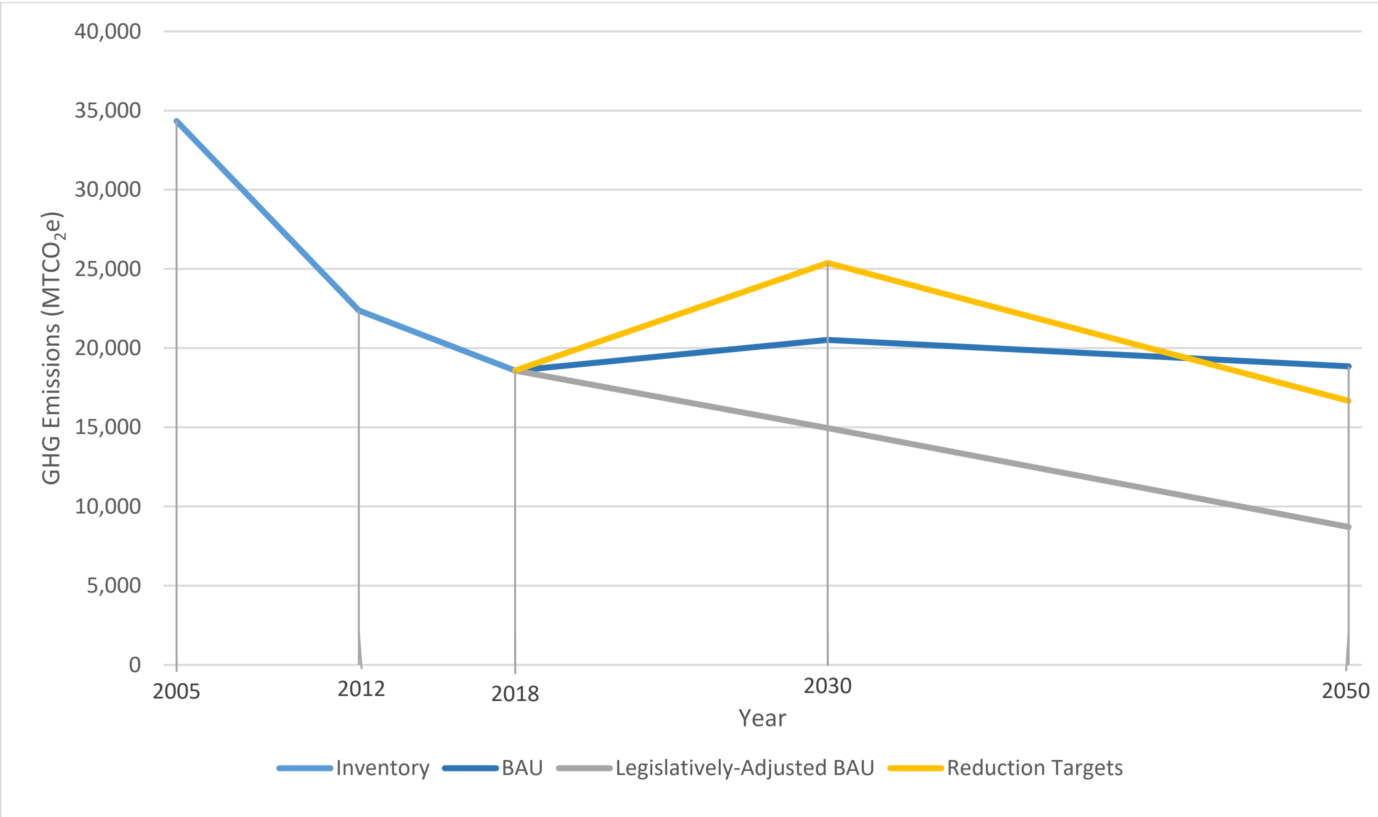

Figure 4.8-1 City of Westmorland Greenhouse Gas Emissions, Forecasts, and Targets

4.8.3 Reduction Measures

Although the Legislatively-Adjusted BAU emissions forecast would meet the City's 2030 and 2050 emissions reduction targets, Westmorland may choose to implement GHG reduction measures, based on the measures identified in Chapter 3. Each measure is a program, policy, or project the City could implement that would result in a reduction in GHG emissions. Reduction measures were identified to reduce emissions from all sectors. The quantified emissions reduction measures, based on the list of regionally applicable measures, are summarized below in Table 4.8-3.

Table 4.8-3 City of Westmorland Greenhouse Gas Reduction Measures

Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
Transportation Measures			

Table 4.8-3 City of Westmorland Greenhouse Gas Reduction Measures			
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
T-1.1	Create a ridesharing program for agricultural workers modeled after the Green Raiterios program in the San Joaquin Valley.	122	116
T-1.2	Plan and implement a system of bicycle lanes and multi-use trails that link the cities, unincorporated communities, schools, commercial/retail, employment centers, health care service facilities, public transportation, and other points of interest.	2	5
T-1.4	Adopt Complete Street Ordinances to ensure that streets and roads are designed and operated as a balanced, multimodal transportation network that enables safe access for all users.	48	28
T-1.5	Adopt zoning changes that encourage higher density mixed use development in incorporated cities.	48	28
T-2.1	Require projects with loading docks to provide electric outlets to power truck refrigeration units rather than allow trucks to idle while unloading.	<1	<1
T-2.2	Synchronize traffic signals to reduce idling	344	206
T-2.4	Work with the air district to establish an incentive program to trade in fossil fuel-powered landscaping equipment with electric versions.	24	78
T-3.1	Transition to a more fuel-efficient municipal vehicle fleet	12	16
T-3.2	Install public electric vehicle charging stations	181	240
T-3.3	Require electric vehicle charging stations at new non-residential developments	134	179
T-3.4	Explore local "cash for clunkers" or similar incentive programs that provide access to new or used zero emission on-road vehicles	23	12
Energy Measures			
2 10 E-1.1	Require new residential developments to install alternatively powered water heaters	2	10
E-1.3	Reduce or eliminate natural gas and propane consumption in new and existing residential buildings	71	511
E-1.5	Require major renovations to incorporate energy efficiency measures	58	32
E-2.3	Require large parking lots for new commercial development projects to include solar canopies to produce on-site renewable energy, and provide shading for energy efficiency benefits.	See E-2.5	See E-2.5
E-2.4	Supply municipal facilities with on-site renewable electricity	29	-
E-2.5	Adopt a reach code to require new commercial developments to achieve zero net energy	-	-
E-2.6	Establish or join program to increase grid-supply renewable and zero-carbon electricity	2,347	-
Waste Measures			

Table 4.8-3 City of Westmorland Greenhouse Gas Reduction Measures			
Measure Number	Measure Description	GHG Reduction Potential	
		2030	2050
WS-1.1	Provide recycling and composting receptacles and use of biodegradable or recycled-material products at municipal facilities and events, where feasible.	145	434
WS-1.2	Promote alternative uses of agricultural and organic waste by promoting the construction of composting and anaerobic digestion facilities.		
WS-1.3	Create waste diversion ordinances for construction projects.		
Agriculture Measures			
AG-1.1	Work with utilities and/or air districts to provide incentives such as CARB's FARMER program to convert stationary diesel- or gas-powered irrigation pumps to electric pumps that are connected to the grid or use off-grid alternative/renewable energy sources, such as solar.	1	1
AG-1.2	Work with utilities, dairies, ranches, and others to expedite permitting and promote energy generation, flaring, and methane capture systems at manure management facilities at cattle ranches and dairy farms.	36	71
AG-1.3	Provide incentives for replacing gas- or diesel-powered agricultural equipment with electric or alternatively-fueled equivalents.	5	11
AG-1.5	Work with farmers to either reduce or replace the use of synthetic nitrogen-based fertilizers with compost alternatives.	43	85
AG-2.2	Target stream restoration programs and riparian restoration strategies for carbon sequestration, natural heat relief, water quality improvements, and/or wildlife habitat mitigation.	4	4
AG-2.4	Develop and enforce landscape tree requirement for new developments	<1	<1

Notes: CAP = climate action plan; CARB = California Air Resources Board; EPA = U.S. Environmental Protection Agency; FARMER = Funding Agricultural Replacement Measures for Emissions Reductions; GHG = greenhouse gas; LED = light emitting diode; $MTCO_2e$ = metric tons of carbon dioxide equivalent; NA = not enough data available to quantify potential GHG reductions

Based on the implementation of the measures identified in Westmorland, communitywide emissions would be further reduced by approximately 3,678 $MTCO_2e$ in 2030 and 2,066 $MTCO_2e$ in 2050.

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Chapter 5

Implementation and Monitoring

The success of the Imperial Valley Regional Climate Action Plan (Regional CAP) will require defined steps for implementation of greenhouse gas (GHG) reduction measures and ongoing monitoring of implementation progress. GHG reduction measure implementation will require the support of all jurisdictions in Imperial Valley, which will ultimately determine whether regional goals are met.

5.1 Summary of CAP Implementation

Implementation of the Regional CAP measures identified in Chapter 3, as well as meeting the local reduction goals identified in Chapter 4, will require the collaboration between the Imperial County Transportation Commission (ICTC), the County of Imperial (County), the seven incorporated cities within Imperial County, as well as other regional agencies such as the Imperial Irrigation District and the Imperial County Air Pollution Control District. The Regional CAP identifies a comprehensive set of goals and measures that the region can implement to reduce GHG emissions in Chapter 3 and Chapter 4. These measures would be implemented through ordinances, policies, resolutions, programs, and incentives at the city/county and regional levels, and supported through ongoing outreach and education activities. Given the long time horizon of the Regional CAP, ongoing monitoring of reduction measure implementation and effectiveness will guide modifications to specific implementation actions. As circumstances change over time, implementation efforts may need to be adjusted to account for new technologies, changes in State or federal regulations, or funding availability. Further, through monitoring of measure success in reducing GHG emissions, some implementation efforts may be adjusted to ensure measures meet the goals of the Regional CAP.

5.1.1 Implementation Coordination

Implementation of the Regional CAP measures will require the involvement of all municipal organizations and community members within the Imperial Valley. This includes actions taken by municipal staff and local decision-making bodies (e.g., city councils) to implement or support the implementation of reduction measures. Local agencies will need to collaborate with ICTC and the Southern California Association of Governments (SCAG), as well as other public and private entities, to implement the measures that require ongoing funding or additional implementation beyond agency boundaries. Implementation of measures identified in the Regional CAP would assist each local jurisdiction in meeting local GHG reduction targets. As the County and cities implement these measures, they will continue to examine additional efforts that could be taken to further reduce local GHG emissions in the long term.

5.1.2 Local Actions

Based on the analysis and reduction measures identified in this Regional CAP, local agencies can develop locally-appropriate implementation strategies to support regional GHG reduction efforts. These implementation strategies would ensure that the overall direction set forth in the Regional CAP is translated to local and community actions. Local implementation strategies will describe, for example, specific actions the local jurisdiction will require for new developments, will undertake themselves, or will pursue via ordinances, incentives, or other actions to achieve local GHG reductions.

Continuous management and oversight will be necessary for the implementation of the GHG reduction measures identified in the Regional CAP. ICTC and SCAG are committed to supporting local agencies in achieving the goals of this Regional CAP. Ensuring that measures translate to on-the-ground results and reductions in GHG emissions is critical for the region to achieve targets and will depend on the participation of all local governments, residents, and businesses.

5.2 Implementation Strategy

As noted previously, implementation of the Regional CAP, including meeting local reduction targets and achieving GHG reduction benefits, will require collaboration between ICTC, SCAG, local governments, and communities at-large. Meaningful implementation of the Regional CAP would require multiple components, including:

- Administration
- Implementation Schedule and Prioritization
- Funding
- Monitoring and Reporting

These components are not specific to ICTC or any individual jurisdiction, but are basic steps that should be taken to implement the Regional CAP locally. These components are intended to guide local agencies in implementing the Regional CAP.

5.2.1 Administration

ICTC and SCAG will continue to provide staffing and administrative support at the regional level. This includes implementing regional programs such as the Imperial Valley Regional Transportation Impact Fee, operation of regional transit agencies, and the Sustainable Communities Program. ICTC will also work to align existing and future programs, policies, and initiatives with the goals and measures identified in the Regional CAP.

In the development of local implementation plans or strategies, local agencies are encouraged to appoint existing staff or dedicate a new staff position to oversee the successful implementation and tracking of local GHG reduction strategies. A local staff person dedicated to reduction measure implementation and monitoring, would be primarily responsible for coordinating across various municipal departments to gather data, report on progress, track completed projects, and ensure that schedule and funding of upcoming projects are discussed at key decision-making meetings.

In general, the goal in implementing the Regional CAP is not to create new administrative tasks or new staff positions, but rather to leverage existing programs and staff to the maximum extent feasible. Local governments should seek to incorporate GHG planning and long-term reductions into their existing procedures, institutional organization, reporting, and long-term planning. These processes will be unique to each jurisdiction.

5.2.2 Implementation Schedule and Prioritization

ICTC and SCAG will track State measures and facilitate the implementation of regional reduction measures, especially those addressing GHG emissions from transportation and agricultural activities. ICTC will also continually coordinate with local agencies to assist in the implementation of local measures, as necessary. In general, ICTC will provide regional support of Regional CAP implementation and act as the purveyor of funding and resources from SCAG to assist in measure implementation and monitoring.

Ultimately, each local jurisdiction in the Imperial Valley will be responsible for initiating local actions that reduce GHG emissions with support from ICTC and SCAG. Local efforts following the Regional CAP will include identification of reduction measure implementation schedules and priorities. These activities will guide local agencies in setting timelines for program development or action items to achieve local GHG reductions. Prioritization of implementation actions will vary by jurisdiction, but can be organized by implementation feasibility, cost to implement, and existing resources available.

5.2.3 Funding

The GHG reduction measures in the Regional CAP were formulated with an understanding that ICTC and local agencies have limited staff time and financial resources to implement them. The costs for implementation include the creation or promotion of voluntary programs, continuing administration of these programs, coordination and outreach with other government agencies and businesses, and exploration or study of potential legislative or regulatory mechanisms not yet codified. Some reduction measures will require up-front capital expenditures by local agencies, but funding and financing options are available for initial or ongoing implementation of other measures.

Some funding sources may not be directed towards a local jurisdiction, but rather to a regional agency such as ICTC or SCAG. ICTC and local agencies should continually monitor private and public funding sources for new grant and rebate opportunities and to better understand how larger agencies are accessing funds that can be used for GHG reductions at the local level. Leveraging financing sources is one of the most important roles ICTC and local governments can play in helping implement GHG reduction measures.

Local, regional, State, and federal public sources of funding will be needed along with the substantial involvement of the private sector. Local implementation plans will take into account the costs of staff resources throughout implementation of GHG reduction measures, as well as the financial benefits and cost savings. Funding options that should be explored by ICTC and local agencies include:

- State and Federal Grants and Low-Interest Loans;
- Support from Local Businesses, Non-Profits, and Agencies;
- Self-Funding and Revolving Fund Programs;
- Agreements with Private Investors; and,
- Taxes and Bonds.

Specific funding sources, available at the time the Regional CAP was prepared, are provided in Table 5-1. ICTC and local governments should continue to monitor funding resources provided on the State's

Climate Change Funding Wizard website, which is regularly updated and provides resources for funding available to cities, residents, and businesses for projects and activities that reduce GHG emissions and improve local resiliency.

Table 5-1 Potential Funding Sources for Regional CAP Implementation

Funding Source	Eligible Applicant(s)	Description
California Climate Investments (CCI)	Public Agencies	▸ CCI is the statewide initiative that provides funds from the Cap-and-Trade program for GHG reducing projects and programs. ▸ Funds can support a variety of projects including affordable housing, renewable energy, public transportation, zero-emission vehicles, environmental restoration, sustainable agriculture, recycling, and more. ▸ Numerous state programs listed above are funded by CCI; however, the program continues to evolve and is updated by the state periodically to include new or modified programs.
Federal Tax Credits for Energy Efficiency	Private Property Owners	Tax credits for energy efficiency can be promoted to residents.
Imperial Irrigation District (IID) Programs	Private Property Owners	IID offers a variety of rebates and programs for residents and businesses to improve energy efficiency and reduce energy costs. This includes: ▸ Energy Rewards Rebate Program, which offers IID customers incentives to purchase energy efficient appliances and products. ▸ Electric Vehicles and EV Charger Rebates, which provide rebates or other incentives for the purchase of an electric vehicle or installation of electric vehicle charging stations.
Energy Efficient Mortgages (EEM)	Private Property Owners	▸ An EEM is a mortgage that credits a home's energy efficiency in the mortgage itself. ▸ Residents can finance energy saving measures as part of a single mortgage. ▸ To verify a home's energy efficiency, an EEM typically requires a home energy rating of the house by a home energy rater before financing is approved. ▸ EEMs typically are used to purchase a new home that is already energy efficient, such as an ENERGY STAR® qualified home.
California Energy Commission (CEC) Energy Efficiency Financing	Public Agencies	▸ The CEC offers energy efficiency financing and low interest loans to cities and counties for installing energy-saving projects.
Energy Upgrade California	Private Property Owners	▸ Program is intended for home energy upgrades. ▸ Funded by the American Recovery and Reinvestment Act, California utility ratepayers, and private contributions. ▸ Utilities administer the program, offering homeowners the choice of one of two upgrade packages—basic or advanced.

Table 5-1 Potential Funding Sources for Regional CAP Implementation

		▸ Homeowners are connected to home energy professionals. ▸ Rebates, incentives, and financing are available. ▸ Homeowners can receive up to $4,000 back on an upgrade through the local utility.
CEC Bright Schools Program	Local Utility Companies	▸ In partnership with the California Conservation Corps, CEC provides local utility companies and other qualifying energy service companies with resources to assist schools in undertaking energy efficiency projects.
Property-Assessed Clean Energy (PACE)	Private Property Owners	▸ The PACE finance program is intended to finance energy and water improvements within a home or business through a land-secured loan. ▸ Municipalities are authorized to designate areas where property owners can enter into contractual assessments to receive long-term, low-interest loans for energy and water efficiency improvements, and renewable energy installation on their property. ▸ Financing is repaid through property tax bills.
Private Funding	Private Property Owners	▸ Private equity can be used to finance energy improvements, with returns realized as future cost savings. ▸ Rent increases can fund retrofits in commercial buildings. ▸ Net energy cost savings can fund retrofits in households. ▸ Power Purchase Agreements (PPA) involve a private company that purchases, installs, and maintains a renewable energy technology through a contract that typically lasts 15 years. After 15 years, the company would uninstall the technology or sign a new contract. ▸ On-Bill Financing (OBF) can be promoted to businesses for energy-efficiency retrofits. Funding from OBF is a no-interest loan that is paid back through the monthly utility bill. Lighting, refrigeration, heating, ventilation, and air conditioning, and light-emitting diode streetlights are all eligible projects.
California Department of Resources Recycling and Recovery (CalRecycle) Funding	Public Agencies and Private Property Owners	▸ CalRecycle grant programs allow jurisdictions to assist public and private entities in management of waste streams. ▸ Incorporated cities and counties in California are eligible for funds. ▸ Program funds are intended to: • Reduce, reuse, and recycle all waste. • Encourage development of recycled-content products and markets. • Protect public health and safety and foster environmental sustainability.
Clean Water State Revolving Funds (CWSRF)	Public Agencies	▸ CWSRF is a federal-State partnership that provides communities with low-cost financing for a wide range of water quality infrastructure projects.

5.2.4 Monitoring and Reporting

Regular monitoring is important to ensure programs are effective in achieving GHG reduction goals and continued implementation is feasible. Through early and ongoing monitoring, ICTC and local agencies can make informed decision on future priorities, funding, and scheduling. Monitoring activities should provide concrete data to document regional and local progress in reducing GHG emissions. ICTC will continue to work with SCAG and local agencies to develop protocols for monitoring the effectiveness of emissions reduction measures and for undertaking regional GHG emissions inventory updates.

At the regional level, ICTC, with the support of SCAG, is committed to providing updated GHG resources and tracking progress of state-level programs. With the support of local agencies, ICTC can also assist in tracking the completing or implementation of regional and local GHG reduction measures, and in preparing regional or local progress reports highlighting implementation accomplishments. Through this Regional CAP, local agencies are encouraged to develop implementation plans that identify methods for monitoring local measure implementation and regularly reporting results of implementation to ICTC and the public.

5.3 Public Participation

The success of many measures will ultimately depend on public participation in the Regional CAP implementation process. This includes ongoing engagement with individual residents and businesses, community organizations, developers, property owners, and other local and regional government agencies. While the Regional CAP focuses on measures in which regional and local agencies have a role, many of the measures require partnerships, collaboration, and active engagement.

ICTC is committed to continued public outreach support to inform residents on the role they can play in combating climate change. Effective and long-term climate action and resilience in Imperial Valley can only be achieved through efforts that continue to change the way individuals interact with the environment. Many of the measures identified in Chapter 3 and Chapter 4 focus on increasing community awareness and participating in existing programs or connecting the community with new information, tools, funding, or resources to take action. Thus, this Regional CAP serves as a resource to support community-based action.

5.4 Environmental Review

The California Environmental Quality Act (CEQA) requires lead agencies to identify significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. Most proposals for physical development are subject to the provisions of CEQA. The County and cities in Imperial Valley have adopted regulations for the environmental review process that set thresholds for determining significance. The identification of local and regional measures to achieve State GHG reduction targets are incorporated into this Regional CAP for the purpose of providing available pathways for local agencies to set updated thresholds for determining significance. Local agencies have the opportunity to build off of this Regional CAP by preparing local climate action plans or GHG reduction plans that incorporate the measures identified in Chapter 3 and Chapter 4. With the support of ICTC, local agencies can design these plans to meet the criteria identified in Section 15183.5 of the CEQA Guidelines to be “qualified” documents for the purposes of reducing GHG emissions. These “qualified” plans may be used for the specific purpose of streamlining the analysis of GHG emissions for subsequent projects within that jurisdiction.

Even in the absence of a “qualified” CAP, this Regional CAP provides measures and overarching policies intended to guide future development to increase sustainability and to reduce the impacts of climate change regionally. These measures should be used by local agencies to identify goals for local actions to improve local and regional sustainability through the development review process and agency plans and polices.

Chapter 6

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Appendices

Appendix A
Greenhouse Gas Emissions Inventory


Photo Source. CDFW. 2016. https://www.flickr.com/photos/californiadfg/26733381021/

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Greenhouse Gas Emission Inventory

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Table of Contents

Tables

Figures

Appendices

1 Executive Summary

A greenhouse gas (GHG) emissions inventory identifies the major sources and quantities of GHG emissions produced by community-wide activities within a jurisdiction's boundaries in a given year. Estimating GHG emissions enables local governments and regional agencies to establish an emissions baseline, track emissions trends, identify the greatest sources of GHG emissions within their jurisdiction, and establish targets for future GHG reductions. While identifying GHG emissions originating from a specific city or agency is essential for effective emission reduction progress tracking, it is also beneficial to view emissions from a regional perspective, where collaboration across jurisdictions and agencies can create more effective climate policies.

This document includes: a multi-year community inventory for all of Imperial Valley, including each of the incorporated cities and the unincorporated areas of Imperial County, a multi-year inventory capturing the regional GHG emissions generated by agricultural activities and a single year GHG emissions inventory for vehicles using the Calexico Ports of Entry. The community GHG inventories have been completed for the years 2005 and 2012 to align with the GHG inventories included in the Brawley and Calexico Climate Action Plans that were adopted in 2015. GHG inventories for 2018 were also completed for each community and are intended to be used as the baseline for forecasting community GHG emissions. The Agricultural inventory estimates GHG emissions in years consistent with the Community inventory, including 2005, 2012, and 2018. The Port of Entry GHG inventory was completed for 2015 using data from the 2015 *Vehicle Idling Emissions Study at Calexico East and Calexico West Ports-of-Entry*.

The community GHG emission inventories were calculated using the International Council for Local Environmental Initiatives (ICLEI) methodologies, specifically, the *U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions* Version 1.2 (Community Protocol). Consistent with this protocol, the community GHG inventories are divided into four sectors, or sources of emissions: energy (electricity and natural gas), transportation, solid waste, and water. Like all GHG emissions inventories, this document must rely on the best available data and calculation methodologies. The findings of this analysis provide a solid foundation upon which the Imperial County Transportation Commission (ICTC), acting as the lead agency for the Imperial Valley Regional Climate Action Plan, can coordinate with the County of Imperial, the incorporated cities and other relevant stakeholders to plan and act to reduce regional GHG emissions.

A summary of the community GHG emissions and agricultural GHG emissions for 2005, 2012, and 2018, and the GHG emission associated with the 2015 Port of Entry operations are included in the section below. A detailed analysis of the community GHG inventories for each of the eight jurisdictions is included in Appendix A, with a description of the data and calculations methodologies for the community GHG inventories included in Appendix B. The methodologies, assumptions, and data for the agricultural GHG emission inventory and the Port of Entry vehicle GHG emissions inventory are also included in Appendices C and D, respectively.

1.1 Community GHG Inventory Results

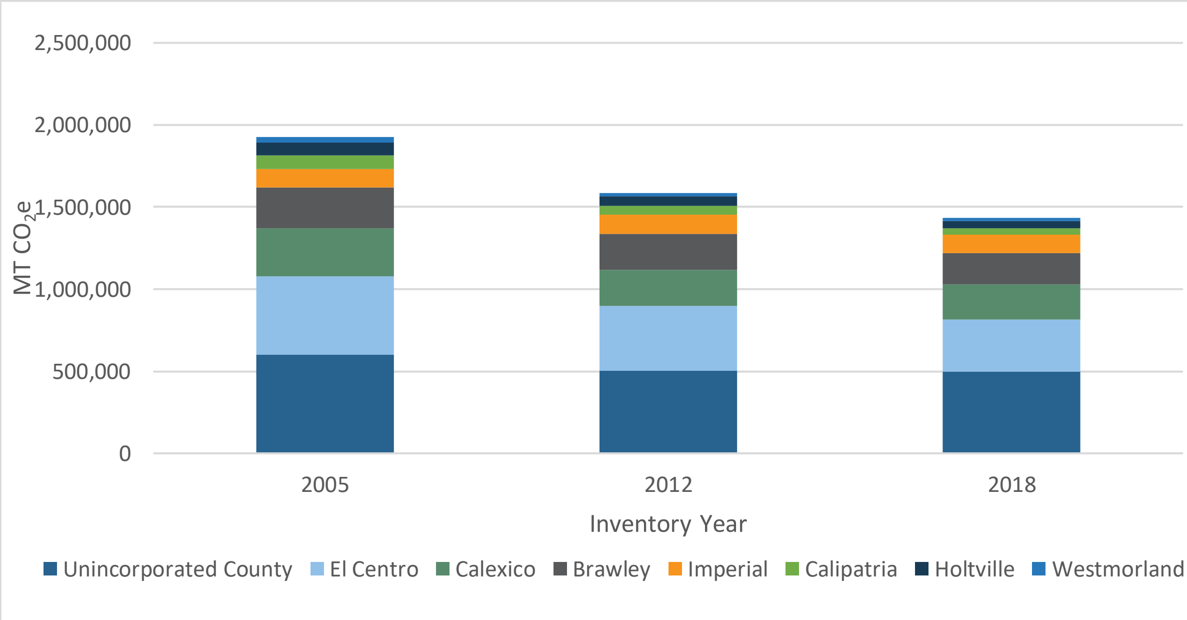
Activities in Imperial Valley generated GHG emissions to the magnitude of 1,924,301 metric tons of carbon dioxide equivalent (MT CO_2e) in 2005, 1,585,553 MT CO_2e in 2012, and 1,434,715 MT CO_2e in 2018. This equates to a 25% reduction in Imperial Valley's community GHG emissions between 2005 and 2018. This reduction in GHG emissions was primarily driven by increasingly lower GHG emissions associated with energy consumption, due to increased procurement of renewable energy. The reduction in total GHG emissions was also influenced to a lesser extent by reductions in waste generation, and partially offset by an increase in GHG emissions from on-road vehicles. GHG emission totals for the eight Imperial Valley jurisdictions, for each of the three inventory years, are provided in Table 1 and Figure 1.

Table 1 Multi-year Imperial Valley GHG Emissions Summary

	2005		2012		2018		Percent Change in Emissions (2005 to 2018)
Emission Source	Emissions (MT CO_2e)	Percent of Annual Total	Emissions (MT CO_2e)	Percent of Annual Total	Emissions (MT CO_2e)	Percent of Annual Total	
City of Brawley	251,571	13%	219,489	14%	190,778	13%	-24%
City of Calexico	291,173	15%	222,799	14%	217,473	15%	-25%
City of Calipatria	85,603	4%	50,840	3%	38,726	3%	-55%
City of El Centro	474,715	25%	391,242	25%	315,556	22%	-34%
City of Holtville	74,470	4%	57,736	4%	45,614	3%	-39%
City of Imperial	110,187	6%	116,676	7%	111,231	8%	1%
City of Westmorland	33,979	2%	21,991	1%	18,167	1%	-47%
Unincorporated Communities	602,603	31%	504,780	32%	497,169	35%	-17%
Imperial Valley Total	**1,924,301**	**100%**	**1,585,553**	**100%**	**1,434,715**	**100%**	**-25%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent;
Totals may not add up to 100% due to rounding

Figure 1 Multi-year Imperial Valley GHG Emissions Summary



The majority of Imperial Valley's community GHG emissions are generated by unincorporated parts of the County and the City of El Centro, which collectively contribute approximately 56% of the total Imperial Valley emissions in each inventory year. GHG emissions are primarily generated by activities that consume energy or fossil fuels, which can be categorized under four primary sectors of energy, transportation, water and waste. The magnitude of GHG emissions in each jurisdiction is generally proportional to the demographics; thus, jurisdictions that have a smaller contribution to the total Imperial Valley population and job totals generally have relatively lower contributions to the Imperial Valley GHG emissions total. For example, Calipatria, Holtville and Westmorland which collectively contribute approximately 15% of Imperial Valley's total jobs and population, contribute a similar proportion of total Imperial Valley community GHG emissions.

The Community inventory results show that GHG emissions in nearly all Imperial County incorporated cities, and unincorporated areas and communities, have decreased significantly since 2005. The exception is the City of Imperial, which had nearly constant emission totals since 2005,where higher population growth rates resulted in a less than 1% change in total emissions. Even with the significant growth in population and employment in the region, the decreased total GHG emissions are primarily a result of increased energy efficiency, increased procurement of renewable energy by the utility provider, and increased fuel efficiency in passenger vehicles.

It is worth noting that the years selected for the Community inventory do not fully capture the impacts of the 2008 financial crisis on Imperial Valley. Data presented in this inventory show that emissions trend steadily downward since 2005, while population and jobs appear to have grown steadily over the same time period. Contrarily, many of Imperial County's jurisdictions experienced sharp job losses and stagnant population growth for a number of years beyond 2008 that is not captured by the chosen inventory years, with the Cities of Holtville and Westmorland still having not fully recovered to the pre-financial crisis levels of employment and population as of 2018.[1 2] Additionally, the majority of growth within Imperial Valley during this time period has occurred in the cities of El Centro, Imperial and Calexico, which have experienced a smaller decrease in total emissions in the 2005 to 2018 time period, as compared to the other jurisdictions.

1.2 Agricultural GHG Inventory Results

Agriculture is one of the identifying characteristics of Imperial Valley. In 2017, Imperial Valley was ranked the 10th highest producing county for gross value of agricultural production in California; and was the top producer of alfalfa hay, alfalfa seed, Sudan hay, sweet corn, and wheat. Additionally, cattle were the number one gross value commodity produced in the county.[3] Considering the importance of agriculture in Imperial Valley, a GHG inventory needs to include GHG emissions resulting from these activities.

The Agricultural GHG Inventory includes GHG emissions generated by the following sources:

- Stationary Fuel Combustion
- Agricultural Off-road Equipment
- Crop Production (including soil management and crop residue burning)
- Livestock Enteric Fermentation
- Livestock Manure Management

These agricultural emission sources are consistent with reporting in the *California GHG Emissions Inventory*, with the exception of off-road equipment.[4] To maintain consistency with the Community inventory, GHG emissions have been calculated for the years 2005, 2012 and 2018.

This report presents agricultural GHG emissions separate from the Community inventory, as agricultural activity data used to calculate GHG emissions is presented at the county level and cannot be readily attributed to anyone jurisdiction. The Agricultural GHG inventory is further discussed in Appendix C, where detailed methodology and results are provided.

Agricultural GHG emissions have increased by nearly 13% in Imperial Valley since 2005, with 2,081,481 MT CO_2e emitted in 2005 and 2,354,168 MT CO_2e emitted in 2018. Nearly all agricultural emission sectors have had an increase in GHG emissions since 2005, with the exception of crop residue burning which has decreased by 36%. The annual GHG emissions are largely dominated by emissions from livestock (greater than 80% of emissions each year), including enteric fermentation and manure management. Soil management is the next largest emissions source, contributing 13% to 15% of emissions each year from nitrous oxide (N_2O) emissions from the application of synthetic fertilizer and carbon dioxide (CO_2) emissions from soil liming. Stationary fuel combustion in

[1] Southern California Association of Governments. Profile of the City of Holtville. Local Profiles. https://www.scag.ca.gov/Documents/Holtville.pdf

[2] Southern California Association of Governments. Profile of the City of Westmorland. Local Profiles. https://www.scag.ca.gov/Documents/Westmorland.pdf

[3] Imperial County Agricultural Commissioner Sealer of Weights and Measures. 2019. Imperial County Agricultural Crop and Livestock Report. https://www.co.imperial.ca.us/ag/docs/spc/crop_reports/2018_Imperial_County_Crop_and_Livestock_Report.pdf.

[4] The California Greenhouse Gas Emissions Inventory reports agricultural off-road equipment under transportation sector emissions. Source: California Air Resources Board. 2019. 2019 Edition, California Greenhouse Gas Emission Inventory: 2000-2017. https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2017/ghg_inventory_trends_00-17.pdf.

agricultural pumps, off-road equipment, and crop residue burning collectively contribute about 3% of total annual agricultural emissions. The agricultural inventory results are provided in Figure 2 and Table 2.

Figure 2 Imperial Valley Agricultural Emissions Summary

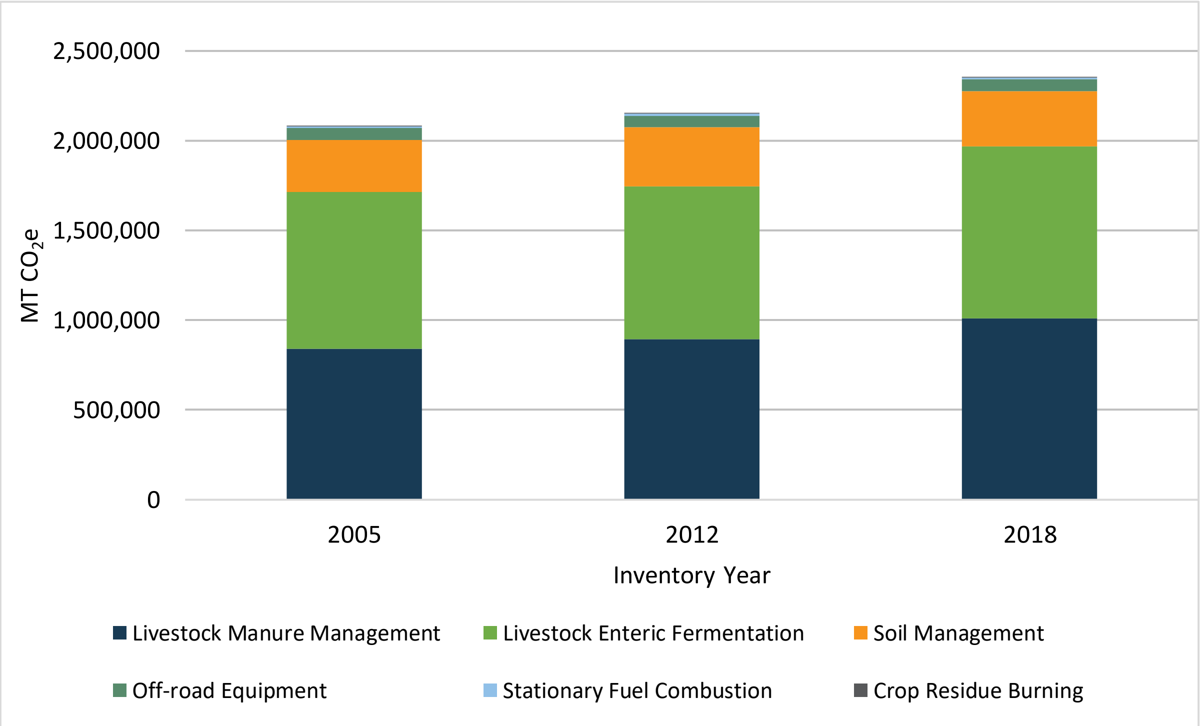


Table 2 Imperial Valley Agricultural Emissions Summary

Emission Source	2005 Emissions ($MT CO_2e$)	2005 Percent of Annual Total	2012 Emissions ($MT CO_2e$)	2012 Percent of Annual Total	2018 Emissions ($MT CO_2e$)	2018 Percent of Annual Total	Percent Change in Emissions (2005 to 2018)
Stationary Fuel Combustion	9,134	0.4%	10,047	0.5%	9,546	0.4%	5%
Off-road Equipment	66,053	3.2%	65,207	3.0%	64,501	2.7%	-2%
Crop Residue Burning	3,327	0.2%	6,440	0.3%	2,115	0.1%	-36%
Nitrogen Fertilizer Application	257,516	12.4%	291,926	13.5%	274,796	11.7%	7%
Liming	32,816	1.6%	36,098	1.7%	34,299	1.5%	5%
Livestock Enteric Fermentation	870,677	41.8%	850,519	39.5%	959,904	40.8%	10%
Livestock Manure Management	841,958	40.4%	895,088	41.5%	1,009,006	42.9%	20%
Total	**2,081,481**	**100%**	**2,155,325**	**100%**	**2,354,168**	**100%**	**13%**

Notes: **$MT CO_2e$** = Metric Tons of Carbon Dioxide Equivalent;
Totals may not add up to 100% due to rounding
Detailed results are provided in Appendix C

1.3 Calexico Port of Entry Vehicle Emissions Inventory

The City of Calexico contains two heavily trafficked international border crossings, the Calexico West and Calexico East Ports of Entry (POEs). The Calexico West POE is primarily used by passenger vehicles, while the Calexico East POE is used by both passenger and commercial vehicles. There has been concern over air pollutants generated by vehicles waiting in queue for entry to the United States, as these pollutants are carried into Imperial Valley, impacting residents. In 2014, the *Vehicle Idling Emissions Study at Calexico East and Calexico West Ports-of-Entry* was conducted to quantify these emissions based on real observations of border wait times, vehicle types, and vehicles origin and destinations.[5] From the information presented in this study, it was possible to estimate the annual GHG emission contribution of vehicles traveling northbound through the Calexico POEs.

GHG emissions for the Calexico POE are presented for the various conditions that vehicles experience due to traffic volumes. Vehicles experience conditions that are:

- Uncongested (traffic flows freely),

[5] Imperial County Air Pollution Control District. 2015. Vehicle Idling Emissions Study at Calexico East and Calexico West Ports-of-Entry. http://www.imperialctc.org/media/managed/pdf/Idling_Vehicle_Study_Calexico_PyOEs_Final_20151030_Stud_only.pdf

- Creeping queue (traffic flows freely but at speeds less than 10 miles per hour),
- Stop-and-go (traffic flowing at less than 5 miles per hour on average), and
- Idling.

Additional GHG emissions are generated during the warm-up period when vehicles are restarted after the engine has been turned off for a period of time, categorized as Start-up emissions. The estimated GHG emissions for the Calexico POEs for the year 2014 are provided in Table 3. The GHG emissions reported here are representative of traffic conditions prior to the completion of Phase 1 of the Calexico West POE in September of 2018 which included upgrades expected to reduce congestion with northbound lane improvements, new inspection and operation facilities, and improved pedestrian facilities.

Table 3 Calexico Ports of Entry Annual Vehicle GHG Emissions

Emission Source	Start-up Emissions (MT CO_2e)	Idle Emissions (MT CO_2e)	Stop-and-go Emissions (MT CO_2e)	Creeping Queue Emissions (MT CO_2e)	Uncongested Emissions (MT CO_2e)	Total Emissions (MT CO_2e)
Calexico West						**4,193**
Passenger Vehicles	6	232	288	750	2,917	4,193
Calexico East						**8,457**
Passenger Vehicles	6	137	97	594	2,956	3,790
Commercial Vehicles	-	746	1,737	-	2,184	4,667
Total (East and West)	**12**	**1,115**	**2,122**	**1,344**	**8,057**	**12,649**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent
Totals may not add up to 100% due to rounding
Detailed results are provided in Appendix D Calexico Ports of Entry Vehicle GHG Emissions Inventory

The majority of GHG emissions are generated by commercial vehicles at the Calexico East POE, which were approximately 4,667 MT CO_2e, or 37% of annual emissions from northbound traffic at both POEs. While both the East and West POEs generate a similar magnitude of GHG emissions from passenger vehicles, 3,790 MT CO_2e and 4,193 MT CO_2e, respectively, the total emissions at Calexico East POE are higher due to the contribution of commercial vehicles. Uncongested flow conditions also generate the most GHG emissions comparatively, as these conditions are associated with longer driving distances as vehicles approach the POEs. Idling emissions contribute 1,115 MT CO_2e annually, which is about 9% of the annual emissions. The contribution of emissions from each of the traffic conditions, in MT CO_2e, are shown in Figure 3 and the total emission contribution from each traffic condition at each POE is shown in Figure 4. A detailed description of the calculation methodology for POE vehicle GHG emissions is provided in Appendix D.

Figure 3 GHG Emissions Summary by Traffic Conditions

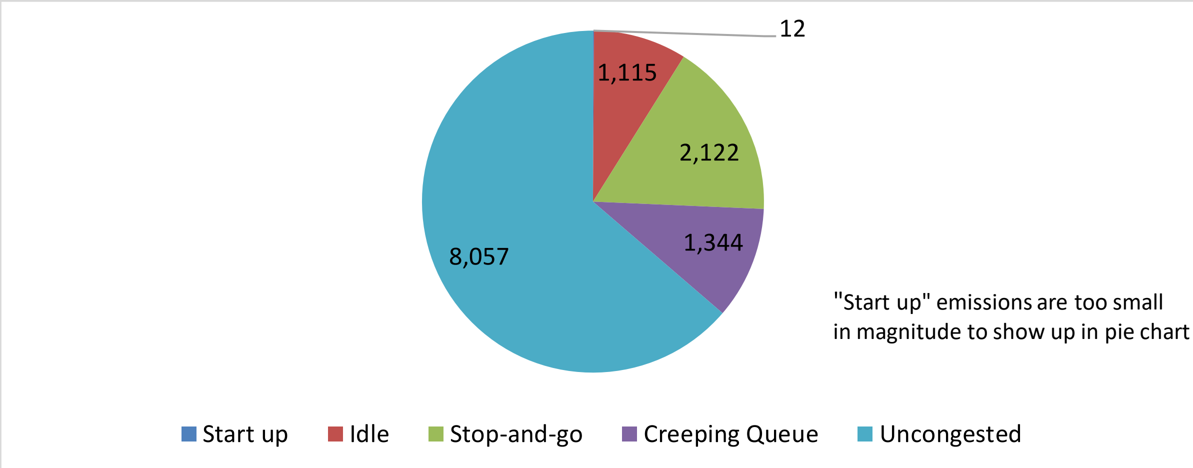
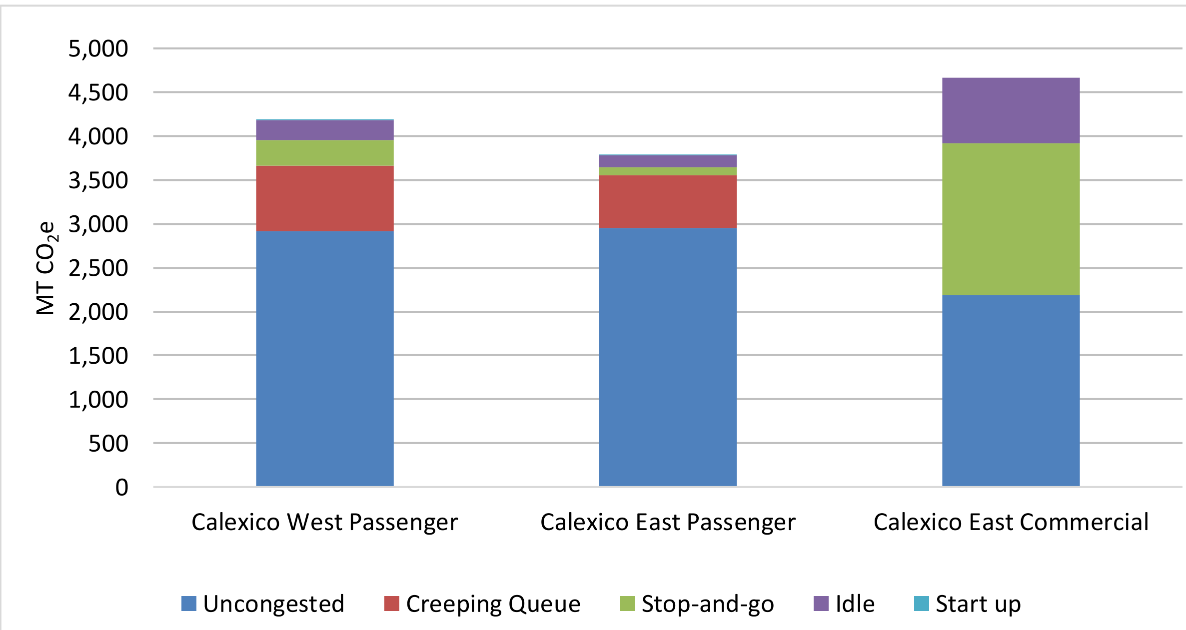


Figure 4 GHG Emissions Summary by Vehicle Class and POE



2 Introduction

Local governments play a fundamental role in reducing GHG emissions, and collaboration with regional planning agencies and other entities can present unique opportunities for further GHG reductions. Regional and city specific policies can effectively reduce GHG emissions and prepare communities for the potential impacts of climate change. Through such efforts, Imperial Valley can reduce GHG emissions at both the community and regional level. The Imperial County Transportation Comission (ICTC) is leading this endeavor for the Imperial Valley in development of the Imperial Valley Regional Climate Action Plan, through coordination with the jurisdicitons and agencies within Imperial Valley, and local stakeholders.

Each jurisdiction can influence community activities that generate GHG emissions, for example, by improving building codes, incentivizing alternative transportation options, and educating community members about their choices as consumers. That influence may be exercised directly through a jurisdiction's authority over local land use planning and building standards, and indirectly through programs that encourage GHG reducing activities. Jurisdictions can also work across their community borders to further emission reductions, such as working with utility providers, waste authorities, or county transportation commisions.

By quantifying the GHG emissions from local community activities as well as for the region as a whole, this report provides an understanding of largest GHG emission sources in Imperial Valley and where the greatest opportunities for emission reductions exist on both a local and regional level. It also provides decision-makers and the community with useful information to inform policy decisions and provides a baseline against which future progress can be measured.

2.1 Purpose of a GHG Emissions Inventory

The purpose of the Imperial Valley GHG Emissions Inventory is to identify the sources and quantities of GHG emissions within the jurisdictional boundaries of the incorporated cities and unincorporated communities of Imperial County, as well as other regional GHG emission sources. This GHG inventory has three separate parts: a Community Inventory, Agricultural Inventory and Calexico Ports of Entry Vehicle Emisisons Inventory. The discussion in this report is focused towards the Community inventory, as it will provide the basis for development of Climate Action Plan (CAP) policies needed for Imperial Valley to achieve its fair share of California's GHG emission reduction targets. A detailed discussion of the results of the Agricultural Inventory and the Ports of Entry Vehicle Emisisons Inventory are provided in Appendix C and Appendix D, respectively.

The Community GHG inventory provides a multi-year view of how emissions have changed within Imperial Valley, as well as:

- Provides an understanding of Imperial Valley's major sources of GHG emissions and where the greatest opportunities for GHG emissions reductions exist,
- Provides a breakdown of the GHG emissions in Imperial Valley by jurisdiction,
- Creates a GHG emissions baseline from which Imperial Valley communities can set GHG emissions reductions targets and measure future progress,

- Enables jurisdictions to understand the scale of emissions from various sources and develop GHG emissions accounting and reporting principles, and
- Provides best practices to aid in the development of a regional Climate Action Plan.

2.2 Community GHG Inventory

The community GHG emission inventories were calculated using the International Council for Local Environmental Initiatives (ICLEI) methodologies, specifically, the *U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions* Version 1.2 (Community Protocol). Consistent with the Community Protocol, GHG emissions produced by activities that can be attributed to one specific jurisdiction are included in the Community GHG inventory. This Community GHG inventory provides a multi-year view of the GHG emissions generated by each jurisdiction of Imperial Valley, including:

- The City of Brawley,
- The City of Calexico,
- The City of Calipatria,
- The City of El Centro,
- The City of Holtville,
- The City of Imperial,
- The City of Westmorland, and
- All unincorporated communities and areas under the jurisdiction of Imperial County.

The GHG emissions assesed in the Community inventories are generated from activities that can be influenced by each jurisdiction. The activies are categorized under the four main sectors of:

- Energy – Including electricity, propane and natural gas consumption in residential and non-residential buildings
- Transportation – Including on-road vehicles and off-road equipment
- Water – Including potable water conveyance and treatment and wastewater collection and treatment
- Waste – Including life-cycle emissions of solid waste generated and landfill processes

GHG emissions are attributed to each jurisdcition based on whether the emissions occur within, or originate from activities in, their jurisdictional boundary. Emissions generated by agricultural related activities are not included in the Community inventories for each jurisdiction as agricultural activity data is tracked at the state and county level and not easily attributed to each jurisdiciton individually. Accordingly, agricultural activities are reported seperately in the Agricultural inventory, which does not disaggregate emissions by jurisdictions within Imperial Valley.

2.2.1 Baseline GHG Inventory Year

The state of California uses 1990 as a reference year to remain consistent with Assembly Bill (AB) 32, which codified the state’s 2020 GHG emissions target by directing California Air Resources Board (CARB) to reduce statewide emissions to 1990 levels by 2020. However, cities and counties throughout California typically elect to use years later than 1990 as baseline years because of the increased reliability of recordkeeping from those years and the large amount of growth that has occurred since 1990. The year 2005 was selected as the baseline year for the Community inventory to maintain consistency with previous GHG inventories calculated for the cities of Brawley and Calexico in 2015. Additionally, it is important to note that in 2016 statewide GHG emissions fell below 1990 levels, generally achieving the goals of AB 32.[6]

2.2.2 Interim GHG Inventory Years

To assess GHG emission trends since the 2005 baseline year, interim year inventories were developed for 2012 and 2018. Establishing these interim year emission levels allows accurate representation of multi-year trends and provides more data for the forecasting of future emissions as part of climate action policy development. The 2012 interim inventory year was chosen to maintain consistency with the GHG inventories developed as part of the 2015 Brawley and Calexico CAPs, while the 2018 interim year was chosen as it is the most recent year for which reliable activity data is available.

2.3 Agricultural GHG Inventory

Agriculture plays a significant role in the Imperial Valley economy and GHG emission sources. This report presents agricultural GHG emissions separate from the Community inventory, as agricultural activity data is tracked at the state and county level and not easily attributed to each jurisdiction individually. The Agricultural GHG inventory is further discussed in Appendix C, where detailed methodology and results are provided.

[6] CARB. July 11, 2018. Climate pollutants fall below 1990 levels for first time. https://ww2.arb.ca.gov/news/climate-pollutants-fall-below-1990-levels-first-time

3 Community GHG Inventory Methodology

This inventory was completed using CAPDash, Rincon's proprietary custom Climate Action Plan (CAP) tool. CAPDash was designed to use methodologies recommended and supported by CARB. The Community inventory was developed using ICLEI methodologies, specifically, the *U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions* Version 1.2 (*Community Protocol*).[7] Emissions were calculated using the principles and methods of these protocols.

3.1 Calculating Emissions

The following section provides background information on applicable GHG emissions and activity data as well as use of appropriate emission factors.

3.1.1 Greenhouse Gases

According to the *Community Protocol*, local governments should assess emissions of six internationally recognized GHGs. These gases are outlined in Table 4, which includes their sources and global warming potential (GWP).[8] This inventory was prepared in conformance with ISO 14064-1 and therefore uses the 100-year GWP values published in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5).[9] The GWP refers to the ability of each gas to trap heat in the atmosphere. For example, one pound of methane has 28 times more heat capturing potential than one pound of carbon dioxide. This report focuses on the three GHGs most relevant to local government policymaking: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). These gases comprise a large majority of GHG emissions at the community level. The other gases, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluorides are emitted primarily in private sector manufacturing and electricity transmission and are the subject of regulation at the state level and therefore, have been excluded from this inventory. GHG emissions are reported in metric tons of carbon dioxide equivalent (MT CO_2e) units, per standard practice. When dealing with an array of emissions, the gases are converted to their carbon dioxide equivalents for comparison purposes.

[7] ICLEI. 2019. ICELI- U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions. Version 1.2. http://icleiusa.org/ghg-protocols/

[8] According to the United States Environmental Protection Agency (USEPA), the GWP was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of carbon dioxide (USEPA 2017); https://www.epa.gov/ghgemissions/understanding-global-warming-potentials).

[9] International Organization for Standardization (ISO) published ISO 14064-1 in 2006 (revised 2018) to provide an international standard for the quantification and reporting of GHG emissions.

Table 4 Summary of Greenhouse Gas Emission

Greenhouse Gas	Formula	Source	GWP (CO_2e)
Carbon Dioxide	CO_2	Combustion	1
Methane	CH_4	Combustion, anaerobic decomposition of organic waste (landfills, wastewater treatment plants), fuel handling	28
Nitrous Oxide	N_2O	Combustion and wastewater treatment	265
Hydrofluorocarbons	Various	Leaking refrigerants and fire suppressants	4 – 12,400
Perfluorocarbons	Various	Aluminum production, semiconductor manufacturing, HVAC equipment manufacturing	6,630 – 11,100
Sulfur Hexafluoride	SF_6	Transmission and distribution of power	23,500

Source: Intergovernmental Panel on Climate Change (IPCC), Fifth Assessment Report AR5, 2014.
GWP: Global Warming Potential

3.1.2 Activity Data and Emission Factors

Emissions are estimated using calculation-based methodologies to derive emissions using activity data and emissions factors. To estimate emissions, the following general equation is used:

$$Activity\ Data\ \times Emission\ Factor = Emissions$$

Activity data refer to the relevant measurement of energy use or other GHG-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Emission factors are used to convert energy usage or other activity data into associated emissions quantities. They are usually expressed in terms of emissions per unit of activity data (e.g., pounds [lbs] of CO_2/kilowatt hour [kWh]).

3.1.2.1 Activity Data

The activity data used to complete the multi-year GHG inventories for each jurisdiction were collected from multiple sources. The type of activity data used to calculate GHG emissions is summarized in Table 5, while the values and direct data sources for each jurisdiction are outlined further in the emission calculation methodology for each sector in Appendix B. Activity data was not available for all activities for all inventory years; therefore, available data was used to derive estimates for the missing data points. In some cases, demographic data was used to estimate activity data specific to a jurisdiction. The assumptions used for these estimates are provided where applicable.

Table 5 Summary of Activity Data Used for Calculations

Emissions Source	Activity Data	Units
Energy		
Natural Gas	Residential and Commercial Natural Gas Consumption within Jurisdiction	Therms
Propane	Residential and Commercial Propane Consumption within Jurisdiction	Gallons
Electricity	All Electricity Use within Jurisdiction	kWh
Transmission and Distribution Losses	Electricity Supplier Grid Loss Factor Applied to Consumption	kWh
Transportation		
On-Road Transportation	Annual Vehicle Miles Traveled within Jurisdiction, using SB 375 RTAC Methodology[1]	VMT
Off-Road Equipment	County-wide Emissions Attributed to Jurisdiction Based on Various Metrics	MT CO_2e
Water		
Water Consumption	Annual Potable Water Delivered within Jurisdiction	MG
Wastewater	Annual Wastewater Generated within Jurisdiction	MG
Waste		
Solid Waste Disposal	Annual Waste Sent to Landfills Originating in Jurisdiction	Short Tons

Notes: **kWh** = kilowatt-hour; **VMT** = Vehicle Miles Traveled; **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; **MG** = Million Gallons

[1] Senate Bill 375 Regional Targets Advisory Committee (SB 375 RTAC) Methodology utilizes the origin-destination method allowing for better allocation of VMT across jurisdictions by accounting for all internal VMT with the jurisdiction, half of the VMT that crosses jurisdiction boundaries, and discounting pass-through traffic with no trip endpoint within the jurisdiction.

3.1.2.2 Emission Factors

Emission factors used to calculate GHG emissions in the Community GHG inventories were obtained from jurisdiction specific factors and default values, as provided in the *Community Protocol*. Where available, emission factors that were specific to the conditions in Imperial Valley were used. To maintain consistency between each jurisdiction, the same emission factors were used for each jurisdiction; however, these emission factors vary between inventory years. Accordingly, variance in emissions between the incorporated cities and the unincorporated County are primarily a result of the differences in activity data. Table 6 provides a general overview of the emission factors used for GHG emission calculations. Specific values for each jurisdiction are provided in the emission calculation methodology discussions for each sector in Appendix B.

Table 6 General Summary of GHG Emission Factors Used for Calculations

Emissions Source	Emission Factor	Units
Energy		
Natural Gas	Emissions per Unit of Natural Gas Burned	MT CO_2e/Therm
Propane	Emissions per Unit of Propane Burned	MT CO_2e/Gallon
Electricity	Emissions per Unit of Electricity Consumed	MT CO_2e/kWh
Transmission and Distribution Losses	Emissions per Unit of Electricity Lost	MT CO_2e/kWh
Transportation		
On-Road Transportation	Emissions per Vehicle Mile Traveled	MT CO_2e/VMT
Off-Road Equipment	County-wide Emissions Attributed to Jurisdiction Based on Various Metrics	MT CO_2e
Water		
Water Consumption	Energy Consumed per Unit of Water Supplied Multiplied by Electricity Emission Factor	(kWh/MG) x (MT CO_2e/kWh)
Wastewater	Energy Consumed per Unit of Wastewater Generated Multiplied by Electricity Emission Factor	(kWh/MG) x (MT CO_2e/kWh)
	Process Emissions Generated per Unit of Wastewater Generated	MT CO_2e/MG
Waste		
Solid Waste Disposal	Methane Commitment per Unit of Waste Landfilled	MT CO_2e/Short Ton
	Emissions from Landfilling Process Equipment per Unit of Waste Landfilled	MT CO_2e/Short Ton

Notes: **kWh** = kilowatt-hour; **VMT** = Vehicle Miles Traveled; **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; **MG** = Million Gallons

Values for emission factors are provided in *Appendix B Community GHG Inventory Detailed Methodology*.

3.2 Reporting GHG Emissions

GHG emissions can be reported by sector, where they are categorized based on the activity that generates the emissions, or by scope, where they are categorized based on where they occur in relation to the entity being analyzed and its degree of control over the emission source. The following section discusses reporting of emissions by scope and sector.

3.2.1 GHG Emissions by Scope

For community-wide GHG inventories, emissions sources can be categorized by "scope" according to the entity's degree of control over the emissions source and the location of the source. Emissions sources are categorized as direct (scope 1) or indirect (scope 2 or scope 3), in accordance with the

World Resources Institute and the World Business Council for Sustainable Development's *Greenhouse Gas Protocol for Community-Scale Greenhouse Gas Emission Inventories*.[10] The following are the community-wide emissions scope definitions.

- **Scope 1:** Direct GHG emissions from sources located within the jurisdictional boundaries of the community, including emissions from fuel combustion in vehicles[11] in the community, direct emissions from natural gas combustion in homes and businesses within the community, and wastewater treatment at in-boundary treatment plants.
- **Scope 2:** Indirect GHG emissions associated with the consumption of electricity within the community.
- **Scope 3:** All other indirect or embodied GHG emissions not covered in scope 2, which occur because of activity within the jurisdictional boundaries but are generated outside of the boundaries, including methane emitted at landfills outside the community resulting from solid waste generated within the community, electricity transmission and distribution losses, and wastewater effluent discharge.

3.2.2 GHG Emissions by Sector

In addition to categorizing emissions by scope, the *Community Protocol* recommends that local governments examine their emissions in the context of the sector that is responsible for those emissions. Many local governments will find a sector-based analysis more directly relevant to policy making and project management, as it assists in formulating sector-specific reduction measures and CAP components.

This community GHG inventory reports emissions by the following sectors:

- Energy
- Transportation
- Water [12]
- Solid waste

Table 7 summarizes the scopes of each sector in the Community inventory.

[10] World Resource Institute. 2014. Greenhouse Gas Protocol for Community-Scale Greenhouse Gas Emission Inventories. https://ghgprotocol.org/greenhouse-gas-protocol-accounting-reporting-standard-cities

[11] This accounts for GHG emissions from running exhaust, idle exhaust, starting exhaust, diurnal, resting loss, running loss, and hot soak.

[12] Emissions for water consumption and wastewater collection are accounted for under the Energy emission sector and are provided in the water sector for informational purposes. These calculated emissions are not added to the total emissions for any jurisdiction.

Table 7 Summary of GHG Emission Sectors and Scopes

Sector	Scope 1	Scope 2	Scope 3
Energy	Natural Gas	Electricity	N/A
Transportation	Gasoline, Diesel and CNG	N/A	N/A
Water	Wastewater treatment emissions	Electricity consumed in potable water conveyance and treatment[1]	Wastewater effluent discharge emissions
Solid Waste	N/A	N/A	Methane from decomposition and process emissions

Notes: CNG= Compressed natural gas; N/A= Not applicable

1. Emissions fromlectricity consumed in potable water conveyance and treatment is reported under non-residential electricity consumption.

4 Community GHG Inventory Results

In 2018, community activities in Imperial Valley generated approximately 1,434,715 MT CO_2e. This is a 10% reduction in total GHG emissions from the 2012 emissions, 1,585,553 MT CO_2e, and a 25% reduction from the 2005 emissions, 1,924,301 MT CO_2e. These totals include all scope 1 emissions from onsite combustion of natural gas and propane in the residential and non-residential sectors, the combustion of gasoline and diesel fuel in vehicles with trips beginning and/or ending within Imperial Valley, and in-boundary wastewater treatment process and fugitive emissions.[13] These totals also encompasses all scope 2 emissions associated with electricity consumed within the City and all scope 3 emissions. Scope 3 emissions included in this inventory are those associated with the landfilling of solid waste generated by the community, electricity transmission and distribution losses, and emissions resulting from the discharge of wastewater treatment effluent.

The significant population growth in Imperial Valley between 2005 and 2018 has shaped the GHG emissions profile. In the time period covered by the Community GHG inventory, Imperial Valley experienced an overall 22% increase in population and 35% increase in employment. While this growth has created an overall increase in the activities that generate GHG emissions, improvements in efficiency and per capita reductions of fuel and energy consumption, waste generation and water consumption have largely offset the impacts of this growth on GHG emissions. The largest reductions since 2005 are influenced by GHG emissions associated with electricity consumption. As a proportion of the total change in GHG emissions between 2005 and 2018, reductions from electricity consumption make up 93% of this reduction in GHG emissions. The reduced carbon intensity of electricity provided by Imperial Irrigation District (IID) through the procurement of an increased proportion of renewable energy, and increased energy efficiency in residential and non-residential land uses, are the primary drivers for the change in GHG emission totals.

While growth in Imperial Valley has occurred at varied rates in the incorporated cities and the unincorporated communities, the largest contributing jurisdictions to total GHG emissions have remained the same since 2005. The unincorporated communities and areas have remained the largest contributor to GHG emissions, contributing around 30% of all Imperial Valley community emissions in each inventory year. El Centro has been the second largest contributor, generating about 25% of total emissions each year, and Calexico and Brawley the third and fourth largest contributors, at about 15% and 13% of total emissions each year, respectively. The cities of Calipatria, Holtville, Imperial and Westmorland collectively generate approximately 15% of Imperial Valley's total annual GHG emissions, contributing about 3%, 3%, 8% and 1% of total emissions, respectively.

[13] GHG emissions associated with vehicles trips that do not begin or end within the jurisdiction but cross through a jurisdiction (pass-through trips) are not included in a jurisdiction's GHG emissions.

4.1 Regional Community GHG Emissions by Scope

As shown in Figure 5 and Table 8, scope 1 emission sources produced the largest proportion of Imperial Valley community GHG emissions in 2012 and 2018, totaling 748,335 MT CO_2e (47% of total emissions) and 854,339 MT CO_2e (60% of total emissions), respectively. This is in contrast to 2005, where scope 1 sources generated fewer emissions than scope 2 sources, at 756,778 MT CO_2e (39% of total emissions). Scope 2 emission sources produced 865,973 MT CO_2e in 2005, 642,119 MT CO_2e in 2012, and 392,331 MT CO_2e in 2018 (45%, 40% and 27% of total GHG emissions, respectively), showing a 55% decrease in emissions magnitude over this time period. Scope 3 emission sources have remained the smallest contributor to total Imperial Valley emissions, generating 301,149 MT CO_2e in 2005, 194,664 MT CO_2e in 2012 and 187,543 MT CO_2e in 2018 (16%, 12% and 13% of total GHG emissions, respectively).

Figure 5 Regional Community Emissions by Scope

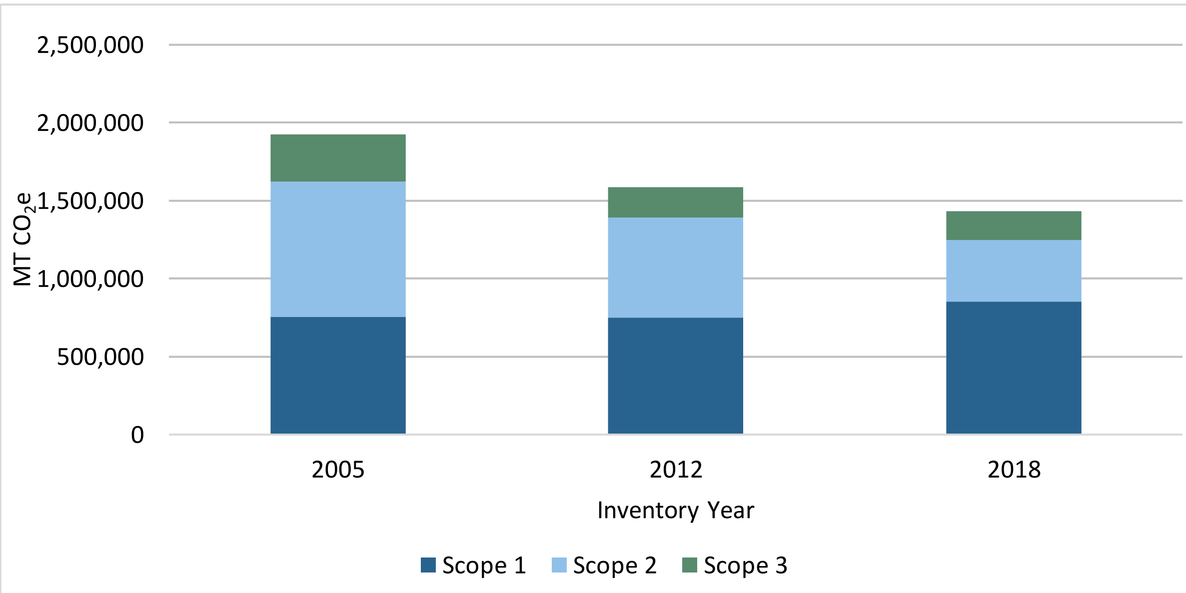


Table 8 Regional Community Emission by Scope

Jurisdiction	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)	Percent Change (2005 – 2018)
Scope 1	756,778	748,335	854,339	13%
Scope 2	865,973	642,119	392,331	-55%
Scope 3	301,550	195,099	188,044	-38%
Total	**1,924,301**	**1,585,553**	**1,434,715**	**-25%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

Scope 1 emissions are primarily generated by transportation, which contributes about 87% of the total scope 1 emissions each year, with the remainder generated by natural gas combustion (7% to 9% of scope 1 emissions), propane combustion (2% of scope 1 emissions) and wastewater treatment process and fugitive emissions (2% of scope 1 emissions). Residential electricity consumption contributes approximately 41% to 46% of total scope 2 emissions each year, while non-residential electricity consumption contributes the remaining 54% to 59% of scope 2 GHG emissions. Annual scope 3 emissions are primarily generated by solid waste disposal (68% to 79% of scope 3 emissions). A breakdown of the sources of the Imperial Valley GHG emissions as reported by scope is provided in Table 9.

Table 9 Regional Community GHG Emissions by Scope Source Breakdown

	2005		2012		2018	
Emission Source	Emissions (MT CO_2e)	Percent of Scope Total	Emissions (MT CO_2e)	Percent of Scope Total	Emissions (MT CO_2e)	Percent of Scope Total
Scope 1	**756,778**	**100%**	**748,335**	**100%**	**854,339**	**100%**
Transportation	656655	87%	650,729	87%	748,111	88%
Natural Gas Combustion	61,345	8%	55,843	7%	56,438	7%
Propane Combustion	13,697	2%	14,856	2%	19,111	2%
Wastewater Treatment Process and Fugitive Emissions	25,080	3%	21,388	3%	19,088	2%
Scope 2	**865,973**	**100%**	**642,119**	**100%**	**392,331**	**100%**
Residential Electricity Consumption	355,576	41%	297,312	46%	159,619	41%
Non-residential Electricity Consumption[1]	510,397	59%	344,807	54%	232,712	59%
Scope 3	**301,550**	**100%**	**195,099**	**100%**	**188,044**	**100%**
Solid Waste	218,847	73%	132,773	68%	148,337	79%
Electricity T&D Losses	79,670	26%	59,075	30%	36,094	19%
Wastewater Effluent Discharge	3,033	1%	3,251	2%	3,612	2%

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; **T&D** = Transmission and Distribution
Totals may not add up to 100% due to rounding

1. GHG emissions from electricity consumption associated with the treatment and conveyance of potable water is included in the total non-residential electricity consumption emissions.

4.2 Regional Community GHG Emissions by Sector

By understanding the relative scale of emissions from each sector, the Imperial Valley and its constituent jurisdictions can more effectively focus emission reduction strategies towards the greatest GHG emission sources. Presented here is an overview of emissions by sector at the Regional level. A more detailed assessment of emissions by sector for each of the Imperial Valley jurisdictions is provided in Appendix A.

Energy consumption in residential and non-residential land uses is the largest contributor to the total community GHG emissions in 2005 and 2012, while transportation is the second largest source. In 2018, transportation becomes the largest contributor to total GHG emissions (52% of total emissions, or 748,111 MT CO_2e) as transportation sector emissions continue to rise from 2005 into 2018 (14% increase) and energy emission continue to fall into 2018 (51% decrease from 2005 levels). In 2018, energy emissions were 503,975 MT CO_2e (36% of total emissions), down from 1,020,685 MT CO_2e in 2005 (54% of total emissions). Emissions associated with the landfilling of solid waste is the third largest GHG emission source in Imperial Valley each inventory year, generating 218,847 MT CO_2e in 2005, 132,773 MT CO_2e in 2012, and 148,337 MT CO_2e (11%, 8% and 10% of total GHG emissions, respectively). Figure 6 and Table 10 show the contribution of each sector towards total regional GHG emissions in each inventory year.

Figure 6 Regional Community GHG Emissions by Sector

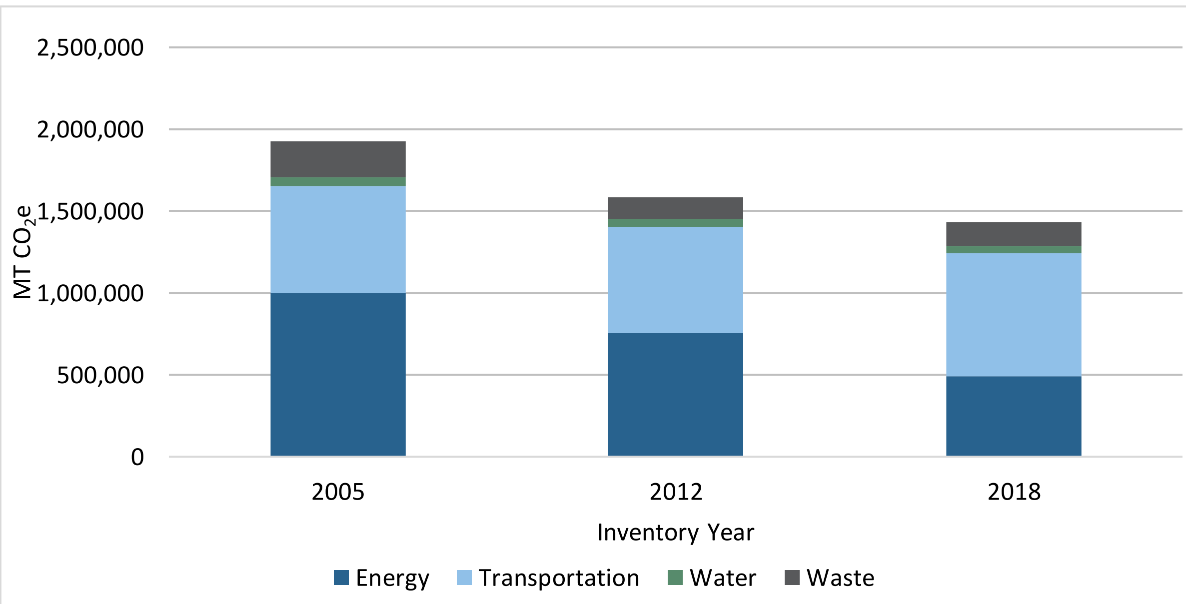


Table 10 Regional GHG Emissions by Sector

Emission Sector	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)	Percent Change (2005 – 2018)
Energy	**1,020,685**	**771,893**	**503,975**	**-51%**
Natural Gas	61,345	55,843	56,438	-8%
Residential Propane	981	1,521	1,922	96%
Non-residential Propane	12,717	13,335	17,190	35%
Residential Electricity	355,576	297,312	159,619	-55%
Non-residential Electricity	510,397	344,807	232,712	-54%
Electricity T&D Losses	79,670	59,075	36,094	-55%
Transportation	**656,655**	**650,729**	**748,111**	**14%**
Passenger On-road Vehicles	409,000	411,678	435,912	7%
Commercial On-road Vehicles	168,974	168,097	211,916	25%
Off-road Equipment	78,681	70,955	100,283	27%
Water[2]	**51,492**	**48,285**	**45,133**	**-12%**
Wastewater Process and Fugitive Emissions	28,114	30,158	34,291	22%
Wastewater Collection and Treatment	15,819	12,835	7,898	-50%
Potable Water Consumption	7,560	5,292	2,944	-61%
Waste	**218,847**	**132,773**	**148,337**	**-32%**
Landfilled Waste Decomposition	215,844	130,504	146,662	-32%
Landfill Process Emissions	3,003	2,270	1,676	-44%
Total[1]	**1,924,301**	**1,585,553**	**1,434,715**	**-25%**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

Values may not add up due to rounding

1. Emissions from Wastewater Collection and Treatment are not added into the total emission and are provided here for informational purposes. The emissions from these sources are from the consumption of electricity and are therefore captured under Non-residential Electricity.

2. Electricity consumption associated with potable water treatment and delivery is not included in this total, as data for this activity was not available for unincorporated areas and communities of Imperial County. The exclusion of these emissions does not influence the total emissions of Imperial Valley, or any jurisdictions, as this emissions source is provided mainly for informational purposes, and is already captured in the Non-residential Electricity consumption.

4.2.1 Energy Sector

The energy sector includes GHG emissions resulting from electricity and natural gas used in residences, commercial, governmental and industrial[14] buildings throughout Imperial Valley. Electricity is supplied to Imperial Valley by IID. IID provided electricity consumption for each jurisdiction of Imperial Valley for the years 2012 and 2018, along with an estimate of the breakdown of consumption between residential and non-residential customers. Data for the 2005 inventory year disaggregated by jurisdiction was not readily available and was estimated by extrapolating the change in per household and per employment consumption in Imperial Valley between 2018 to 2012. This estimated "efficiency" was then applied to the 2005 demographic data to obtain an estimate of residential and non-residential consumption in each jurisdiction. Emissions resulting from electricity consumption were estimated by multiplying annual electricity consumption by the electricity generation emission factor for each inventory year. The IID emission factors used in this inventory are 0.271 MT CO_2e/Megawatt hour (MWh) for 2018 and 0.446 MT CO_2e/MWh for 2012. An IID specific emission factor was not available for 2005, so the eGRID value of 0.595 MT CO_2e/MWh was used.[15] [16] As such, 865,973 MT CO_2e were generated from electricity use in the community in 2005, 642,119 MT CO_2e in 2012, and 392,331 MT CO_2e in 2018 (85%, 83%, and 78% of total energy emissions in each year, respectively). In addition to energy consumption, the amount of emissions generated due to electricity transmission and distribution (T&D) losses were determined by multiplying the total community electricity consumption by 9.2%, as provided by IID. Although emissions generated due to electricity T&D losses occur outside of Imperial Valley or any of the incorporated city's operational control, emissions related to T&D loses are directly related to electricity use within the community. T&D emissions associated with community electricity use were 79,670 MT CO_2e 2005, 59,075 MT CO_2e in 2012, and 36,094 MT CO_2e in 2018 (8%, 8%, and 7% of total energy emissions in each year, respectively).

Natural gas is provided to Imperial Valley by Southern California Gas Company (SoCal Gas) for end-use applications in the residential, commercial, and industrial sectors. Emissions resulting from the combustion of natural gas were calculated by multiplying annual natural gas consumption by the most recent natural gas emissions factors available. The most recent emission factors for natural gas and used in this inventory are 53.06 kg CO_2/mmBtu, 1.0 g CH_4/mmBtu, 0.1 g N_2O/mmBtu.[17] Community-wide emissions generated by natural gas combustion were calculated to be 61,345 MT CO_2e in 2005, 55,843 MT CO_2e in 2012, and 56,438 MT CO_2e in 2018 (6%, 7%, and 11% of total energy GHG emissions in each year, respectively). The natural gas consumption emissions do not include industrial sector sources.[18]

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[14] Industrial sector consumption was not available for natural gas consumption due to California Public Utility Commission Privacy and Aggregation rules. Industrial electricity consumption was available and is included under Non-residential electricity.

[15] eGRID is the Emissions and Generation Resource Integrated Database maintained by the United States Environmental Protection Agency. It is a comprehensive source of data on the environmental characteristics of almost all electric power generated in the United States. https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid

[16] USEPA. 2008. eGRID2007 Version 1.1 Year 2005 Summary Tables. p.4. https://www.epa.gov/sites/production/files/2015-01/documents/egrid2007v1_1_year05_summarytables.pdf. Accessed May 20, 2020.

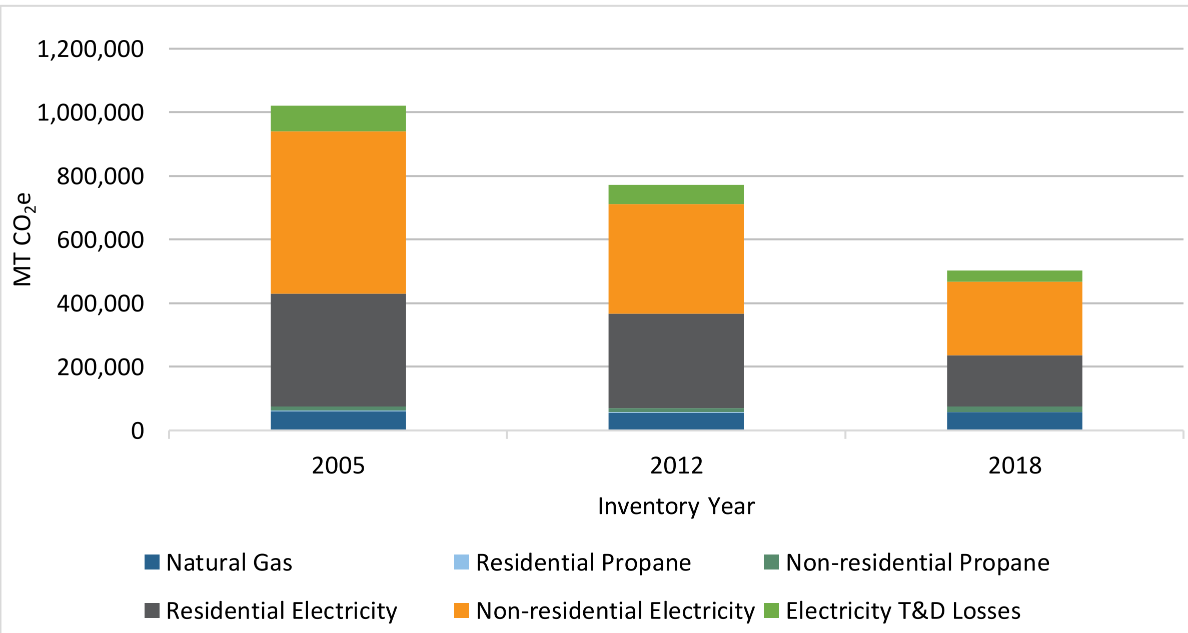
[17] The Climate Registry 2018 Default Emission Factors (Table 12.1 & Table 12.9.1), May 2018. https://www.theclimateregistry.org/wp-content/uploads/2018/06/The-Climate-Registry-2018-Default-Emission-Factor-Document.pdf

[18] Natural gas activity data is not reported in this GHG inventory or the associated appendices, due to CPUC data privacy rules. The natural gas consumption data was acquired through the Energy Data Request Program (EDRP), which does not allow any of the data obtained to be shared with any parties outside of the jurisdiction which requested the data, or the party which has agreed to the terms of the Non-Disclosure Agreement associated with the data release.

In addition to natural gas, a number of homes and businesses use propane to fuel appliances and equipment. Emissions resulting from the combustion of propane were calculated by multiplying annual propane consumption by the most recent propane emissions factors available; 5.72 kg CO_2/gallon, 0.27 g CH_4/gallon and 0.05 g N_2O/gallon.[19] Estimated residential emission from propane combustion were 981 MT CO_2e in 2005, 1,521 MT CO_2e in 2012, and 1,922 MT CO_2e in 2018 (less than 1% of annual energy emissions); while non-residential propane combustion emissions were 12,717 MT CO_2e in 2005, 13,335 MT CO_2e in 2012, and 17,190 MT CO_2e in 2018 (1%, 2%, and 3% of total energy GHG emissions in each year, respectively).

In 2018, a total of 503,975 MT CO_2e was generated within the community due to energy use. This total represents a 35% decrease in emissions from 2012 (771,893 MT CO_2e), and an additional 15% decrease from 2005 (1,020,685 MT CO_2e), equating to a total reduction of energy emission between 2005 and 2018 of 516,710 MT CO_2e, or approximately 51%. Figure 7 and Table 11 show the breakdown of emissions from electricity and natural gas use by source. Most emissions from the energy sector are due to non-residential electricity consumption which makes up about 46% of total energy emissions, each year, and from residential electricity consumption which makes up 32% to 39% of total energy emissions, each year.

Figure 7 Regional Community Energy Sector GHG Emissions Summary



[19] United States Environmental Protection Agency. 2020. Emission Factors for Greenhouse Gas Inventories. Table 1. https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf.

Table 11 Regional Community Energy Sector GHG Emissions Summary

	2005		2012		2018	
Emission Source	Emissions (MT CO_2e)	Percent of Total	Emissions (MT CO_2e)	Percent of Total	Emissions (MT CO_2e)	Percent of Total
Natural Gas	61,345	6%	55,843	7%	56,438	11%
Residential Electricity	981	<1%	1,521	<1%	1,922	<1%
Residential Propane	12,717	1%	13,335	2%	17,190	3%
Non-residential Propane	355,576	35%	297,312	39%	159,619	32%
Non-residential Electricity	510,397	50%	344,807	45%	232,712	46%
Electricity T&D Losses	79,670	8%	59,075	8%	36,094	7%
Total Energy Emissions	**1,020,685**	**100%**	**771,893**	**100%**	**503,975**	**100%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent;
Totals may not add up to 100% due to rounding

4.2.2 Transportation Sector

Transportation emissions are generated by the community through on-road transportation and the use of off-road equipment. On-road transportation is the largest emissions contributor to the transportation sector and thus the focus of the Communtiy Inventory, generating 554,881 MT CO_2e in 2005, 556,188 MT CO_2e in 2012, and 614,991 MT CO_2e in 2018 (90%, 89%, and 89% of total transportation emissions in each year, respectively). Emissions associated with off-road equipment make-up the remaining 10% to 11% of transportation sector emissions. The data and methodology used to estimate transportation emissions are described further below. Figure 8 and Table 12 provide a summary of transportation emissions by source.

Figure 8 Regional Community Transportation Sector GHG Emissions Summary

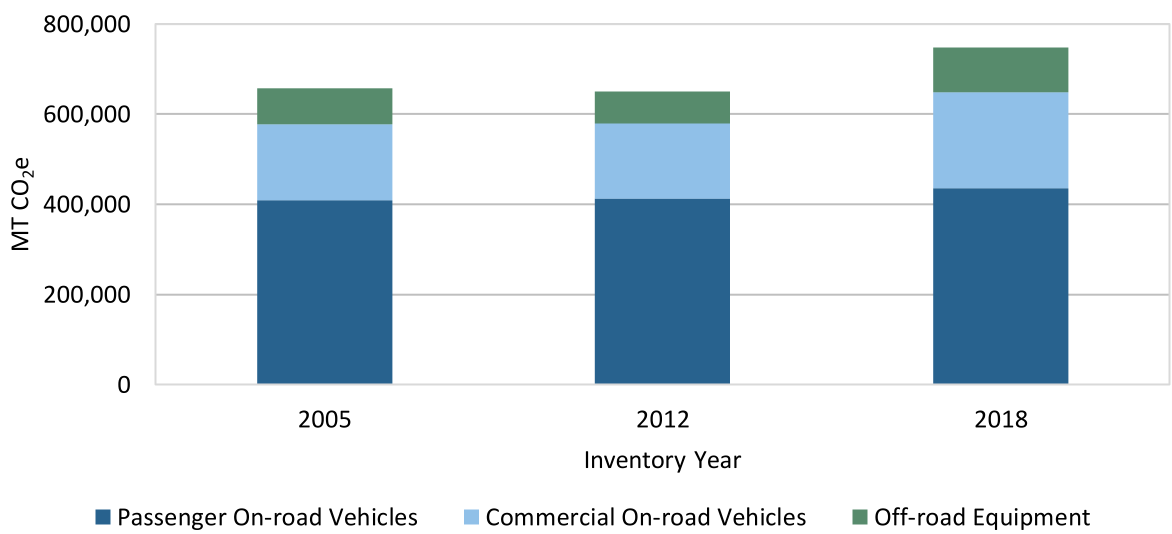


Table 12 Regional Community Transportation Sector GHG Emissions Summary

	2005		2012		2018	
Emission Source	Emissions (MT CO_2e)	Percent of Total	Emissions (MT CO_2e)	Percent of Total	Emissions (MT CO_2e)	Percent of Total
Passenger On-road Vehicles	409,000	62%	411,678	63%	435,912	58%
Commercial On-road Vehicles	168,974	26%	168,097	26%	211,916	28%
Off-road Equipment	78,681	12%	70,955	11%	100,283	13%
Total Transportation Emissions	**656,655**	**100%**	**650,729**	**100%**	**748,111**	**100%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent;
Totals may not add up to 100% due to rounding

4.2.2.1 On-road Transportation

Emissions from on-road transportation in Imperial Valley were estimated based on VMT and emissions rates associated with the vehicle fleet in each inventory year. VMT was obtained for each of the eight Imperial Valley jurisdictions using the Trip Based Southern California Association of Governments (SCAG) model. VMT was calculated from the model output using the origin-destination methodology recommended by the Regional Targets Advisory Committee (RTAC) pursuant to Senate Bill 375 (SB 375). The origin-destination method includes all trips occurring within a jurisdiction's limits and half of any trips that either originate or terminate within the jurisdiction's limits, excluding VMT from pass-through trips (i.e. not originating or terminating within a jurisdiction's limits). This methodology allows the summing of VMT for each jurisdiction within the region to obtain regional VMT values, without the risk of double counting. The Trip Based SCAG model utilizes socio-economic data (i.e. population, employment, households, workers, school enrollment, etc.), transportation analysis zones (TAZ), and the highway and transit network to calculate community VMT.

Emissions due to passenger vehicle operation were calculated using the *Community Protocol* Method TR.1.A where VMT data was converted into emission data using Equations TR.1.B.2 and TR.1.B.3 and regional emission factors from CARB's most recent EMission FACtors (EMFAC2017) model. EMFAC2017 VMT-based emission rates are dependent on the vehicle class, model years, speed, and fuel type. Emissions from freight and service trucks (i.e. medium and heavy-duty trucks) were calculated using *Community Protocol* Method TR.2.C, which is similar to assigning passenger emissions. By combining EMFAC2017 factors and VMT data, average emission factors for passenger vehicles (LDA), light-duty trucks (LDT), medium-duty trucks (MHDT), and heavy-duty trucks (HHDT) were derived for each inventory year. Details of the calculations and emission factors used are provided in Appendix B. As shown in Figure 8 and Table 12, passenger vehicles contribute the greatest amount of emissions to the transportation sector emissions ranging between 61% and 64% in each inventory year. Commercial on-road vehicles are the second largest transportation source, generating 26% to 28% of transportation sector emissions each year.

4.2.2.2 Off-road Equipment Use

Off-road equipment emissions for the entire Imperial Valley were obtained directly from the CARB OFFROAD2007 Model. Estimated GHG emissions from off-road equipment were 78,681 MT CO_2e in 2005, 70,955 MT CO_2e in 2012 and 100,283 MT CO_2e in 2018. In order to attribute emissions to each jurisdiction from the county-level model output, various metrics were developed based on the equipment categories, using the proportion of specific activities existing in the jurisdiction as compared to the Imperial County total. For example, light-commercial equipment and industrial equipment classes were attributed based on the number of jobs in each jurisdiction, whereas lawn and garden equipment were attributed based on the number of households. These attribution metrics are further detailed for each jurisdiction in Appendix B.

4.2.3 Water Sector

Water sector emissions include emissions associated with electricity used in the treatment and delivery of potable water, electricity used in the collection and treatment of wastewater, and process and fugitive emissions generated by the treatment of wastewater. In Imperial County, each of the incorporated cities, and a portion of the unincorporated communities, have centralized wastewater treatment plants that are under their own jurisdictional control which collect wastewater from within their own jurisdictional boundaries. Therefore, wastewater treatment emissions are reported according to where the emissions occur. Wastewater treatment process and fugitive emissions and septic fugitive emissions occur within the respective jurisdiction and are under their direct control, and would therefore be considered scope 1 emission sources, as discussed in Section *GHG Emissions by* Scope. Effluent discharge emissions are a result of reactions with nitrogen in wastewater effluent in the discharge waters, which can continue to occur at a considerable distance from the wastewater treatment plant origination. Thus, these emissions would be considered scope 3 and are included here separately from other wastewater treatment fugitive emissions.

The electricity emissions associated with potable water and wastewater are provided here for informational purposes but are not added to the total emissions of Imperial Valley or any jurisdiction. Since the treatment of water and wastewater occurs within each jurisdiction, this energy consumption is already captured under non-residential electricity consumption in the energy sector. The potable water emissions reported here also do not include unincorporated areas or communities, as consistent data that would capture the potable water consumption for these areas was not available at the time of this report. The exclusion of this data means that the emissions with potable water consumption reflects only the water consumed in incorporated cities.

Wastewater treatment process and fugitive emission were the largest source of GHG emissions in the water sector in each inventory year, generating 19,583 MT CO_2e in 2005, 20,948 MT CO_2e in 2012, and 23,808 MT CO_2e in 2018. Emissions from electricity consumption associated with wastewater collection and treatment and potable water treatment and distribution were the second and third largest sources, respectively, in each inventory year. The smallest emission sources in the water sector are fugitive emissions from septic systems and emissions associated with effluent discharge. Figure 9 and Table 13 provide a summary of water sector sources and their relative contribution to total water sector emissions. While comparing the total emissions from each source at the County level provides the general magnitude of each emissions source, the lack of unincorporated County potable water emissions lends a comparison at the jurisdiction level to be the most relevant, as provided in Appendix A.

Figure 9 Regional Community Water Sector Emissions Summary

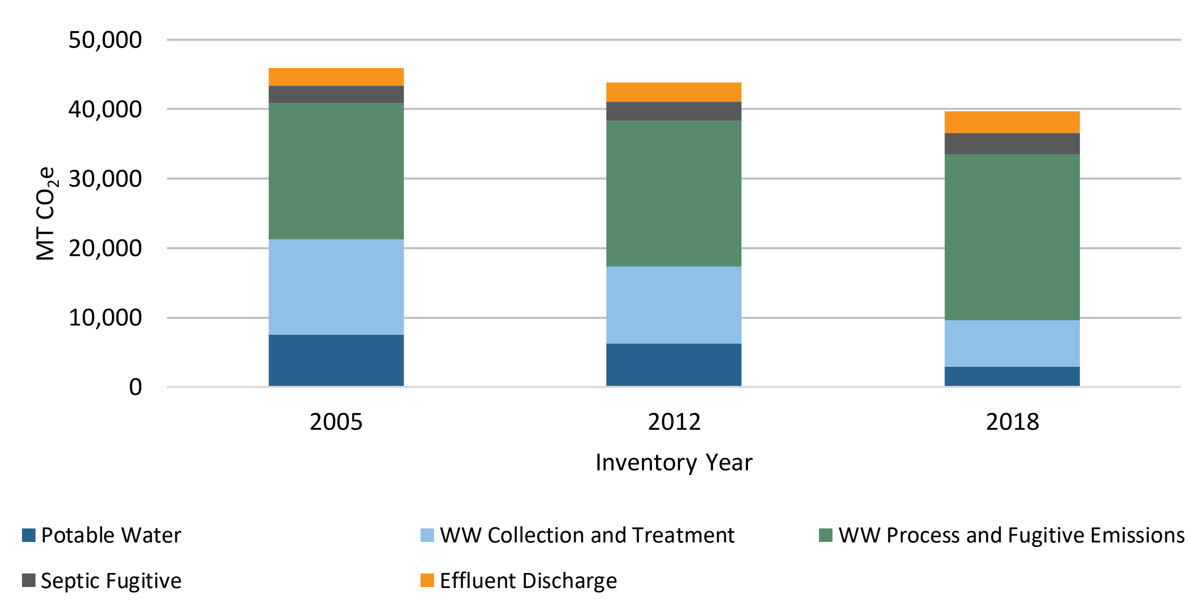


Table 13 Regional Community Water Sector Emissions Summary

Emission Source	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)	Percent Change (2005-2018)
Potable Water[1]	7,560	6,254	2,944	-61%
Wastewater Collection and Treatment	13,689	11,105	6,684	-51%
Wastewater Treatment Process and Fugitive Emissions	19,583	20,948	23,808	22%
Septic Fugitive	2,511	2,723	3,139	25%
Effluent Discharge	2,632	2,816	3,111	18%
Total Water Emissions	**45,976**	**43,844**	**39,685**	**-14%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent;
Totals may not add up to 100% due to rounding

1. Unincorporated County potable water consumption is not included in this total. Totals are provided for general assessment of the magnitude of emissions.

4.2.3.1 Potable Water

Potable water is supplied to the majority of the incorporated cities of Imperial County by IID, with the exception of Calipatria which receives water from Golden State Water, which ultimately originates from IID as well. Excluding Calipatria, potable water is treated by plants under the control of each jurisdiction. Emissions associated with potable water only considers the electricity consumed in treatment at these plants, and the delivery from these plants to the community. The geography of Imperial Valley provides surface water that requires no additional energy to convey from its source at the Colorado River, to its final destination in Imperial Valley. In fact, IID reports water conveyance as a net source of electricity, which is excluded from these emission calculations as it is assumed that this renewable electricity generation is captured in the electricity emission factor provided by IID.[20]

The amount of energy required for community water usage was calculated following *Community Protocol* Method WW.14, where energy required for each segment of the water cycle was estimated using energy intensities specific to the water segment. The energy intensity for water treatment and distribution used to calculate emissions for all jurisdictions is 1,214 kWh/million gallons (MG) of water, as obtained from the California Public Utilities Commission (CPUC) 2010 *Embedded Energy Water Study* Agency Profile for the City of Calexico.[21] The total potable water consumed as part of this emission report was 10,472 MG in 2005, 11,558 MG in 2012 and 8,937 MG in 2018, excluding potable water consumed in the unincorporated areas and communities of the County. The emissions associated with potable water consumption have decreased in magnitude since 2005, as the GHG emissions associated with electricity generation have decreased from increased renewable energy procurement and a reduction in total water consumption through efficiency practices and policies.

4.2.3.2 Wastewater

Wastewater generated in the majority of Imperial Valley is collected in local sewer lines that ultimately discharge into local treatment and disposal facilities managed by the respective jurisdiciton from which wastewater is generated. Wastewater emissions from treatment plants, including energy used for collection and treatment and fugitive emissions were calculated using *Community Protocol* Methods WW.6, WW.7, WW.8, WW.12 and WW.15. Each of these equations require a per capita waste generation rate, which includes both residential and commerical wastewater generation. These volumes were derived from the values provided in the IID 2012 *Integrated Regional Water Management Plan*, allowing a jurisdicition specific generation rate to be derived based on the total wastewater flows reported at each wastewater treatment plant and the respective jurisdiction population.[22] Updated wastewater generation rates were obtained for the 2018 invenotry year for the cities of Brawley, Calexico and El Centro, from their respective 2015 Urban Water Management Plans. The derivation of these wastewater generation rates is further detailed in Appendix B. In contrast to the incorporated cities, more than half of the unincorporated communities' population is expected to be served by on-site septic systems.[23] Fugitive emissions from on-site septic systems were calculated based on the population served by septic, using *Community Protocol* Method WW.11. The total population served by septic, obtained from Imperial

[20] Imperial Irrigation District. November 2012. Imperial Integrated Regional Water Management Plan. Appendix O. pp. O-20. https://www.iid.com/water/water-supply/water-plans/imperial-integrated-regional-water-management-plan.

[21] CPUC 2010. Embedded Energy Water Studies Study 2: Water Agency and Function Component Study and Embedded Energy-Water Load Profiles; Appendix B-Agency Profiles. https://www.cpuc.ca.gov/general.aspx?id=4388. Accessed March 20, 2020.

[22] 1. Source: IID. 2012. Integrated Regional Water Management Plan. Appendix N IID Capital Projects. Table N-20. pp. N-53. https://www.iid.com/home/showdocument?id=9548. Accessed May 15, 2020.

[23] Imperial County Public Health Department. 2015. Onsite Wastewater Treatment Systems: Local Agency Management Program/Advanced Protection Management Program. http://www.icphd.org/media/managed/environmentalhealth/Imperial_County_Local_Agency_Management_Program.pdf. Accessed May 25th, 2020.

County Public Health Department Local Agency Management Program, was estimated to be 20,669 in 2005, 22,410 in 2012, and 25,387 in 2018.

The resulting collective emissions from wastewater treatment at centralized treatment plants was 35,905 MT CO_2e in 2005, 34,868 MT CO_2e in 2012 and 35,158 MT CO_2e. The nearly constant emissions over time are a result of the decreased emissions associated with electricity consumption offsetting the increases in process and fugitive emissions from the increased wastewater generation of the growing population. Fugitive emissions from septic have increased by 18% between 2005 and 2018, with emissions totaling 2,511 MT CO_2e in 2005, 2,723 MT CO_2e in 2012, 3,139 MT CO_2e in 2018. Collective wastewater treatment emissions have stayed nearly constant between 2005 and 2018, with 38,416 MT CO_2e emitted in 2005 and 36,741 MT CO_2e emitted in 2018.

4.2.4 Waste Sector

The solid waste sector GHG emissions sources generated approximately 11% of total regional community emissions in 2018, with approximately 148,337 MT CO_2e being generated. This is a slight increase in emissions from 2012, when 132,773 MT CO_2e was generated and a 32% decrease in emissions from 2005, when 218,847 MT CO_2e was generated. Emissions associated with the waste sector are due the collection and transport of waste to landfills, the methane commitment of the decomposition of waste at a landfill, and waste processing equipment. Waste transport and collection emissions are not reported in this inventory as the majority of waste is disposed of within Imperial Valley and is captured under commercial on-road transportation. GHG emissions from solid waste were calculated using *Community Protocol* Methods SW.4 and SW.5. Solid waste generated within Imperial Valley is disposed of at multiple landfill facilities, with the majority of waste being disposed of at the Imperial Landfill (about 60% of annual waste) and the Monofill facility (about 33% of annual waste), with the remainder being disposed of at various sites (less than 10%) that are primarily within Imperial County. The magnitude of GHG emissions from landfills is largely determined by the amount of waste disposed and whether the facilities implement landfill gas capture. The total waste generation in Imperial Valley was 272,996 short tons in 2005, 206,324 short tons in 2012 and 152,345 short tons in 2018.[24] This equates to an overall 44% reduction in landfilled waste since 2005. Landfill gas capture can significantly reduce emissions generated by solid waste. In Imperial Valley, only the Imperial Landfill reports having landfill gas capture.[25] A weighted landfill gas capture rate was developed for the entire Imperial Valley waste stream for each inventory year, for which the details are provided in Appendix B.

The methane commitment of landfilled waste generated in Imperial Valley was 215,844 MT CO_2e in 2005, 130,504 MT CO_2e in 2012 and 146,662 MT CO_2e in 2018. All of these emissions do not occur within the respective inventory year, but instead represent the total emissions that will be generated as the landfilled waste decays over time. The exclusion of total emissions from landfills within Imperial Valley (*Community Protocol* SW.1) reduces the potential for double counting waste emissions or attributing the methane commitment of jurisdictions outside of Imperial Valley that may dispose of waste at Imperial County facilities. Landfill process emissions were also calculated based on the total waste disposed, equating to 3,003 MT CO_2e in 2005, 2,270 MT CO_2e in 2012, and 1,676 MT CO_2e in 2018, representing 1% to 2% of total waste emissions. The total waste sector emissions for Imperial Valley and the contribution of each sources are provided in Figure 10 and Table 14.

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[24] Solid waste disposal totals for 2018 were obtained directly from each jurisdiction, and 2005 waste disposal totals from CalRecycle. 2012 totals were estimated by interpolating the waste generation rate per service population of 2018 and 2005.
CalRecycle. Local Government Central: Single-year Countywide Destination Detail. Imperial County, 2005. https://www2.calrecycle.ca.gov/LGCentral/DisposalReporting/Destination/DisposalByFacility. Accessed December 2019.

[25] CalRecycle. 2020. SWIS Facility/Site Search. SWIS Data File. https://www2.calrecycle.ca.gov/SWFacilities/Directory/. Accessed March 25th, 2020.

Figure 10 Regional Community Waste Sector Emissions Summary

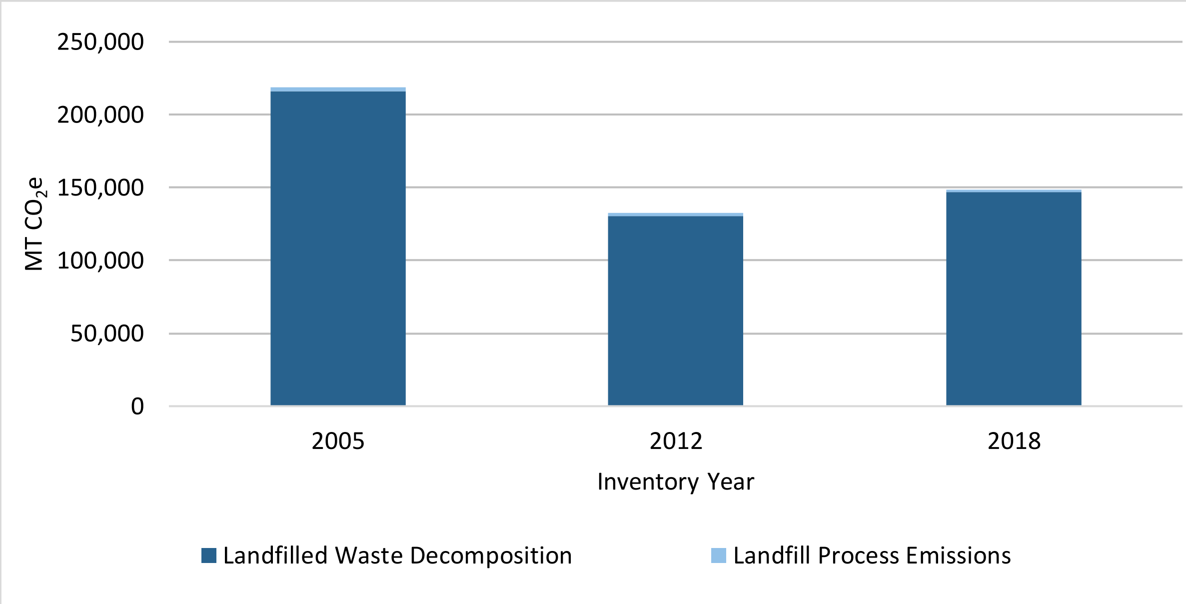

Table 14 Regional Community Waste Sector Emissions Summary

Emission Source	2005 Emissions ($MT\ CO_2e$)	2005 Percent of Total	2012 Emissions ($MT\ CO_2e$)	2012 Percent of Total	2018 Emissions ($MT\ CO_2e$)	2018 Percent of Total
Landfilled Waste Decomposition	215,844	99%	130,504	98%	146,662	99%
Landfill Process Emissions	3,003	1%	2,270	2%	1,676	1%
Total Waste Emissions	**218,847**	**100%**	**132,773**	**100%**	**148,337**	**100%**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent;
Totals may not add up to 100% due to rounding

4.3 2018 Community GHG Inventory Results

In 2018, unincorporated Imperial County generated the most GHG emissions of any other jurisdictions, 497,169 MT CO_2e, or 35% of total emissions. El Centro was the second largest contributor to total Imperial Valley GHG emissions, generating 315,556 MT CO_2e, or 22% of total emissions, followed by Calexico and Brawley which had emissions of 217,473 MT CO_2e and 190,778 MT CO_2e, respectively (15% and 13% of total emissions). The City of Imperial generated about 8% of the total Imperial Valley emissions in 2018, with 111,231 MT CO_2e. Calipatria, Holtville and Westmorland each contributed the least to regional community GHG emissions, with 38,726 MT CO_2e, 45,614 MT CO_2e and 18,167 MT CO_2e, respectively. Figure 11 and Table 15 provide a summary of the 2018 community inventory emissions by sector.

The unincorporated County generated the most transportation and waste sector emissions compared to other jurisdictions in 2018, with the high transportation emissions being generally attributed the larger geographic area which it occupies. El Centro had the highest energy and water sector emissions in 2018, which is due to its relatively higher population and it being the largest employment center of the County. Further discussion of the emissions for each jurisdiction are provided in Appendix A.

Figure 11 2018 Inventory Emissions Summary

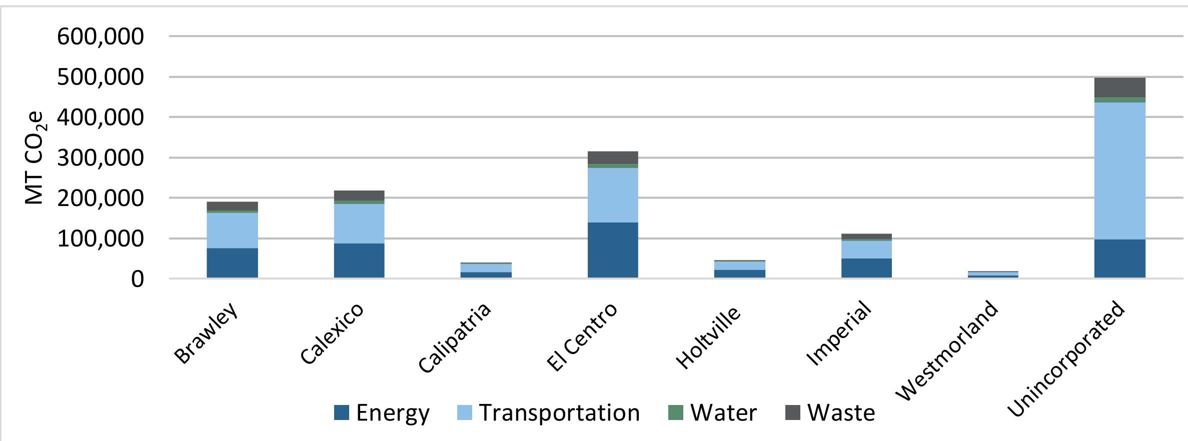

Table 15 2018 Inventory Emissions Summary

Emission Sector	Brawley	Calexico	Calipatria	El Centro	Holtville	Imperial	Westmorland	Unincorp. County
Energy	75,740	86,845	15,718	138,395	22,525	49,172	7,911	96,827
Transportation	86,201	96,471	19,590	135,090	19,015	44,370	8,244	339,132
Water	6,230	8,679	1,659	10,621	1,407	4,394	567	11,575
Waste	22,607	25,479	1,759	31,450	2,667	13,295	1,446	49,635
Total	**190,778**	**217,473**	**38,726**	**315,556**	**45,614**	**111,231**	**18,167**	**497,169**
% of Regional Emissions	**13%**	**15%**	**3%**	**22%**	**3%**	**8%**	**1%**	**35%**

Notes: Values presented in Metric Tons of Carbon Dioxide Equivalent (MT CO_2e)

4.4 2012 Community GHG Inventory Results

In 2012, unincorporated Imperial County generated the most GHG emissions of any other jurisdictions, 504,780 MT CO_2e, or 32% of total emissions. El Centro was again the second largest contributor to total Imperial Valley GHG emissions, generating 391,242 MT CO_2e, or 25% of total County emissions, followed by Calexico and Brawley which had emissions of 222,798 MT CO_2e and 219,489 MT CO_2e, respectively (both contributing about 14% of total emissions). The City of Imperial generated about 7% of the total Imperial Valley emissions in 2012, with 116,676 MT CO_2e. Calipatria, Holtville and Westmorland each contributed the least to total GHG emissions, with 50,840 MT CO_2e, 57,736 MT CO_2e and 21,991 MT CO_2e, respectively. Figure 12 and Table 16 provide a summary of the 2012 community inventory emissions by sector.

The unincorporated County generated the most transportation and waste sector emissions compared to other jurisdictions in 2012, nearly double that of El Centro, the next largest contributor for these sectors. El Centro also had the highest energy and water sector emissions 2012, which is again due to its relatively higher population and it being the largest employment center of the region. Further discussion of the emissions for each jurisdiction are provided in Appendix A.

Figure 12 2012 Inventory Emissions Summary

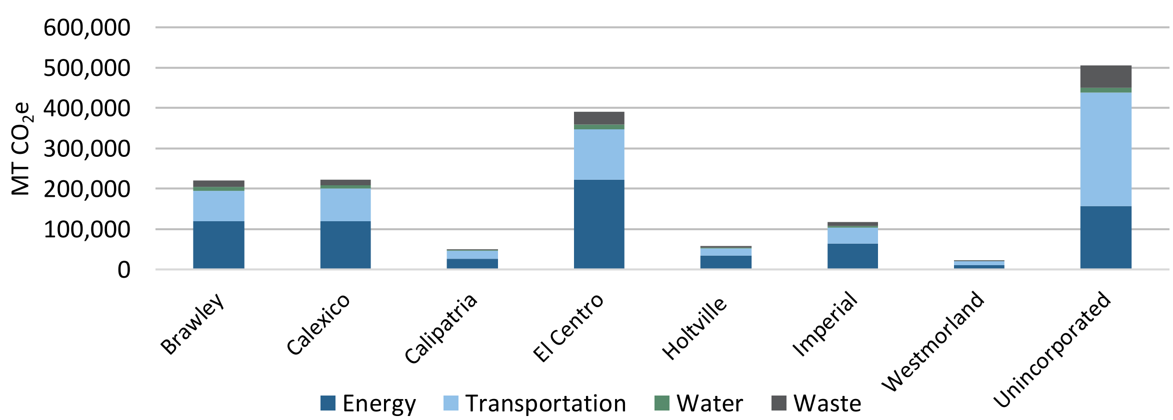

Table 16 2012 Inventory Emissions Summary

Emission Sector	Brawley	Calexico	Calipatria	El Centro	Holtville	Imperial	Westmorland	Unincorp. County
Energy	119,445	119,155	26,845	222,148	33,777	64,085	10,704	157,606
Transportation	75,409	81,409	20,162	125,495	19,278	39,199	9,589	280,188
Water	8,733	7,846	2,103	11,286	1,692	4,195	691	11,737
Waste	15,902	14,388	1,730	32,313	2,988	9,196	1,007	55,249
Total	**219,489**	**222,799**	**50,840**	**391,242**	**57,736**	**116,676**	**21,991**	**504,780**
% of Regional Emissions	**14%**	**14%**	**3%**	**25%**	**4%**	**7%**	**1%**	**32%**

Notes: Values presented in Metric Tons of Carbon Dioxide Equivalent (MT CO_2e)

4.5 2005 Community GHG Inventory Results

The 2005 community inventory had similar results to the 2012 Community inventory, with emissions being higher in in 2005, with the exception of Imperial where emissions were about the same as the other inventory years. Unincorporated Imperial County generated the most GHG emissions of any other jurisdictions, 602,603 MT CO_2e, or 31% of total emissions. El Centro was again the second largest contributor to total Imperial Valley GHG emissions, generating 474,715 MT CO_2e, or 25% of total emissions, followed by Calexico and Brawley which had emissions of 291,173 MT CO_2e and 251,571 MT CO_2e, respectively (15% and 13% of total emissions, respectively). The City of Imperial generated about 6% of the total Imperial Valley community GHG emissions in 2012, with 110,187 MT CO_2e. Calipatria, Holtville and Westmorland each contributed the least to regional GHG emissions, with 85,603 MT CO_2e, 74,470 MT CO_2e and 33,979 MT CO_2e, respectively. Figure 13 and Table 17 provide a summary of the 2005 community inventory emissions by sector.

Similar to the 2012 and 2018 Community inventories, the unincorporated County contributed the largest share of transportation and waste sector emissions, while El Centro contributed the largest share of energy and water sector emissions. Further discussion of the emissions for each jurisdiction are provided in Appendix A.

Figure 13 2005 Inventory Emissions Summary

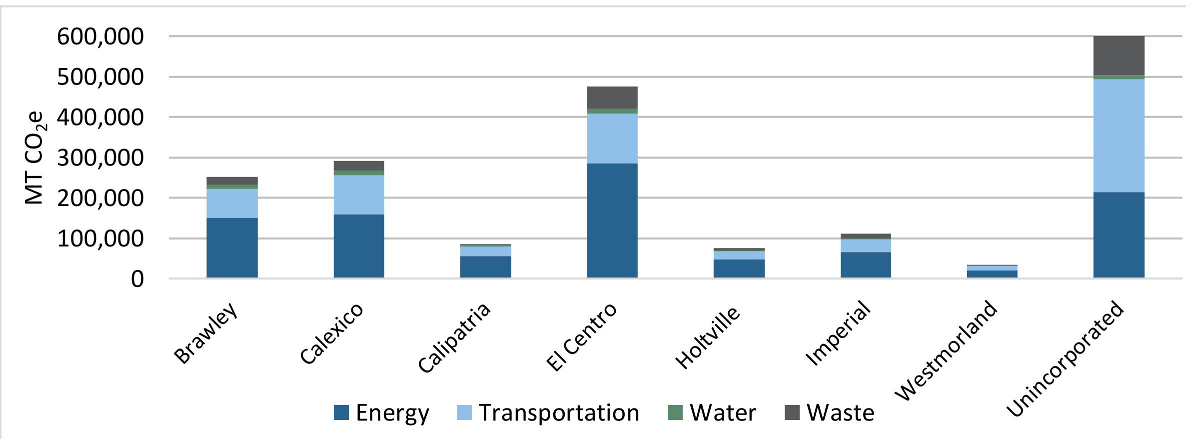

Table 17 2005 Inventory Emissions Summary

Emission Sector	Brawley	Calexico	Calipatria	El Centro	Holtville	Imperial	Westmorland	Unincorp. County
Energy	149,963	158,790	55,531	285,590	47,182	66,357	19,557	214,337
Transportation	71,858	97,757	24,343	122,627	19,925	29,950	12,137	278,059
Water	9,217	10,151	2,543	11,876	1,840	3,417	825	11,624
Waste	20,534	24,474	3,186	54,623	5,523	10,464	1,461	98,583
Total	**251,571**	**291,173**	**85,603**	**474,715**	**74,470**	**110,187**	**33,979**	**602,603**
% of Regional Emissions	**13%**	**15%**	**4%**	**25%**	**4%**	**6%**	**2%**	**31%**

Notes: Values presented in Metric Tons of Carbon Dioxide Equivalent (MT CO_2e)

5 Conclusion

This GHG inventory is intended to provide data that can assist decision makers and stakeholders in identifying opportunities to reduce GHG emissions throughout Imperial Valley as a whole, and within the specific jurisdictions. It also provides an emissions baseline that will be used to set future emissions reduction targets. As previously detailed, the Imperial Valley generated approximately 1,924,301 MT CO_2e in 2005, 1,585,553 MT CO_2e in 2012, and 1,434,715 MT CO_2e in 2018. This equates to a 25% reduction in Imperial County's community GHG emissions between 2005 and 2018. This change in emisisons was not consistent between all jurisdicitons of the County. The City of Imperial experienced almost no change in total GHG emissions over this time period, and Calipatria reducing emissions by approximately 55%. However, the targets established in both the Brawley and Calexico 2015 CAPs, of reducing emissions to 15% below 2005 emissions levels by 2020, have been well exceeded for these two jurisdicitons. The emission profiles of each jurisdiction are further discussed in Appendix A.

Programs and policies are already underway to help Imperial Valley reduce its GHG emissions consistent with AB 32 and SB 32. Such programs include the Brawley and Calexico Climate Action Plans, utility programs for water and energy efficiency by IID and rebates and incentives provided by SoCal Gas. The assessment of GHG emissions on a regional level can help identify opportunities for GHG emission reductions through multi-jurisdiction collaborations and regional efforts that can be more powerful and effective than jurisdicitons working alone.

Appendix A

Community Inventory Summary by Jurisdiction

This report prepared on 50% recycled paper with 50% post-consumer content.

Table of Contents

Tables

Figures

1 Greenhouse Gas Emissions by Jurisdiction

Provided in this appendix is a summary of the Community Greenhouse gas (GHG) Emissions Inventories for the jourisdictions covered by the Imparial County Transportation Comission (ICTC) Regional Climate Action Plan (RCAP) , for inventory years 2005, 2012 and 2018. GHG inventories were prepared for the following jourisdictions: Brawley, Calexico, Calipatria, El Centro, Holtville, Imperial, Westsmorland, and Unincorporated Imperial County. The purpose of this section is to provide detailed information specific to each jurisdiction that can inform policy makers on the magnitude of GHG emissions from each source, and the reductions necessary to achieve the identified GHG reduction targets to be included in the RCAP.

GHG emisisons are presented by sector[1] and by scope[2], in order to understand both the contribution of emission sources and provide an assessment of whether the GHG emission sources are under the jursidiction's control or within the physical boundaries. Emissions presented by sector fall under the four main categories of energy, transportation, water and waste. These categories contain both community and municipal emission sources from within each jurisidcition's boundaries.

Emissions presented by scope are provided as either scope 1, 2 or 3. Scope 1 emissions are generated within a jurisdicitions boundaries, and consist of the direct emissions of GHGs and the burning of fossil fuels, including natural gas consumption and vehicle emissions from internal combustion engines. Also included in scope 1, are emissions generated by inboundary wastewater treatment, including process and fugitive emissions from centralized wastewater treatment plants and on-site septic treatment systems. Scope 2 emissions consist of electricty consumed within a jurisdiction, where emissions are generated outside of the jursidiction at the source of electriucty generation. Scope 3 emissions are all other indirect or embodied GHG emissions not covered in scope 1 or 2, including emissions generated by waste and wastewater disposal outside of a jurisdiciton's boundaries, and electricity transmission and distribution (T&D) losses. Presenting emission by both scope and sector allows deeper understanding of what sources can be controlled by a jurisdiction, and how to influence emission sources outside of their control.

The following presents the GHG emissions for each jursidciton, with analysis of the potential drivers of changes in emissions over time. Detailed methodology for the GHG emission calculations, including activity data, sources, emission factors and methodologies, can be found in Appendix B.

[1] Greenhouse gas emissions can be broken down by the economic activities or sectors that lead to their production. Standard sectors that are generally included in CAPs are: energy, transportation, waste, and water.

[2] GHG inventory protocols generally classify GHG emissions into three 'scopes. Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions (not included in scope 2).

2 City of Brawley

The City of Brawley (Brawley) is an incorporated city of Imperial County (County), containing about 14% of the total County population (27,417 residents) and 12% of the total employment (9,219 jobs), in 2018. Since 2005, Brawley has experienced population growth at a rate of approximately 20% over the 13-year period. The total jobs in Brawley have also increased at a rate of approximately 30% over the same time period. While growth in Imperial Valley was largely flattened in 2008 by the financial crisis, Brawley has since resumed steady employment and population growth.[3]

Brawley adopted its own CAP in 2015, which includes strategies to reduce GHG emissions to 15% below 2005 baseline emission levels by 2020, and a further 30% reduction of emissions by 2030. While GHG emission inventories have already been conducted for 2005 and 2012 as part of the 2015 CAP, the results here provide updated methodologies and reporting of additional sources, consistent with the current methodologies and emission factors used for the CARB 2017 *Scoping Plan Update*. These updates include use of the Regional Targets Advisory Committee (RTAC) recommended vehicle miles traveled (VMT) attribution methodology, pursuant to Senate Bill 375 (SB 375), for on-road transportation and the inclusion of wastewater fugitive emissions and electricity T&D losses. Additionally, the calculation methodologies were updated to use the most recent global warming potentials from Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). The largest disparity between the GHG inventories in the 2015 CAP and the current inventory, is the energy sector emissions. This is likely due to the use of different electricity consumption data sets, and alternate methods for attributing electricity consumption to specific jurisdictions in the County. The updated inventories also exclude industrial sector natural gas consumption due to the availability of this data in accordance with California Public Utilities Commission (CPUC) data request and privacy rules.

2.1 City of Brawley GHG Emissions by Sector

The City of Brawley has reduced its total GHG emission by 24% between 2005 and 2018, from 251,693 MT CO_2e in 2005 to 190,742 MT CO_2e in 2018. This exceeds the goal of a 15% emissions reduction below 2005 baseline emissions by 2020 and provides substantial progress towards their 2030 goal of a 30% reduction. The total GHG emissions in Brawley in 2005 and 2012 are dominated by energy consumption. However, in 2018, significant reduction in emissions from increased renewable energy procurement by the Imperial Irrigation District (IID) utility resulted in energy emissions falling to a level that is nearly equivalent to the transportation emissions, which is the second largest emissions source. The transportation sector was generally the second largest source of GHG emissions in Brawley in 2005, 2012 and 2018. Even with increased fuel efficiency, growth in VMT in Brawley has resulted in a 20% increase in transportation emissions between 2005 and 2018. Waste sector emissions have remained the third largest source of emissions in Brawley, with Water sector emissions being the smallest source. The inventory results by sector for Brawley are provided in Figure 1. GHG emission results by sector are provided in Table 1, including total emissions by

[3] Southern California Association of Governments (SCAG). 2019. Profile of the City of Brawley. https://www.scag.ca.gov/Documents/Brawley.pdf

source for each inventory year and the percent change in emissions between 2005 and 2018 for each source.

Figure 1 City of Brawley GHG Emissions by Sector

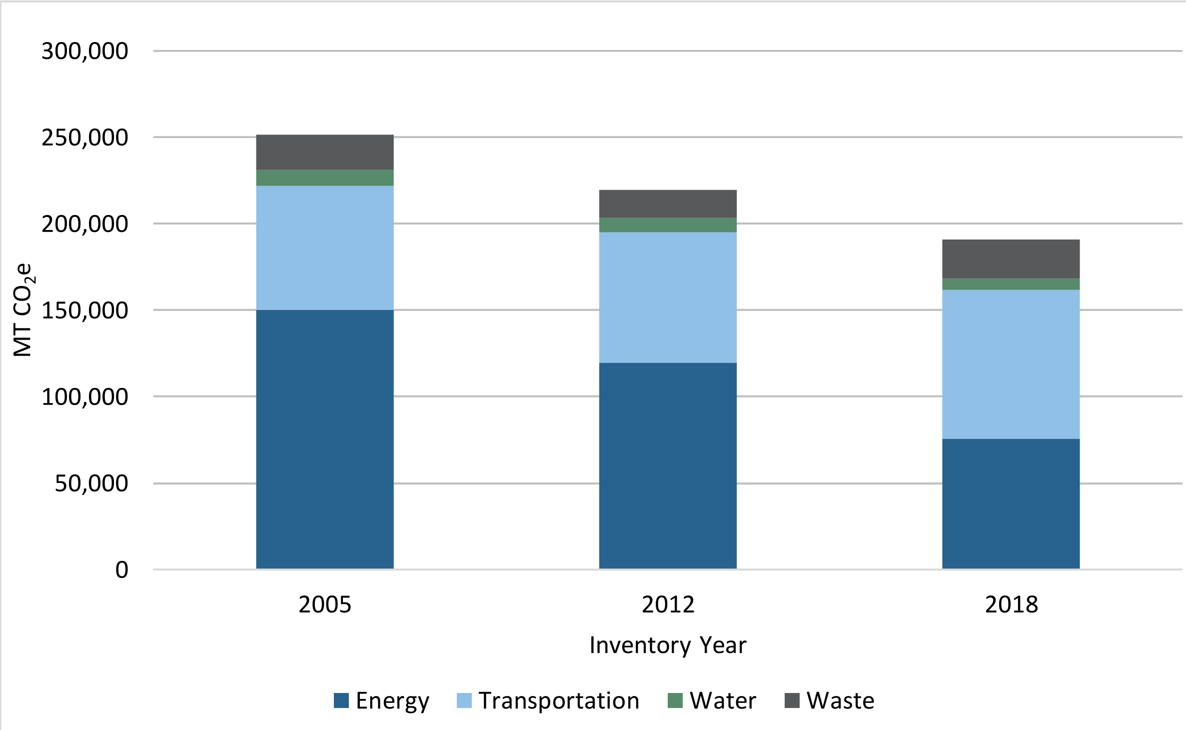

Table 1 City of Brawley GHG Emissions by Sector

Emission Sector	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)	Percent Change (2005 – 2018)
Energy	**155,548**	**124,035**	**77,442**	**-50%**
Natural Gas	10,349	9,505	9,289	-10%
Residential Propane	302	293	291	-4%
Non-residential Propane	1,535	1,785	2,049	33%
Residential Electricity	61,917	50,090	27,429	-56%
Non-residential Electricity	69,367	52,889	32,839	-53%
Electricity T&D Losses	12,078	9,474	5,545	-54%
Transportation	**71,858**	**75,409**	**86,201**	**20%**
Passenger On-road Vehicles	46,619	48,403	53,151	14%
Commercial On-road Vehicles	17,189	19,486	23,011	34%
Off-road Equipment	8,050	7,520	10,039	25%
Water	**9,217**	**8,733**	**6,230**	**-32%**
Wastewater Process and Fugitive	3,754	4,172	4,492	20%
Wastewater Collection and Treatment	3,623	3,018	1,018	-72%
Potable Water Consumption	1,841	1,543	720	-61%
Waste	**20,534**	**15,902**	**22,607**	**10%**
Landfilled Waste Decomposition	20,252	15,631	22,352	10%
Landfill Process Emissions	282	272	255	-9%
Total[1]	**251,693**	**219,519**	**190,742**	**-24%**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

Values may not add up due to rounding

1. Emissions from Wastewater Collection and Treatment and Potable Water Consumption are not added into the total emission for the jurisdiction and are provided here for informational purposes. The emissions from these sources are from the consumption of electricity and are therefore captured under Non-residential Electricity.

2.2 City of Brawley GHG Emissions by Scope

The total GHG emissions in Brawley primarily result from scope 2 emission sources, which consists of electricity consumption. The scope 2 emissions have decreased by 54% between 2005 and 2018, becoming the second largest source of GHG emissions in 2018 (32% of total 2018 emissions). Scope 1 emissions, including direct emissions from combustion of fossil fuels in vehicles and buildings and process and fugitive emissions from the City of Brawley Wastewater Treatment Plant (WWTP), were the second largest sources of emissions in both 2005 and 2012, becoming the largest source in 2018 (53% of total 2018 emissions). This is due mostly to the steady decrease in scope 2 emissions, as scope 1 emissions only increased by 17% increase between 2005 and 2018. Scope 3 emission generally decreased between 2005 and 2012 and increased between 2012 and 2018. Scope 3 emissions contribute the least to the total emissions (15% of total 2018 emissions). The inventory results by scope for Brawley are provided in Figure 2, with the total emissions by scope and the percent change between 2005 and 2018 provided in Table 2.

Figure 2 City of Brawley GHG Emissions by Scope

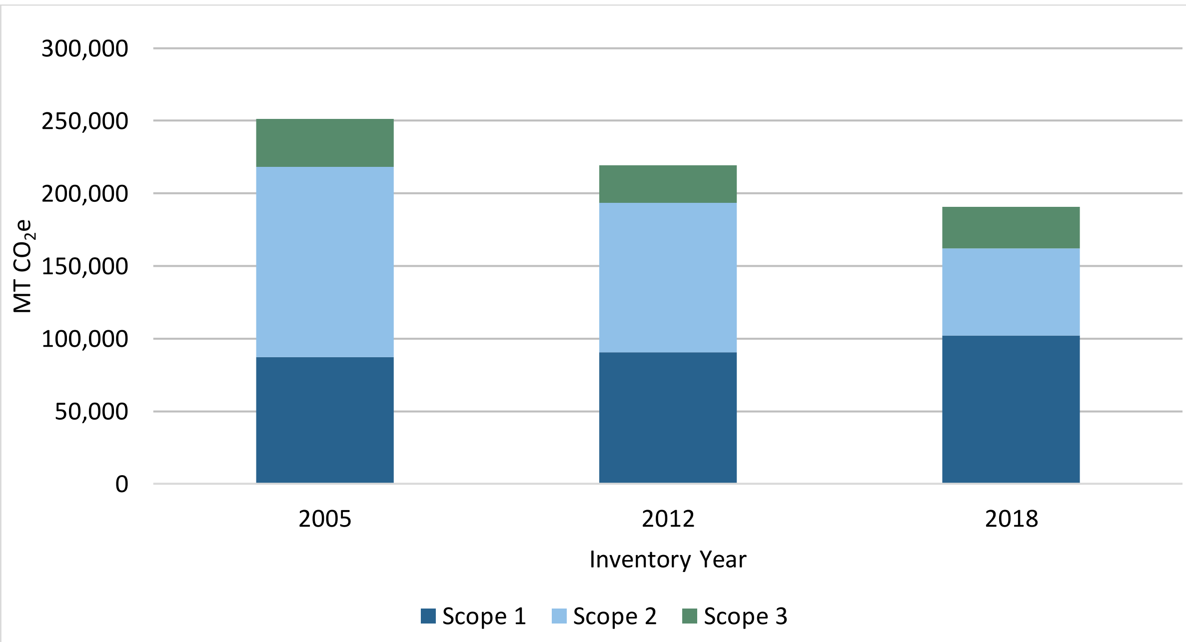

Table 2 City of Brawley GHG Emissions by Scope

Emissions Scope	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)	Percent Change (2005 – 2018)
Scope 1	87,231	90,640	101,826	17%
Scope 2	131,284	102,979	60,268	-54%
Scope 3	33,057	25,871	28,684	-13%
Total	**251,571**	**219,489**	**190,778**	**-24%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

2.3 City of Brawley GHG Emission Summary

The City of Brawley's total GHG emissions have decreased in magnitude by 24%, from 251,571 MT CO_2e in 2005 to 190,778 MT CO_2e in 2018, which surpasses the 15% 2020 reduction target established by the 2015 CAP at least two years earlier than targeted. The primary driver of these emission reductions is from the energy sector, specifically emissions from electricity consumption (scope 2), which was a result from a mix of state legislation and policies established in the 2015 CAP. A large portion of the emissions reduction in this category came from the increased renewable energy procurement by IID, effectively reducing the GHGs per unit of energy in half between 2005 and 2018. However, even though Brawley experienced significant population growth between 2005 and 2018, the total energy consumption in the residential and non-residential sectors stayed nearly constant. This increased efficiency reflects the adoption of updated building codes that require increased energy efficiency, potential participation in statewide and regional energy efficiency programs, and success of policies included in the 2015 CAP.

Transportation (scope 1) emissions trended with demographic changes, contributing to 43% of the total emissions in 2018. VMT by passenger car increased by 42% between 2005 and 2018, while population increased by 20%; however, increased fuel efficiency resulted in only a 14% increase in passenger vehicle emissions over the same time period. Commercial on-road transportation emissions scaled closely with employment between 2005 and 2018, with commercial VMT, employment and commercial on-road emissions having all increased at about 34% between 2005 and 2018.

Emissions from the disposal of solid waste increased slightly between 2005 and 2018, contributing to 12% of the total 2018 GHG emissions. While waste landfilled by Brawley decreased in this time period, as would be expected with increase recycling and recovery, the variance in emissions was primarily influenced by variables at the disposal landfills. Variance in the landfill gas capture rate at disposal facilities, or lack thereof, has caused waste emissions to fluctuate over time. This scope 3 emission source can be further reduced by continuing to increase recycling and source reduction; however, future efforts to increase landfill gas capture at waste disposal sites could significantly reduce landfill emissions resulting from the release of methane.

Emissions from the water sector, which includes electricity from the treatment and distribution of potable water (scope 2), electricity from treatment and collection of wastewater (scope 2), and wastewater treatment process and fugitive emissions (scope 1 and 3), made up about 3% of the total emissions in 2018, decreasing by 32% from the 2005 sector emissions of 9,217 MT CO_2e, to 6,230 MT CO_2e in 2018. The water sector sources associated with electricity consumption generally decreased between 2005 and 2018 due to increased water efficiency and the decreased emissions associated with electricity generation. Wastewater process and fugitive emission increased over the same period, as these emissions generally scale with population.

State legislation will continue to help reduce future GHG emissions in Brawley with increasing renewable energy procurement though SB 100, reduced waste emissions through SB 1383, and reduced transportation emissions through advancing fuel efficiency and Low Carbon Fuel Standards. This positions Brawley to exceed their 2015 CAP goal for 2030 well ahead of target and to meet the more stringent state targets established since adoption of the 2015 CAP. State legislation has updated GHG emission reduction targets since the adoption of the Brawley 2015 CAP, with Senate Bill (SB) 32. Based on guidance of the CARB 2017 *Climate Change Scoping Plan,* under SB 32 jurisdictions will be required to reduce GHG emissions to 40% below 1990 levels by the year 2030, or 49% below 2005 levels.[4] As of 2018, Brawley was over halfway towards reaching the SB 32 target, with an overall 24% decrease in GHG emissions since 2005. The RCAP provides opportunity for Brawley to update its GHG reduction targets and establish policies that will help lock in the GHG reduction already attained in the energy sector and reduce the growing transportation sector emissions.

[4] California Air Resources Board (CARB). 2017. California's 2017 Climate Change Scoping Plan. https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf

3 City of Calexico

The City of Calexico (Calexico) is an incorporated city of Imperial County (County), containing about 22% of the total County population (41,199 residents) and 16% of the total employment (11,958 jobs) in 2018. Since 2005, Calexico has experienced population growth at a rate of approximately 19% over the 13-year period. The total jobs in Calexico have increased at an even greater rate of approximately 40% over the same time period. The 2008 financial crisis reduced population growth throughout Imperial Valley from a significant loss of jobs in many jurisdictions into 2010. Calexico was similarly impacted and has since resumed steady employment and population growth.[5]

Calexico adopted its own CAP in 2015, which included strategies to reduce GHG emissions to 15% below 2005 baseline emission levels by 2020, and a 30% further reduction of emissions by 2030. While GHG emission inventories have already been conducted for 2005 and 2012, as part of the 2015 CAP, the results here provide updated methodologies and reporting of additional sources, consistent with the current methodologies and emission factors used for the CARB 2017 *Scoping Plan Update*. These updates include use of the Regional Targets Advisory Committee (RTAC) recommended vehicle miles traveled attribution methodology, pursuant to Senate Bill 375 (SB 375), for on-road transportation and the inclusion of wastewater fugitive emissions and electricity transmission and distribution (T&D) losses. Additionally, the calculation methodologies were updated to use the most recent global warming potentials from Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). The largest disparity between the GHG inventories in the 2015 CAP and the current inventory, is the energy sector emissions. This is likely due to the use of different electricity consumption data sets, and alternate methods for attributing electricity consumption to specific jurisdictions in the County. The updated inventories also exclude industrial sector natural gas consumption due to CPUC data request and privacy rules.

3.1 City of Calexico GHG Emissions by Sector

The City of Calexico has reduced its total GHG emission by 25% between 2005 and 2018, from 291,173 MT CO_2e to 217,473 MT CO_2e. This exceeds the goal of a 15% emissions reduction below 2005 baseline emissions by 2020 and provides substantial progress toward Calexico's 2030 goal of a 30% reduction. The total GHG emissions in Calexico primarily result from energy consumption in 2005 and 2012. A significant decrease in energy emissions occurred between 2005 and 2012 due to decreased energy consumption, which was likely influenced by the economic downturn of the late 2000's. However, in 2018 there was a significant reduction in emissions from increased renewable energy procurement by the IID utility, which results in energy emissions reducing to a level that is slightly lower than transportation emissions. The transportation sector was the second largest source of GHG emissions in Calexico in 2005 and 2012. Even while VMT in Calexico has increased since 2005, improved fuel economy has effectively reduced transportation emissions by 1% from 2005 to 2018. In 2018, transportation surpassed energy as the largest source of emissions in Calexico, primarily due to the significant decrease in energy emissions since 2005. Waste sector emissions have remained the third largest source of emissions in Calexico, with Water sector emissions being the smallest source. The inventory results by sector for Calexico are provided in Figure 3. GHG emission results by sector are provided in

[5] Southern California Association of Governments (SCAG). 2019. Profile of the City of Calexico. https://www.scag.ca.gov/Documents/Calexico.pdf

Table 3, including total emissions by source for each inventory year and the percent change in emissions between 2005 and 2018 for each source.

Figure 3 City of Calexico GHG Emissions by Sector

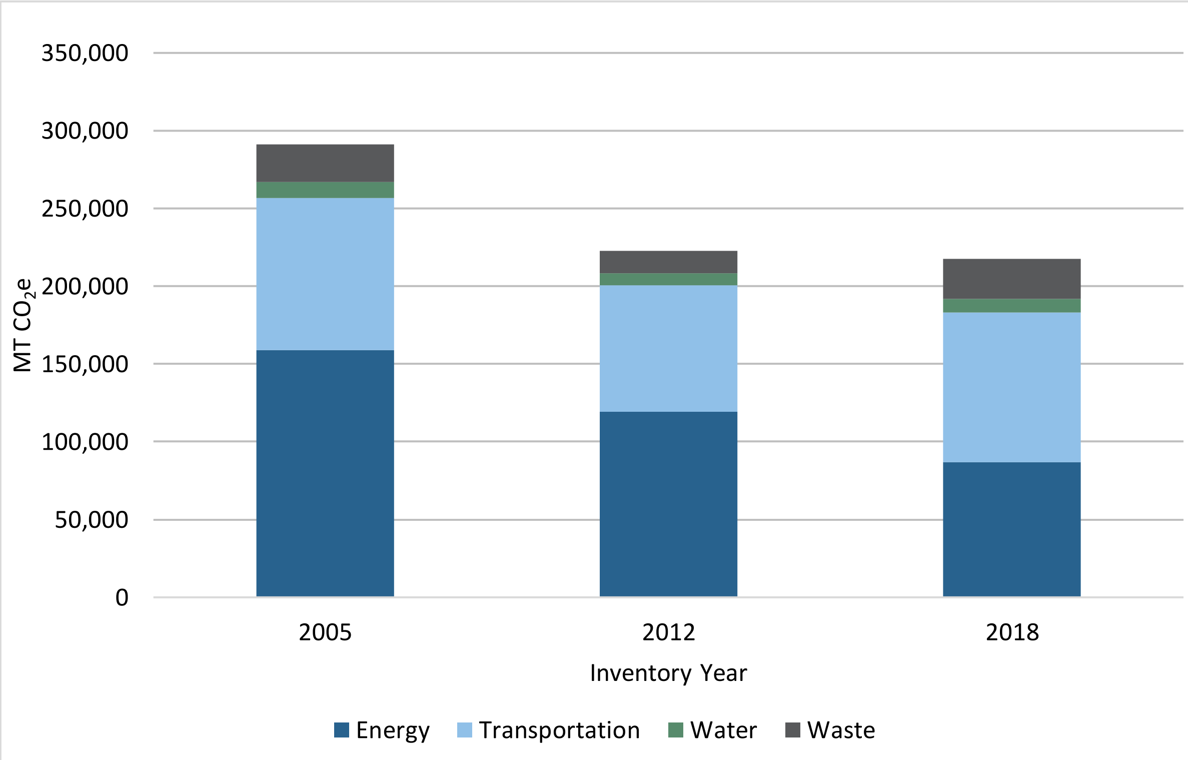

Table 3 City of Calexico GHG Emissions by Sector

Emission Sector	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)	Percent Change (2005 – 2018)
Energy	**163,290**	**122,163**	**88,774**	**-46%**
Natural Gas	12,974	11,793	11,850	-9%
Residential Propane	200	311	381	90%
Non-residential Propane	1,931	1,864	2,733	42%
Residential Electricity	65,064	54,380	30,455	-53%
Non-residential Electricity	70,635	44,700	37,136	-47%
Electricity T&D Losses	12,484	9,115	6,218	-50%
Transportation	**97,757**	**81,409**	**96,471**	**-1%**
Passenger On-road Vehicles	63,874	51,084	54,377	-15%
Commercial On-road Vehicles	23,826	22,419	28,849	21%
Off-road Equipment	10,056	7,906	13,245	32%
Water	**10,151**	**7,846**	**8,679**	**-14%**
Wastewater Process and Fugitive	5,651	4,839	6,750	19%
Wastewater Collection and Treatment	2,846	1,826	1,160	-59%
Potable Water Consumption	1,654	1,181	769	-53%
Waste	**24,474**	**14,388**	**25,479**	**4%**
Landfilled Waste Decomposition	24,139	14,142	25,191	4%
Landfill Process Emissions	336	246	288	-14%
Total[1]	**291,173**	**222,799**	**217,473**	**-25%**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

Values may not add up due to rounding

1. Emissions from Wastewater Collection and Treatment and Potable Water Consumption are not added into the total emission for the jurisdiction and are provided here for informational purposes. The emissions from these sources are from the consumption of electricity and are therefore captured under Non-residential Electricity.

3.2 City of Calexico GHG Emissions by Scope

The total GHG emissions in Calexico primarily result from scope 2 emission sources in 2005 and 2012, which consists of electricity consumption. The scope 2 emissions decreased by 50% between 2005 and 2018, becoming the second largest source of GHG emissions in 2018 (31% of total 2018 emissions). Scope 1 emissions, including direct emissions from combustion of fossil fuels in vehicles and buildings and process and fugitive emissions from the City of Calexico Municipal WWTP, were the second largest sources of emissions in both 2005 and 2012, becoming the largest source in 2018 (54% of total 2018 emissions). This is mostly a result of the decreasing scope 2 emissions, as compared to the negligible reduction in scope 1 emissions between 2005 and 2018. Scope 3 emission generally decreased between 2005 and 2018, reaching a low of 24,077 MT CO_2e in 2012. Scope 3 emissions contribute the least to the total emissions (15% of total 2018 emissions), compared to scope 1 and 2 emission sources. The inventory results by scope for Calexico are provided in Figure 4, with the total emissions by scope and the percent change between 2005 and 2018 provided in Table 4.

Figure 4 City of Calexico GHG Emissions by Scope

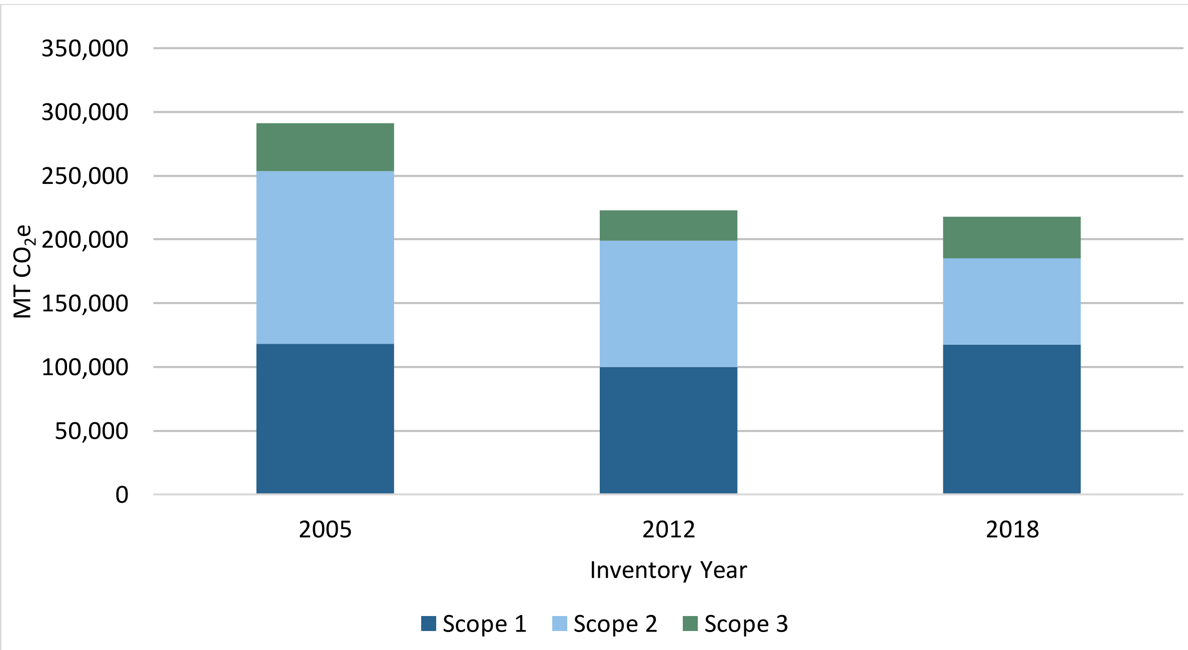

Table 4 City of Calexico GHG Emissions by Scope

Emissions Scope	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)	Percent Change (2005 – 2018)
Scope 1	117,844	99,642	117,386	0%
Scope 2	135,700	99,080	67,591	-50%
Scope 3	37,628	24,077	32,497	-14%
Total	**291,173**	**222,799**	**217,473**	**-25%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

3.3 City of Calexico GHG Emission Summary

The total GHG emission of the City of Calexico have decreased by 25%, from 291,173 MT CO_2e in 2005 to 217,473 MT CO_2e in 2018, surpassing the 2020 targets established by the 2015 CAP in 2012 and nearly hitting the 2030 targets of a 26% reduction below 2005 emissions. The primary driver of these emission reductions is from the energy sector, specifically emissions from electricity consumption (scope 2), which was a result from a mix of state legislation and policies established in the 2015 CAP. A large portion of the emissions reduction in this category comes from the increased renewable energy procurement by IID, effectively reducing the GHGs emitted per unit of energy in half between 2005 and 2018. Additionally, reductions in the energy consumption per person and per job have resulted in only a slight increase in total energy consumed in Calexico, while at the same time there were significant increases in population and employment. This increased efficiency reflects the adoption of updated building codes that require increased energy efficiency, potential participation in statewide and regional energy efficiency programs, and success of the policies in the 2015 CAP.

Transportation (scope 1) emissions contributed to 44% of the total emissions in 2018, with passenger vehicles generating 25% of the total emissions. Travel by passenger car (VMT) increased by 6% between 2005 and 2018, while population increased by 19%; however, increased fuel efficiency resulted in 15% reduction in passenger vehicle emissions over the same time period. Commercial on-road transportation VMT scaled closely with employment between 2005 and 2018, with commercial VMT increasing by 35% and employment increasing by 40%. However, increased fuel efficiency resulted in only an 18% increase in commercial vehicle emissions.

Emissions from the disposal of solid waste increased slightly between 2005 and 2018 from 24,474 MT CO_2e in 2005 to 25,479 MT CO_2e, contributing to 12% of the total 2018 GHG emissions. While the total waste landfilled by Calexico decreased in this time period, as would be expected with increase recycling and recovery, the emissions were primarily influenced by the characteristics of the disposal landfill. Variance in the landfill gas capture rate at disposal facilities, or lack thereof, has caused emissions to fluctuate over time. This scope 3 emission source is largely out of the control of Calexico, however future efforts to increase landfill gas capture at waste disposal sites could significantly reduce this emission source.

Emissions from the water sector, which includes electricity from the treatment and distribution of potable water (scope 2), electricity from treatment and collection of wastewater (scope 2), and wastewater treatment process and fugitive emissions (scope 1 and 3), made up about 4% of the total emissions in 2018, decreasing by 14% from the 2005 sector emissions of 10,151 MT CO_2e. The water sector sources associated with electricity consumption generally decreased between 2005 and 2018 due to increased water efficiency and the decreased emissions associated with electricity generation. Wastewater process and fugitive emission increased over the same period, as these emissions generally scale with population.

State legislation will continue to help reduce future GHG emissions in Calexico with increasing renewable energy procurement though SB 100, reduced waste emissions through SB 1383, and reduced transportation emissions through advancing fuel efficiency and Low Carbon Fuel Standards. This positions Calexico to exceed their 2015 CAP goal for 2030 well ahead of target and to meet the more stringent state targets established since adoption of the 2015 CAP. State legislation has updated GHG emission reduction targets since the adoption of the Calexico 2015 CAP, with SB 32. Based on guidance of the CARB 2017 *Climate Change Scoping Plan,* under SB 32 jurisdictions will be required to reduce GHG emissions to 40% below 1990 levels by the year 2030, or 49% below 2005 levels.[6] As of 2018, Calexico was over halfway towards reaching the SB 32 target, with an overall 26% decrease in GHG emissions since 2005. The RCAP provides opportunity for Calexico to update its GHG reduction targets and establish policies that will help lock in the GHG reduction already attained in the energy sector and reduce the growing transportation sector emissions.

[6] California Air Resources Board (CARB). 2017. California's 2017 Climate Change Scoping Plan. https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf

4 City of Calipatria

The City of Calipatria (Calipatria) is one of the smallest incorporated cities of Imperial County (County), containing about 4% of the total County population (7,488 residents) and 3% of the total employment (1,906 jobs) in 2018. Since 2005, Calipatria has experienced almost no population growth, which is in contrast to the rest of Imperial Valley which had a population growth rate of 34% over the same 13-year period. The total jobs in Calipatria have decreased by nearly 15% over the same time period, which is also in contrast to the growth in jobs experienced by other areas of the County. Calipatria was impacted particularly hard by the 2008 financial crisis, losing 44% of its jobs in 2012, and as of 2018 has only regained about half of those lost.[7]

4.1 City of Calipatria GHG Emissions by Sector

Calipatria has reduced its total GHG emission by 55% between 2005 and 2018, from 85,603 MT CO_2e to 38,726 MT CO_2e. The total GHG emissions in Calipatria were dominated by energy consumption in 2005, making up 66% of total emissions. However, significant reductions in energy consumption in the non-residential sector by 2012, primarily driven due to the loss of jobs, resulted in a 51% decrease in emissions from 2005 to 2012. Between 2012 and 2018, energy emissions fell by another 42%, mainly influenced by increased renewable energy procurement by IID. The transportation sector was the second largest source of GHG emissions in Calipatria in 2005 and 2012, contributing 24,343 MT CO_2e in 2005 (28% of total emissions) and 20,162 MT CO_2e in 2012 (40% of total emissions). After a reduction in transportation emissions of 20% by 2018, transportation became the largest emission source in Calipatria, generating 19,590 MT CO_2e, or 51% of total emissions. The reductions in transportation emissions between 2005 and 2018 is a result of decreased commercial VMT and improved fuel efficiency. Waste and water sector emission sources have generated a similar magnitude of emissions each year, with waste emissions being only slightly larger than water sector in 2005 and 2018, and water only slightly more than waste in 2012. The inventory results by sector for Calipatria are provided in Figure 5. GHG emission results by sector are provided in

[7] Southern California Association of Governments (SCAG). 2019. Profile of the City of Calipatria. https://www.scag.ca.gov/Documents/Calipatria.pdf

Table 5, including total emissions by source for each inventory year and the percent change in emissions between 2005 and 2018 for each source.

Figure 5 City of Calipatria GHG Emissions by Sector

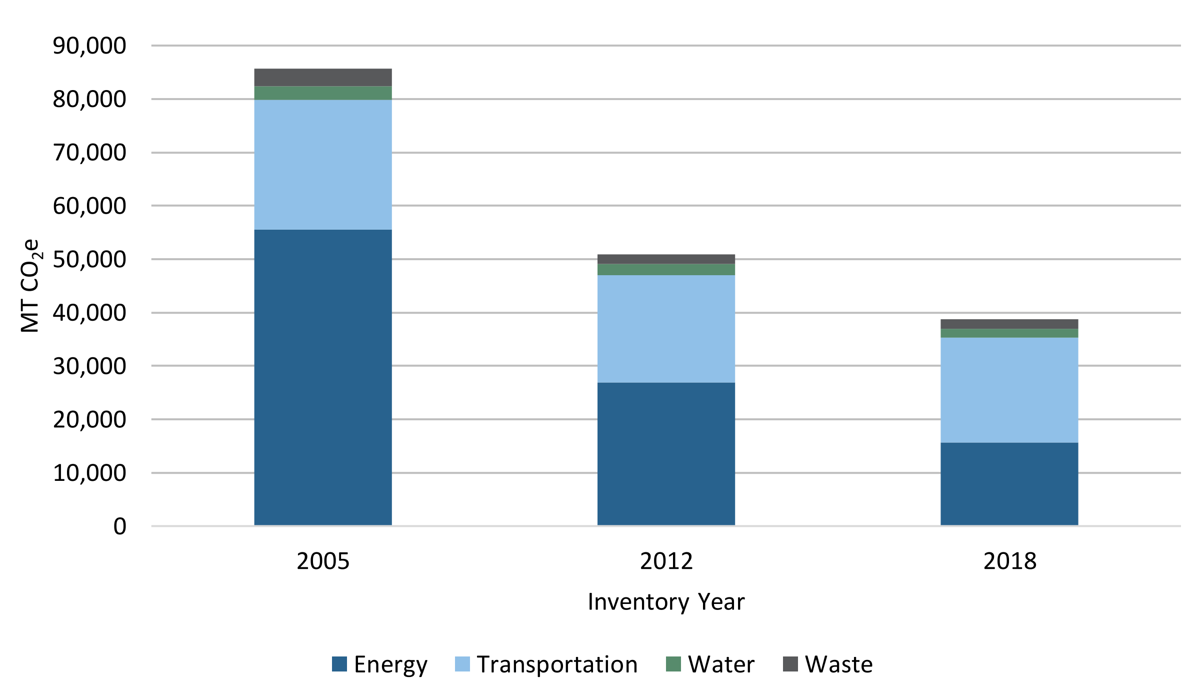

Table 5 City of Calipatria GHG Emissions by Sector

Emission Sector	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)	Percent Change (2005 – 2018)
Energy	**56,836**	**27,641**	**16,150**	**-72%**
Natural Gas	1,015	874	844	-17%
Residential Propane	22	31	38	74%
Non-residential Propane	505	284	428	-15%
Residential Electricity	13,909	10,703	4,628	-67%
Non-residential Electricity	36,727	13,521	8,963	-76%
Electricity T&D Losses	4,658	2,229	1,250	-73%
Transportation	**24,343**	**20,162**	**19,590**	**-20%**
Passenger On-road Vehicles	15,948	15,736	13,464	-16%
Commercial On-road Vehicles	5,859	3,207	4,075	-30%
Off-road Equipment	2,536	1,219	2,050	-19%
Water	**2,543**	**2,103**	**1,659**	**-35%**
Wastewater Process and Fugitive	1,238	1,308	1,227	-1%
Wastewater Collection and Treatment	728	576	329	-55%
Potable Water Consumption	577	219	103	-82%
Waste	**3,186**	**1,730**	**1,759**	**-45%**
Landfilled Waste Decomposition	3,142	1,700	1,739	-45%
Landfill Process Emissions	44	30	20	-55%
Total[1]	**85,603**	**50,840**	**38,726**	**-55%**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

Values may not add up due to rounding

1. Emissions from Wastewater Collection and Treatment and Potable Water Consumption are not added into the total emission for the jurisdiction and are provided here for informational purposes. The emissions from these sources are from the consumption of electricity and are therefore captured under Non-residential Electricity.

4.2 City of Calipatria GHG Emissions by Scope

The total GHG emissions in Calipatria were primarily generated by scope 2 emission sources in 2005, which consists of electricity consumption, and primary scope 1 sources in 2012 and 2018. Scope 1 emission sources include direct emissions from combustion of fossil fuels in vehicles and buildings and process and fugitive emissions from the Calipatria WWTP. The scope 2 emissions have decreased by 73% between 2005 and 2018, becoming the second largest source of GHG emissions in 2012, continuing into 2018 (35% of total 2018 emissions). Scope 1 emissions were the second largest sources of emissions in 2005 and 2012, becoming the largest source in 2018 (57% of total 2018 emissions). This is mostly a result of the decreasing scope two emissions, as compared to the 19% reduction in scope 1 emissions between 2005 and 2018. Scope 3 emission decreased by 61% between 2005 and 2018. Scope 3 emissions contribute the least to the total emissions (8% of total 2018 emissions), compared to scope 1 and 2 emission sources. The inventory results by scope for Calipatria are provided in Figure 6, with the total emissions by scope and the percent change between 2005 and 2018 provided in Table 6.

Figure 6 City of Calipatria GHG Emissions by Scope

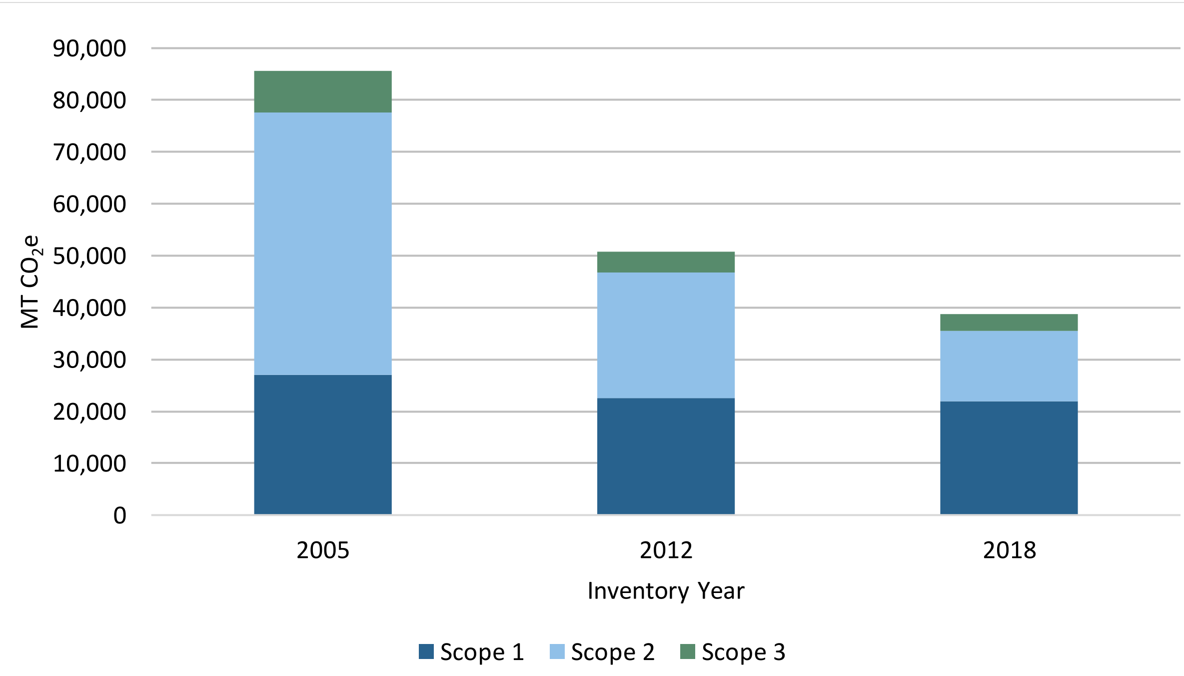

Table 6 City of Calipatria GHG Emissions by Scope

Emissions Scope	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)	Percent Change (2005 – 2018)
Scope 1	26,976	22,504	21,980	-19%
Scope 2	50,636	24,223	13,590	-73%
Scope 3	7,991	4,113	3,155	-61%
Total	**85,603**	**50,840**	**38,726**	**-55%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

4.3 City of Calipatria GHG Emission Summary

The total GHG emission of the City of Calipatria have decreased by 55%, from 85,603 MT CO_2e in 2005 to 38,726 MT CO_2e in 2018, with emissions being reduced in all sectors and scopes. The primary driver of these emission reductions is from the energy sector, specifically emissions from electricity consumption (scope 2), which was a result from a mix of state legislation and significant reduction in non-residential consumption (a 76% reduction in non-residential consumption). A large portion of the emissions reduction in this category comes from the increased renewable energy procurement by IID, effectively reducing the GHGs emitted per unit of energy in half between 2005 and 2018. Additionally, reductions in the energy consumption per resident have resulted in a net decrease in residential energy consumption. This increased efficiency reflects the adoption of updated building codes that require increased energy efficiency and potential participation in statewide and regional energy efficiency programs.

Transportation (scope 1) emissions contributed to 51% of the total emissions in 2018, with passenger vehicles generating 35% of the total emissions. Travel by passenger car (VMT) increased by 5% between 2005 and 2018; however, increased fuel efficiency resulted in 16% reduction in passenger vehicle emissions over the same time period. Commercial on-road transportation VMT scaled with employment between 2005 and 2018, with commercial VMT decreasing by 22% and total commercial transportation emissions decreasing by 30%.

Emissions from the disposal of solid waste decreased by 45% between 2005 and 2018, contributing to 5% of the total 2018 GHG emissions. While waste landfilled by Calipatria decreased in this time period, as would be expected with increase recycling and recovery, the emissions were primarily influenced by the disposal landfill. Variance in the landfill gas capture rate at disposal facilities, or lack thereof, has caused emissions to fluctuate over time. This scope 3 emission source is largely out of the control of Calipatria, however future efforts to increase landfill gas capture at waste disposal sites could significantly reduce this emission source.

Emissions from the water sector, which includes electricity from the treatment and distribution of potable water (scope 2), electricity from treatment and collection of wastewater (scope 2), and wastewater treatment process and fugitive emissions (scope 1 and 3), made up about 4% of the total emissions in 2018, decreasing by 35% from the 2005 sector emissions of 2,543 MT CO_2e. The water sector sources associated with electricity consumption generally decreased between 2005 and 2018 due to increased water efficiency and the decreased emissions associated with electricity generation. Wastewater process and fugitive emission remained about constant over the same period, as these emissions generally scale with population.

The GHG emission reductions experienced in Calipatria since 2005 is in exceedance of the GHG targets established by state legislation under Assembly Bill (AB) 32 and SB 32. AB 32 established a short-term target of reducing statewide GHG emissions to 1990 levels by 2020, or 15% below 2005 GHG emission levels, and a long-term target of 80% reduction below 1990 GHG emission levels by 2050. Calipatria had exceeded the AB 32 target for 2020 by 2012, and as of 2018 continues to make considerable progress towards reaching the long-term emission reduction target. Additionally, Calipatria has exceeded the more aggressive GHG reduction targets established by SB 32. Based on guidance of the CARB 2017 *Climate Change Scoping Plan,* under SB 32 jurisdictions will be required to reduce GHG emissions to 40% below 1990 levels by the year 2030, or 49% below 2005 levels.[8]

[8] California Air Resources Board (CARB). 2017. California's 2017 Climate Change Scoping Plan. https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf

The current progress in exceeding both the 2020 and 2030 targets set by state legislation place Calipatria in great position for the deep decarbonization that will be needed to reach the more aggressive, long term GHG emission reduction targets.

The development of the current RCAP will present opportunity for Calipatria to set aggressive emission reduction targets and, as growth continues, establish policies that will maintain the emission reductions experienced thus far. State legislation will help reduce future GHG emissions in Calipatria with increasing renewable energy procurement though SB 100, reduced waste emissions through SB 1383, and reduced transportation emissions through advancing fuel efficiency and Low Carbon Fuel Standards. However, the development of measures that improve energy efficiency in new development, reduce reliance on fossil fuels, and reduce VMT from passenger cars will be essential to maintaining the current position in emissions reduction and meeting the long-term state targets.

5 City of El Centro

The City of El Centro (El Centro) is the largest incorporated city of Imperial County (County), containing about 24% of the total County population (46,315 residents) and 34% of the total employment (25,901 jobs) in 2018. Since 2005, El Centro has gained about 7,000 residents, at a growth rate of about 18%, which is near the population growth rate of 22% for the entire Imperial Valley. The total jobs in El Centro have grown at a much more rapid rate, increasing by 47% between 2005 and 2018. This employment growth represents 43% percent of the total Imperial Valley employment growth since 2005. The financial crisis of 2008 had resulted in a loss of jobs in El Centro into 2011; however, between 2012 and 2015, El Centro experienced steep growth, gaining nearly 8,000 new jobs.[9]

5.1 City of El Centro GHG Emissions by Sector

The City of El Centro has reduced its total GHG emission by 34% between 2005 and 2018, from 474,715 MT CO_2e to 315,556 MT CO_2e. The total GHG emissions in El Centro were dominated by energy consumption in 2005, 2012 and 2018, making up 61%, 58 % and 45% of total emissions, respectively. Significant reductions in energy consumption, as well as increased renewable energy procurement by the energy provider, IID, resulted in a 51% decrease in energy sector emissions from 2005 to 2018. The transportation sector was the second largest source of GHG emissions in El Centro in each inventory year, contributing 122,627 MT CO_2e in 2005 (26% of total emissions), 125,495 MT CO_2e in 2012 (32% of total emissions), and 135,090 MT CO_2e in 2018 (43% of total emissions). This 10% increase in transportation emissions between 2005 and 2018 can be mainly attributed to the increase of emissions in commercial on-road transportation and off-road equipment. On-road passenger vehicle emissions had only a slight increase from 2005 to 2012, with an effective overall decrease to below 2005 levels in 2018. Waste has been the third largest emissions sources in El Centro each year, generating 54,623 MT CO_2e in 2005 (12% of total emissions), 32,313 MT CO_2e in 2012 (8% of total emissions), and 31,450 MT CO_2e in 2018 (10% of total emissions). The water sector has remained the smallest source of emissions each year, with emissions from this sector being largely comprised of wastewater process and fugitive emissions. The inventory results by sector for El Centro are provided in Figure 7. GHG emission results by sector are provided in Table 7, including total emissions by source for each inventory year and the percent change in emissions between 2005 and 2018 for each source.

[9] Southern California Association of Governments (SCAG). 2019. Profile of the City of El Centro. https://www.scag.ca.gov/Documents/ElCentro.pdf

Figure 7 City of El Centro GHG Emissions by Sector

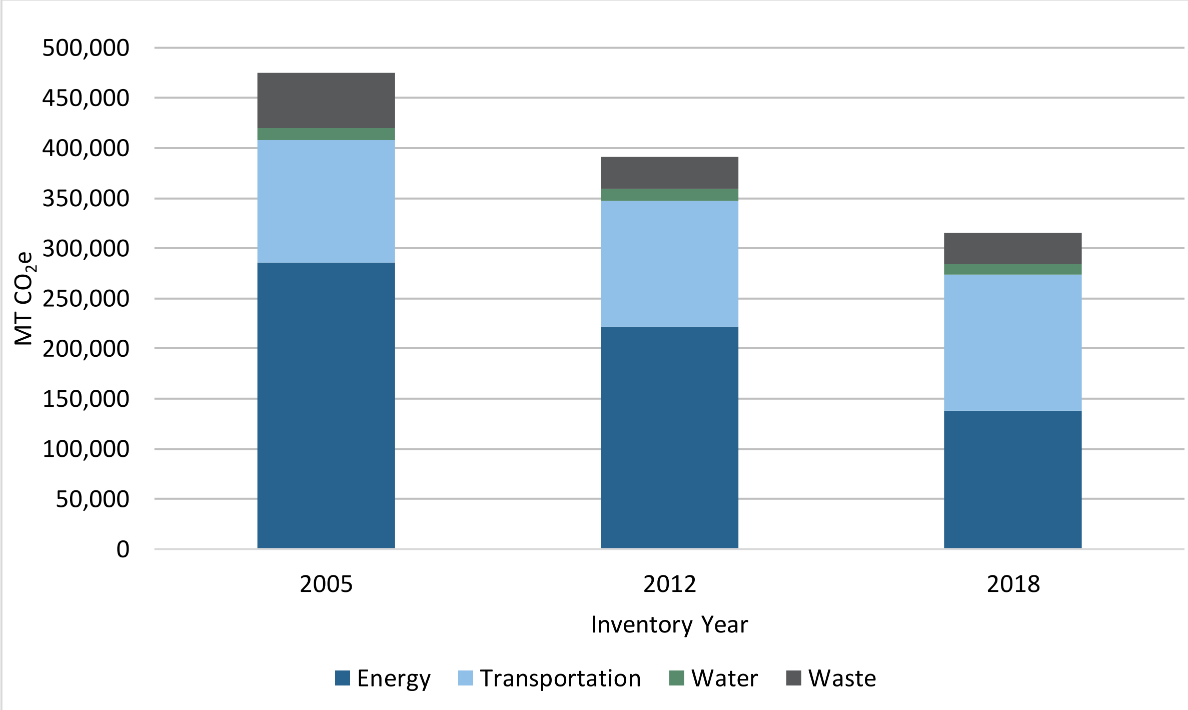

Table 7 City of El Centro GHG Emissions by Sector

Emission Sector	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)	Percent Change (2005 – 2018)
Energy	**291,031**	**226,324**	**141,428**	**-51%**
Natural Gas	21,310	18,853	19,161	-10%
Residential Propane	271	404	503	85%
Non-residential Propane	4,064	4,586	5,968	47%
Residential Electricity	90,456	72,520	35,158	-61%
Non-residential Electricity	152,571	112,901	70,881	-54%
Electricity T&D Losses	22,359	17,059	9,756	-56%
Transportation	**122,627**	**125,495**	**135,090**	**10%**
Passenger On-road Vehicles	78,631	81,156	76,697	-2%
Commercial On-road Vehicles	23,595	25,960	30,646	30%
Off-road Equipment	20,401	18,379	27,747	36%
Water	**11,876**	**11,286**	**10,621**	**-11%**
Wastewater Process and Fugitive	6,435	7,110	7,589	18%
Wastewater Collection and Treatment	3,288	2,723	2,201	-33%
Potable Water Consumption	2,153	1,453	832	-61%
Waste	**54,623**	**32,313**	**31,450**	**-42%**
Landfilled Waste Decomposition	53,873	31,761	31,095	-42%
Landfill Process Emissions	750	552	355	-53%
Total[1]	**474,715**	**391,242**	**315,556**	**-34%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

Values may not add up due to rounding

1. Emissions from Wastewater Collection and Treatment and Potable Water Consumption are not added into the total emission for the jurisdiction and are provided here for informational purposes. The emissions from these sources are from the consumption of electricity and are therefore captured under Non-residential Electricity.

5.2 City of El Centro GHG Emissions by Scope

The total GHG emissions in El Centro primarily result from scope 2 emission sources in 2005 and 2012, which consists of electricity consumption, and primarily from scope 1 sources in 2018. Scope 1 emission sources include direct emissions from combustion of fossil fuels in vehicles and buildings and process and fugitive emissions from the El Centro Municipal Wastewater Treatment Plant. The scope 2 emissions have decreased by 56% between 2005 and 2018, becoming the second largest source of GHG emissions in 2018 (34% of total 2018 emissions). Scope 1 emissions were the second largest sources of emissions in 2005 and 2012, becoming the largest source in 2018 (53% of total 2018 emissions). This is mostly a result of the decreasing scope 2 emissions, as compared to the 9% increase in scope 1 emissions between 2005 and 2018. Scope 3 emission decreased by 46% between 2005 and 2018. Scope 3 emissions contribute the least to the total emissions (13% of total 2018 emissions), compared to scope 1 and 2 emission sources. The inventory results by scope for El Centro are provided in Figure 8, with the total emissions by scope and the percent change between 2005 and 2018 provided in Table 8.

Figure 8 City of El Centro GHG Emissions by Scope

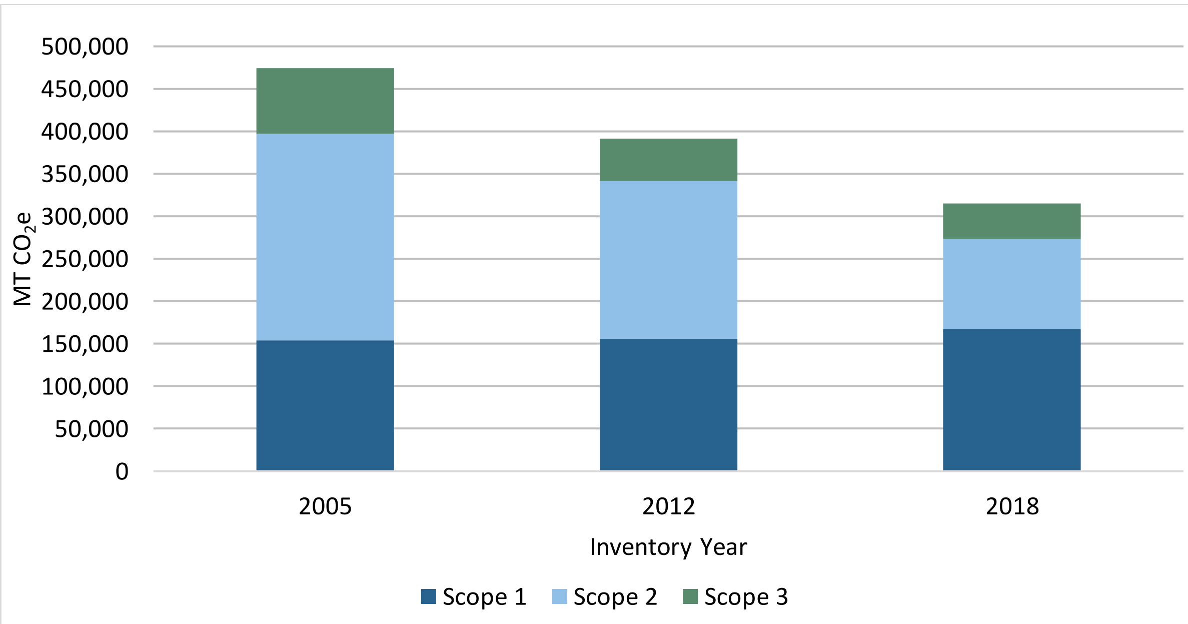

Table 8 City of El Centro GHG Emissions by Scope

Emissions Scope	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)	Percent Change (2005 – 2018)
Scope 1	153,945	155,606	167,413	9%
Scope 2	243,027	185,421	106,039	-56%
Scope 3	77,744	50,214	42,105	-46%
Total	**474,715**	**391,242**	**315,556**	**-34%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

5.3 City of El Centro GHG Emission Summary

The total GHG emission of the City of El Centro have decreased by 34%, from 474,715 MT CO_2e in 2005 to 315,556 MT CO_2e in 2018, with emissions being reduced in all sectors and scopes except for in the transportation sector and scope 1 sources. The primary driver of these emission reductions is from the energy sector, specifically emissions from electricity consumption (scope 2), which was a result of increased renewable energy procurement by IID, effectively reducing the GHGs per unit of energy in half between 2005 and 2018. Additionally, reductions in the energy consumption per resident have resulted in a net decrease in residential energy consumption. This increased efficiency reflects the adoption of updated building codes that require increased energy efficiency and potential participation in statewide and regional energy efficiency programs.

Transportation (scope 1) emissions contributed to 43% of the total emissions in 2018, with passenger vehicles generating 24% of the total transportation emissions. Travel by passenger car (VMT) increased by 22% between 2005 and 2018; however, increased fuel efficiency resulted in 2% decrease in passenger vehicle emissions over the same time period. Commercial on-road transportation VMT scaled with employment between 2005 and 2018, with commercial VMT increasing by 45% and total commercial transportation emissions increasing by 30%.

Emissions from the disposal of solid waste decreased by 42% between 2005 and 2018, contributing to 10% of the total 2018 GHG emissions. Even with steady population and steep job growth, the success of recycling and source reduction programs is shown, with a 53% decrease in solid waste sent to landfills between 2005 and 2018. One factor impacting the GHG reductions in the waste sector is variance in the landfill gas capture rate at disposal facilities, or lack thereof. This scope 3 emission source is largely out of the control of El Centro, however future efforts to increase landfill gas capture at waste disposal sites and increase waste diversion could further reduce this emission source.

Emissions from the water sector, which includes electricity from the treatment and distribution of potable water (scope 2), electricity from treatment and collection of wastewater (scope 2), and wastewater treatment process and fugitive emissions (scope 1 and 3), made up about 3% of the total emissions in 2018, decreasing by 11% from the 2005 sector emissions of 11,876 MT CO_2e. The water sector sources associated with electricity consumption generally decreased between 2005 and 2018 due to increased water efficiency and the decreased emissions associated with electricity generation. Wastewater process and fugitive emission increased by 18% over the same period, as these emissions generally scale with population.

The City of El Centro has reached the state's GHG reduction targets for 2020 set by AB 32; however, a gap remains for reaching the 2030 targets set by SB 32. AB 32 established a short-term target of reducing statewide GHG emissions to 1990 levels by 2020, or 15% below 2005 GHG emission levels, and a long-term target of 80% reduction below 1990 GHG emission levels by 2050. El Centro had reached the AB 32 target for 2020 by 2012 and is in good position to reach the 2030 targets established by SB 32 well ahead of time. Based on guidance of the CARB 2017 *Climate Change Scoping Plan,* under SB 32 jurisdictions will be required to reduce GHG emissions to 40% below 1990 levels by the year 2030, or 49% below 2005 levels.[10]

[10] California Air Resources Board (CARB). 2017. California's 2017 Climate Change Scoping Plan. https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf

The development of the current RCAP will present opportunity for El Centro to establish emission reduction targets consistent AB 32 and SB 32, and, as growth continues, establish policies that will maintain the emission reductions experienced thus far. State legislation will help reduce future GHG emissions in El Centro with increasing renewable energy procurement though SB 100, reduced waste emissions through SB 1383, and reduced transportation emissions through advancing fuel efficiency and Low Carbon Fuel Standards. El Centro will need to work to reduce scope 1 emission sources, the only GHG sources that have been increasing over time, by decarbonizing new and existing buildings and reducing VMT from passenger vehicles.

6 City of Holtville

The City of Holtville (Holtville) is the second smallest incorporated city of Imperial County (County), containing about 3% of the total County population (6,501 residents) and 3% of the total employment (1,978 jobs) in 2018. Between 2005 and 2018, Holtville has experienced a population growth rate of about 20%. The total jobs in Holtville have grown at a much more rapid rate, increasing by 65% between 2005 and 2018. The financial crisis of 2008 had resulted in a loss of jobs in Holtville; with jobs reaching a low of 1,041 in 2012, However, between 2012 and 2016, the number of jobs nearly doubled to 1,972.[11]

6.1 City of Holtville GHG Emissions by Sector

The City of Holtville has reduced its total GHG emission by 39% between 2005 and 2018, from 74,470 MT CO_2e to 45,614 MT CO_2e. Energy sector emissions were the largest source in 2005, 2012 and 2018, making up 65%, 60% and 50% of total emissions, respectively. A relatively constant level of energy consumption, as well as increased renewable energy procurement by the energy provider, IID, resulted in a 52% decrease in energy sector emissions from 2005 to 2018. The transportation sector was the second largest source of GHG emissions in Holtville in each inventory year, contributing 19,925MT CO_2e in 2005 (27% of total emissions), 19,278 MT CO_2e in 2012 (33% of total emissions), and 19,015 MT CO_2e in 2018 (42% of total emissions). This 5% decrease in transportation emissions between 2005 and 2018 can be mainly attributed to the reduction in on-road passenger vehicle emissions, which generated 11,202 MT CO_2e in 2018, down 14% from 2005 emissions. Commercial vehicle emissions stayed relatively constant between 2005 and 2018, with a slight dip in emissions in 2012, while off-road transportation increased with jobs and population, making up only 5% of total emissions in 2018. Waste has been the third largest emissions source in Holtville each year, generating 5,523 MT CO_2e in 2005 (7% of total emissions), 2,988 MT CO_2e in 2012 (5% of total emissions), and 2,667 MT CO_2e in 2018 (6% of total emissions). The water sector has remained the smallest source of emissions each year making up only 3% of total emissions in 2018, with emissions from this sector being largely comprised of wastewater process and fugitive emissions. The inventory results by sector for Holtville are provided in Figure 9. GHG emission results by sector are provided in Table 9, including total emissions by source for each inventory year and the percent change in emissions between 2005 and 2018 for each source.

[11] Southern California Association of Governments (SCAG). 2019. Profile of the City of Holtville. https://www.scag.ca.gov/Documents/Holtville.pdf

Figure 9 City of Holtville GHG Emissions by Sector

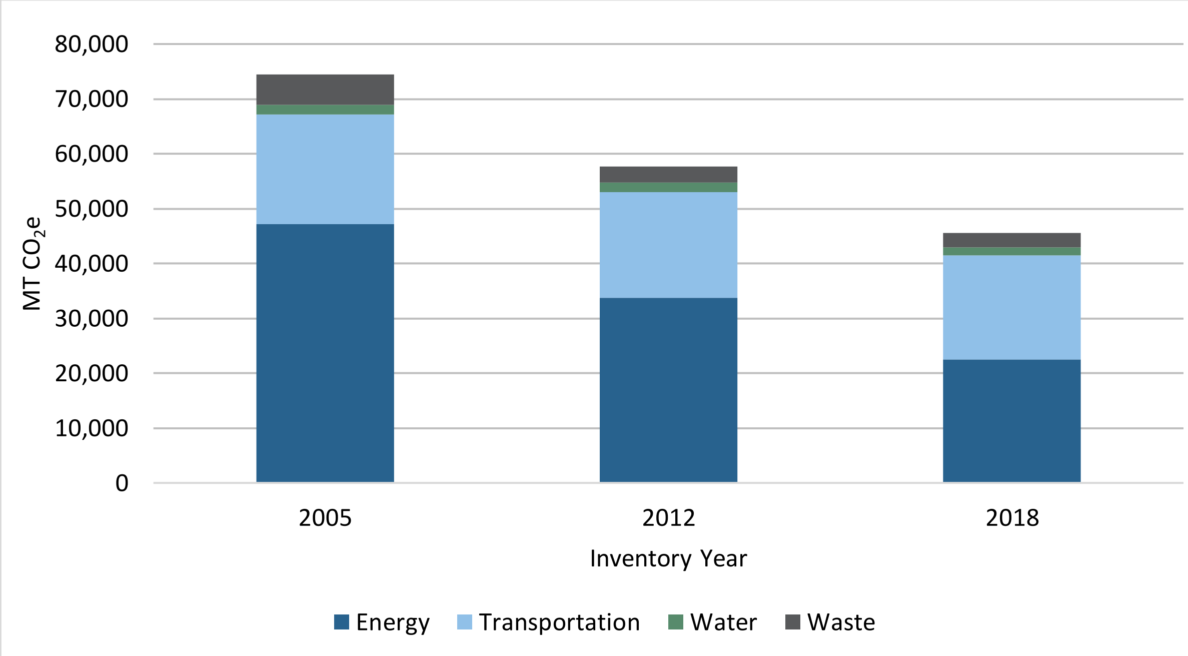

Table 9 City of Holtville GHG Emissions by Sector

Emission Sector	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)	Percent Change (2005 – 2018)
Energy	**48,136**	**34,478**	**22,948**	**-52%**
Natural Gas	1,248	1,138	1,200	-4%
Residential Propane	36	55	69	95%
Non-residential Electricity	271	235	448	65%
Residential Propane	22,927	19,062	9,270	-60%
Non-residential Electricity	19,729	11,204	10,173	-48%
Electricity T&D Losses	3,924	2,784	1,789	-54%
Transportation	**19,925**	**19,278**	**19,015**	**-5%**
Passenger On-road Vehicles	13,029	13,612	11,202	-14%
Commercial On-road Vehicles	5,458	4,609	5,634	3%
Off-road Equipment	1,438	1,057	2,179	52%
Water	**1,840**	**1,692**	**1,407**	**-24%**
Wastewater Process and Fugitive	886	991	983	11%
Wastewater Collection and Treatment	555	465	304	-45%
Potable Water Consumption	398	236	119	-70%
Waste	**5,523**	**2,988**	**2,667**	**-52%**
Landfilled Waste Decomposition	5,448	2,937	2,637	-52%
Landfill Process Emissions	76	51	30	-60%
Total[1]	**74,470**	**57,736**	**45,614**	**-39%**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

Values may not add up due to rounding

1. Emissions from Wastewater Collection and Treatment and Potable Water Consumption are not added into the total emission for the jurisdiction and are provided here for informational purposes. The emissions from these sources are from the consumption of electricity and are therefore captured under Non-residential Electricity.

6.2 City of Holtville GHG Emissions by Scope

The total GHG emissions in Holtville primarily result from scope 2 emission sources in 2005 and 2012, which consists of electricity consumption, with an equal contribution from both scope 1 and scope 2 sources in 2018. Scope 1 emission sources include direct emissions from combustion of fossil fuels in vehicles and buildings and process and fugitive emissions from the City of Holtville Municipal Wastewater Treatment Plant. The scope 2 emissions have decreased by 54% between 2005 and 2018. Scope 1 emissions were the second largest sources of emissions in 2005 and 2012; however as mentioned previously, they became equivalent to scope 2 emissions in 2018, contributing 47% of total emissions. This is mostly a result of the steadily decreasing scope 2 emissions. Scope 3 emission decreased by 54% between 2005 and 2018. Scope 3 emissions contribute the least to the total emissions (10% of total 2018 emissions), compared to scope 1 and 2 emission sources. The inventory results by scope for Holtville are provided in Figure 10, with the total emissions by scope and the percent change between 2005 and 2018 provided in Table 10.

Figure 10 City of Holtville GHG Emissions by Scope

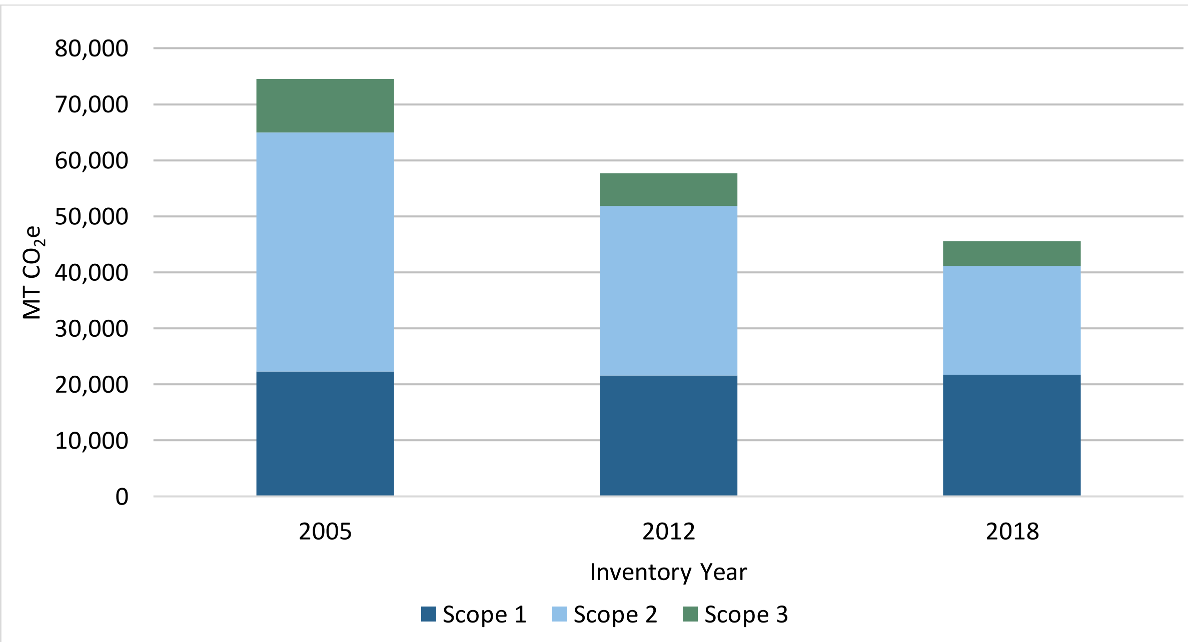

Table 10 City of Holtville GHG Emissions by Scope

Emissions Scope	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)	Percent Change (2005 – 2018)
Scope 1	22,260	21,580	21,677	-3%
Scope 2	42,657	30,266	19,443	-54%
Scope 3	9,553	5,890	4,494	-53%
Total	**74,470**	**57,736**	**45,614**	**-39%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

6.3 City of Holtville GHG Emission Summary

The total GHG emission of the City of Holtville have decreased by 39%, from 74,470 MT CO_2e in 2005 to 45,614 MT CO_2e in 2018, with emissions being reduced in all sectors and scopes sources. The primary driver of these emission reductions is from the energy sector, specifically emissions from electricity consumption (scope 2), which was a result of increased renewable energy procurement by IID, effectively reducing the GHGs per unit of energy in half between 2005 and 2018. Additionally, reductions in the energy consumption per resident and per job have resulted nearly constant overall energy consumption, even as Holtville has experienced job and population growth. This increased efficiency reflects the adoption of updated building codes that require increased energy efficiency and potential participation in statewide and regional energy efficiency programs.

Transportation (scope 1) emissions contributed to 42% of the total emissions in 2018 (19,925 MT CO_2e), with passenger vehicles generating 25% of the total emissions (11,202 MT CO_2e). Travel by passenger car (VMT) increased by 7% between 2005 and 2018; however, increased fuel efficiency resulted in 14% decrease in passenger vehicle emissions over the same time period. Commercial on-road transportation VMT increased with employment between 2005 and 2018 , with commercial VMT increasing by 15% and total commercial transportation emissions only slightly increasing, again attributed to increased fuel efficiency.

Emissions from the disposal of solid waste decreased by 52% between 2005 and 2018, contributing to 6% of the total 2018 GHG emissions. Even with steady population and steep job growth, the success of recycling and source reduction programs is shown, with a 60% decrease in solid waste sent to landfills between 2005 and 2018. One factor impacting the GHG reductions in the waste sector is variance in the landfill gas capture rate at disposal facilities, or lack thereof. This scope 3 emission source is largely out of the control of Holtville, however future efforts to increase landfill gas capture at waste disposal sites and increase waste diversion could further reduce this emission source.

Emissions from the water sector , which includes electricity from the treatment and distribution of potable water (scope 2), electricity from treatment and collection of wastewater (scope 2), and wastewater treatment process and fugitive emissions (scope 1 and 3), made up about 3% of the total emissions in 2018, decreasing by 24% from the 2005 sector emissions of 1,840 MT CO_2e. The water sector sources associated with electricity consumption generally decreased between 2005 and 2018 due to increased water efficiency and the decreased emissions associated with electricity generation. Wastewater process and fugitive emission increased by 11% over the same period, as these emissions generally scale with population.

The City of Holtville has reached the state's GHG reduction targets for 2020 set by AB 32; however, a gap remains for reaching the 2030 targets set by SB 32. AB 32 established a short-term target of reducing statewide GHG emissions to 1990 levels by 2020, or 15% below 2005 GHG emission levels, and a long-term target of 80% reduction below 1990 GHG emission levels by 2050. Holtville had reached the AB 32 target for 2020 by 2012 and is in good position to reach the 2030 targets established by SB 32 well ahead of time. Based on guidance of the CARB 2017 *Climate Change*

Scoping Plan, under SB 32 jurisdictions will be required to reduce GHG emissions to 40% below 1990 levels by the year 2030, or 49% below 2005 levels.[12]

The development of the current RCAP will present opportunity for Holtville to establish emission reduction targets consistent AB 32 and SB 32, and, as growth continues, establish policies that will maintain the emission reductions experienced thus far. State legislation will help reduce future GHG emissions in Holtville with increased renewable energy procurement though SB 100, reduced waste emissions through SB 1383, and reduced transportation emissions through advancing fuel efficiency and Low Carbon Fuel Standards. However, to reach the targets established by SB 32, It is imperative that new and existing buildings are decarbonized as growth in Holtville continues. Additionally, ensuring development is focused towards VMT reduction through infill and more dense zoning will allow reduction in scope 1 transportation emissions.

[12] California Air Resources Board (CARB). 2017. California's 2017 Climate Change Scoping Plan. https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf

7 City of Imperial

The City of Imperial (Imperial) is an incorporated city of Imperial County (County), containing about 10% of the total County population (19,372 residents) and 7% of the total employment (5,171 jobs) in 2018. Of the eight jurisdictions profiled in this analysis, Imperial lies in the middle for population and employment. Between 2005 and 2018, Imperial has experienced massive population growth, at a rate of rate of about 88%. The total jobs in Imperial have grown similarly, increasing by 94% between 2005 and 2018. These growth rates are much larger than those experienced in any other jurisdiction in Imperial Valley and, with 26% of the total Imperial Valley population growth since 2005 occurring in Imperial. While the financial crisis of 2008 had resulted in a loss of jobs in Imperial; the large losses seen in other incorporated cities was not experienced. With job growth being slightly negative until 2011, number of jobs grew rapidly with each year from 2012 onward.[13]

7.1 City of Imperial GHG Emissions by Sector

The City of Imperial has increased its total GHG emission by 1% between 2005 and 2018, from 110,187 MT CO_2e to 111,231 MT CO_2e, with emissions increasing slightly to 116,676 MT in the interim 2012 inventory year. Energy sector emissions were the largest source in 2005, 2012 and 2018, making up 62%, 56% and 45% of total emissions, respectively. Increased renewable energy procurement by the energy provider, IID, contributed to the 26% decrease in energy sector emissions from 2005 to 2018. The transportation sector was the second largest source of GHG emissions in Imperial in each inventory year, contributing 29,950 MT CO_2e in 2005 (27% of total emissions), 39,199 MT CO_2e in 2012 (34% of total emissions), and 44,370 MT CO_2e in 2018 (40% of total emissions). This 48% increase in transportation emissions between 2005 and 2018 is a result of increases in all transportation activities due to the high rates of population and job growth experienced during this time period. Passenger vehicle emissions increased by 41%, commercial vehicle emissions increased by 51%, and off-road equipment emissions increased by 83% between 2005 and 2018. Waste has been the third largest emissions source in Imperial each year, generating 10,464 MT CO_2e in 2005 (10% of total emissions), 9,196 MT CO_2e in 2012 (8% of total emissions), and 13,295 MT CO_2e in 2018 (12% of total emissions). The water sector has remained the smallest source of emissions each year making up only 4% of total emissions in 2018, with emissions from this sector being primarily from wastewater process and fugitive emissions. However, water and wastewater emissions have increased by 29% and 27% in 2012 and 2018, respectively, due to population growth. The inventory results by sector for Imperial are provided in Figure 11. GHG emission results by sector are provided in Table 11, including total emissions by source for each inventory year and the percent change in emissions between 2005 and 2018 for each source.

[13] Southern California Association of Governments (SCAG). 2019. Profile of the City of Imperial. https://www.scag.ca.gov/Documents/Imperial.pdf

Figure 11 City of Imperial GHG Emissions by Sector

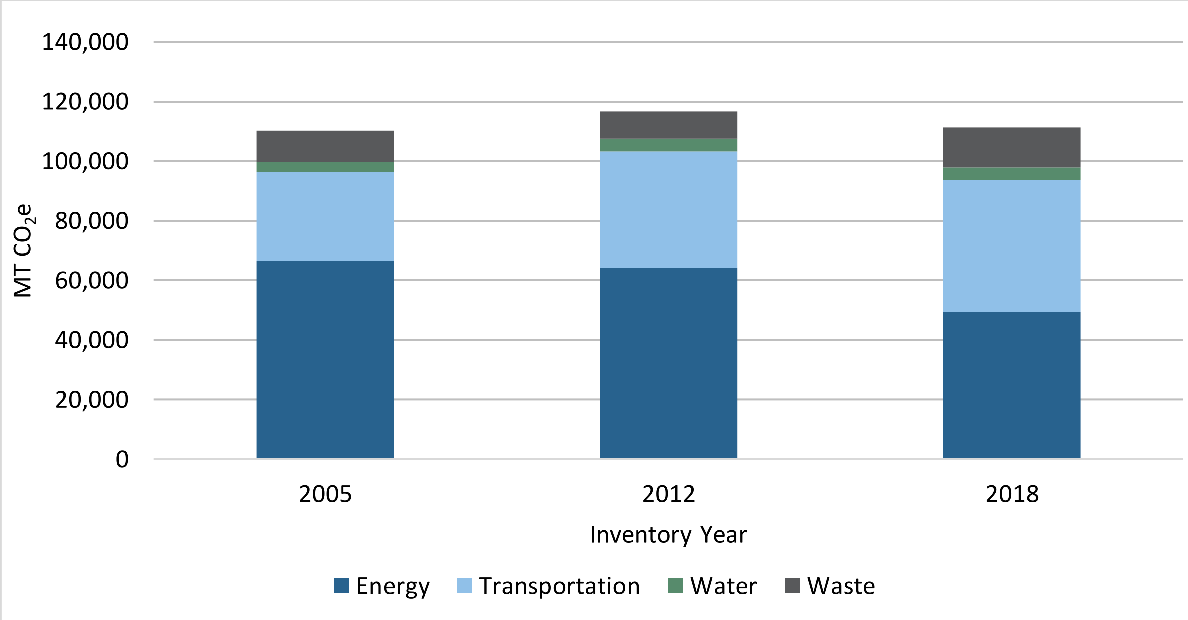

Table 11 City of Imperial GHG Emissions by Sector

Emission Sector	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)	Percent Change (2005 – 2018)
Energy	**68,087**	**65,765**	**50,392**	**-26%**
Natural Gas	3,919	4,715	5,487	40%
Residential Propane	70	139	204	192%
Non-residential Propane	618	778	1,201	94%
Residential Electricity	29,133	31,142	19,912	-32%
Non-residential Electricity	28,999	23,926	19,923	-31%
Electricity T&D Losses	5,348	5,066	3,665	-31%
Transportation	**29,950**	**39,199**	**44,370**	**48%**
Passenger On-road Vehicles	18,302	25,509	25,727	41%
Commercial On-road Vehicles	8,424	10,334	12,745	51%
Off-road Equipment	3,224	3,356	5,897	83%
Water	**3,417**	**4,195**	**4,394**	**29%**
Wastewater Process and Fugitive	1,686	2,516	3,174	88%
Wastewater Collection and Treatment	1,052	1,176	904	-14%
Potable Water Consumption	679	503	317	-53%
Waste	**10,464**	**9,196**	**13,295**	**27%**
Landfilled Waste Decomposition	10,320	9,039	13,145	27%
Landfill Process Emissions	144	157	150	5%
Total[1]	**110,187**	**116,676**	**111,231**	**1%**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

Values may not add up due to rounding

1. Emissions from Wastewater Collection and Treatment and Potable Water Consumption are not added into the total emission for the jurisdiction and are provided here for informational purposes. The emissions from these sources are from the consumption of electricity and are therefore captured under Non-residential Electricity.

7.2 City of Imperial GHG Emissions by Scope

The total GHG emissions in Imperial primarily result from scope 2 emission sources in 2005 and 2012, which consists of electricity consumption, with scope 1 emission sources becoming the largest contributor to total emissions in 2018. Scope 1 emission sources include direct emissions from combustion of fossil fuels in vehicles and buildings and process and fugitive emissions from the City of Imperial Water Pollution Control Plant. The scope 2 emissions have decreased by 29% between 2005 and 2018. Scope 1 emissions were the second largest sources of emissions in 2005 and 2012; becoming the largest in 2018, contributing 47% of total emissions in 2018. This is a result of both the steadily decreasing scope two emissions and steadily increasing scope 1 emissions. Scope 3 emission increased by 8% between 2005 and 2018. Scope 3 emissions contribute the least to the total emissions (16% of total 2018 emissions), compared to scope 1 and 2 emission sources. The inventory results by scope for Imperial are provided in Figure 12, with the total emissions by scope and the percent change between 2005 and 2018 provided in Table 12.

Figure 12 City of Imperial GHG Emissions by Scope

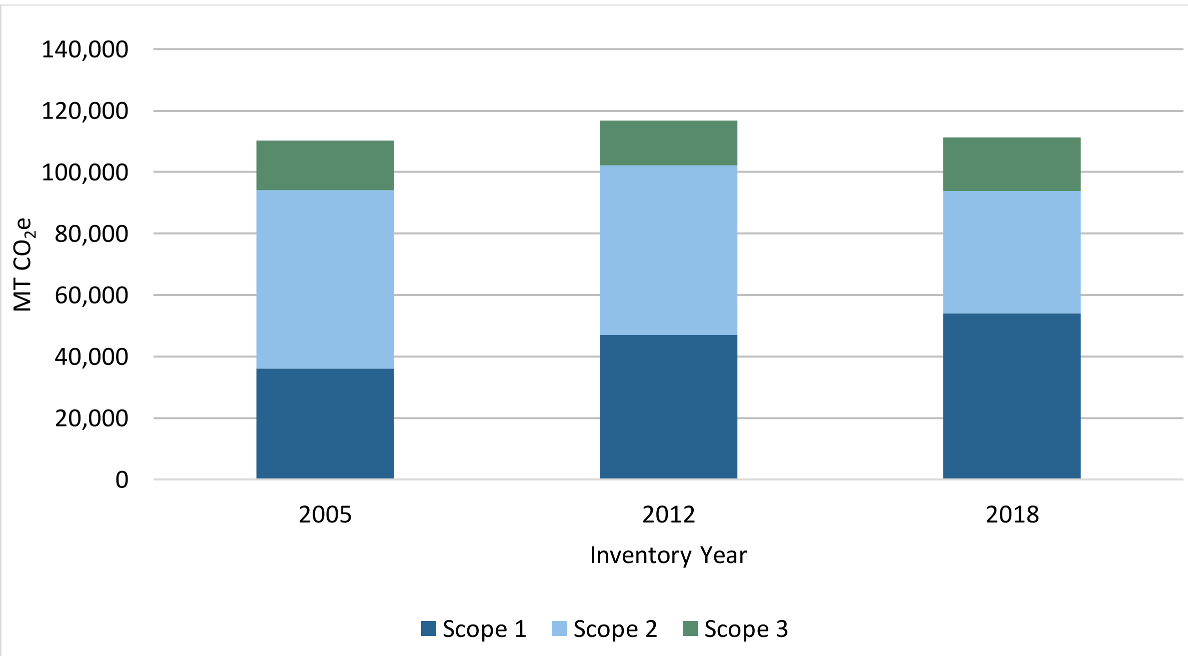

Table 12 City of Imperial GHG Emissions by Scope

Emissions Scope	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)	Percent Change (2005 – 2018)
Scope 1	36,043	47,048	52,655	46%
Scope 2	58,132	55,068	41,240	-29%
Scope 3	16,012	14,561	17,336	8%
Total	**110,187**	**116,676**	**111,231**	**1%**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

7.3 City of Imperial GHG Emission Summary

The total GHG emission of the City of Imperial have decreased by 1%, from 1110,187 MT CO_2e in 2005 to 111,231 MT CO_2e in 2018, with emissions associated with electricity consumption decreasing overall, and all other emission sources having a net increase. Imperial is the only jurisdiction in Imperial Valley that did not experience a significant decrease in GHG emissions since 2005, with all other jurisdiction reducing GHG emissions by at least 20%. This is a result of the massive population and job growth experienced in Imperial as compared to the rest of the County. The population and job growth rates of Imperial, between 2005 and 2018, were 88% and 94%, respectively, whereas the overall Imperial Valley growth rates of population and jobs during the same time period were 22% and 35% respectively.

The primary driver of the slight emission reductions is from the energy sector, specifically emissions from electricity consumption (scope 2), which was a result of increased renewable energy procurement by IID, effectively reducing the GHGs per unit of energy in half between 2005 and 2018. This reduction in the carbon intensity of electricity offset the increase in total energy consumption since 2005, with an estimated 40% increase in overall natural gas consumption, 190% increase in propane consumption, and 50% overall increase in electricity consumption. Electricity consumption, including electricity consumed as part of potable water consumption (all scope 2 sources) were the only sources that experienced a reduction in GHG emissions in Imperial between 2005 and 2018.

Transportation (scope 1) emissions contributed to 40% of the total emissions in 2018 (44,370 MT CO_2e), with passenger vehicles generating 23% of the total emissions (25,727 MT CO_2e). Travel by passenger car (VMT) increased by 75% between 2005 and 2018; however, increased fuel efficiency influenced a lower rate of emissions increase, 41% between 2005 and 2018. Commercial on-road transportation VMT increased with employment between 2005 and 2018 , with commercial VMT increasing by 69% and total commercial transportation emissions increasing by 51%. Off-road equipment, the smallest transportation sector source of emissions (5% of total emissions in 2018), grew with jobs and population between 2005 and 2018, increasing by 83%.

Emissions from the disposal of solid waste increased by 27% between 2005 and 2018, contributing to 12% of the total 2018 GHG emissions. While increased recycling and source reduction reduced the amount of waste generated in Imperial on a per capita basis, the growth in population and jobs resulted in a slight increase of total waste landfilled (5% increase between 2005 and 2018). One factor impacting the GHG reductions in the waste sector is variance in the landfill gas capture rate at disposal facilities, or lack thereof. This scope 3 emission source is largely out of the control of Imperial, however future efforts to increase landfill gas capture at waste disposal sites and increase waste diversion could further reduce this emission source.

Emissions from the water sector , which includes electricity from the treatment and distribution of potable water (scope 2), electricity from treatment and collection of wastewater (scope 2), and wastewater treatment process and fugitive emissions (scope 1 and 3), made up about 4% of the total emissions in 2018, increasing by 29% from the 2005 sector emissions of 3,417 MT CO_2e. The water sector sources associated with electricity consumption generally decreased between 2005 and 2018 due to increased water efficiency and the decreased emissions associated with electricity generation. Wastewater process and fugitive emission increased by 88% over the same period, as these emissions generally scale with population.

As Imperial has experienced the largest growth and smallest reduction in GHG emissions, it is beneficial to view emissions on a per capita basis, with emissions normalized by population. With a population of 10,389, 15,353 and 19,372 in 2005, 2012 and 2018, respectively; the resulting per capita emissions in MT CO_2 per resident are 10.6, 7.6 and 5.7, respectively. This equates to per capita emissions being reduced by nearly half between 2005 and 2018, showing that improvements in energy efficiency and increased renewable energy procurement by IID have mitigated severe increases in GHG emissions caused by rapid growth. From a mass emissions standpoint, Imperial will need to establish aggressive policies to reach state reduction targets; however, on a per capita basis, Imperial is on path to reach the statewide target of 2.0 MT CO_2e per capita by 2030, as set by SB 32. This allows Imperial to focus on improving building efficiency and shared transportation options as growth continues, in order to help offset the increasing GHG emissions from passenger and commercial transportation.

8 City of Westmorland

The City of Westmorland (Westmorland) is the smallest incorporated city of Imperial County (County), containing about 1% of the total County population (2,325 residents) and less than 1% of the total employment (352 jobs) in 2018. Between 2005 and 2018, Westmorland has experienced small population growth, at a rate of rate of about 6%, as compared to the County population growth rate of 22%. The total jobs in Westmorland have decreased by 42% between 2005 and 2018, while the total County experienced a net growth in jobs. In 2012, there was a loss of nearly 270 jobs in Westmorland, which was in addition to the already declining jobs due to the weak economy. As of 2018, Westmorland has only sustained a net increase in jobs of about 8% since 2012, where other jurisdictions had already recovered jobs lost to the great recession.[14]

8.1 City of Westmorland GHG Emissions by Sector

The City of Westmorland has reduced its total GHG emission by 47% between 2005 and 2018, from 33,979 MT CO_2e to 18,167 MT CO_2e. Energy sector emissions were the largest source in 2005, 2012 and 2018, making up 59%, 50% and 45% of total emissions, respectively. Increased renewable energy procurement by the energy provider, IID, and the reduced consumption in the non-residential sector contributed to the 60% decrease in energy sector emissions from 2005 to 2018. The transportation sector was the second largest source of GHG emissions in Westmorland in each inventory year, contributing 12,137 MT CO_2e in 2005 (36% of total emissions), 9,589 MT CO_2e in 2012 (43% of total emissions), and 8,244 MT CO_2e in 2018 (45% of total emissions). This 32% decrease in transportation emissions between 2005 and 2018 is a result of general reduction in on-road transportation activities and increased fuel efficiency. Passenger vehicle emissions decreased by 22%, commercial vehicle emissions decreased by 47%, and off-road equipment emissions increased by 40% between 2005 and 2018. Waste has been the third largest emissions source in Westmorland each year, generating 1,461 MT CO_2e in 2005 (4% of total emissions), 1,007 MT CO_2e in 2012 (5% of total emissions), and 1,446 MT CO_2e in 2018 (8% of total emissions). The water sector has remained the smallest source of emissions each year making up only 2% of total emissions in 2018, with emissions from this sector being primarily from wastewater process and fugitive emissions. Between 2005 and 2018, waste and water sector GHG emissions have reduced by 1% and 31%, respectively. The inventory results by sector for Westmorland are provided in Figure 13. GHG emission results by sector are provided in Table 13, including total emissions by source for each inventory year and the percent change in emissions between 2005 and 2018 for each source.

[14] Southern California Association of Governments (SCAG). 2019. Profile of the City of Westmorland. https://www.scag.ca.gov/Documents/Westmorland.pdf

Figure 13 City of Westmorland GHG Emissions by Sector

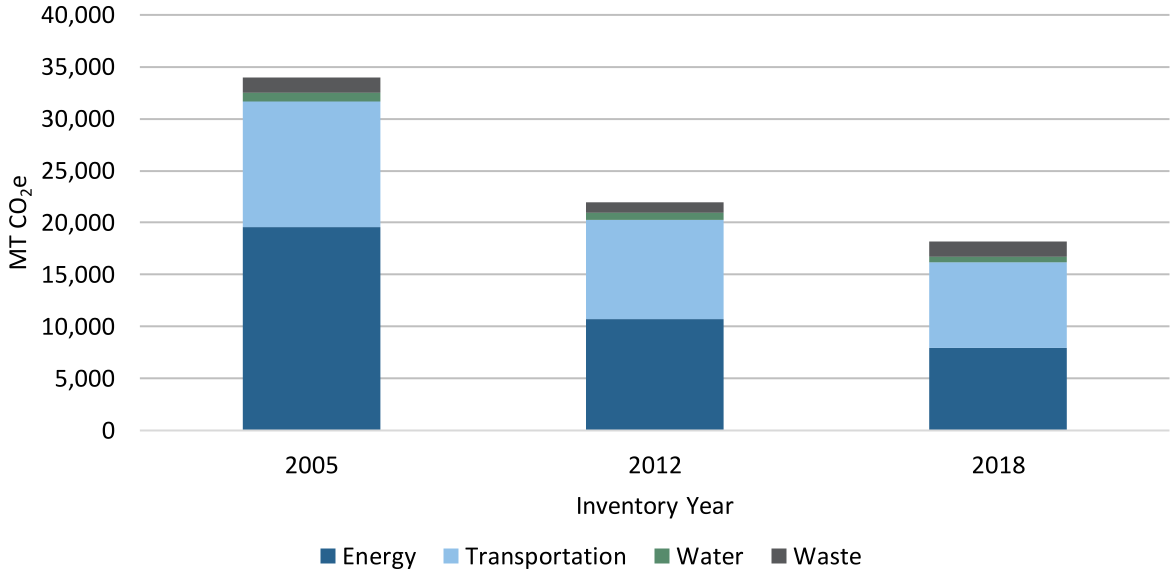

Table 13 City of Westmorland GHG Emissions by Sector

Emission Sector	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)	Percent Change (2005 – 2018)
Energy	**20,024**	**11,023**	**8,097**	**-60%**
Natural Gas	737	616	588	-20%
Residential Propane	14	19	23	63%
Non-residential Propane	133	73	78	-42%
Residential Electricity	8,559	6,201	4,333	-49%
Non-residential Electricity	8,969	3,245	2,451	-73%
Electricity T&D Losses	1,613	869	624	-61%
Transportation	**12,137**	**9,589**	**8,244**	**-32%**
Passenger On-road Vehicles	7,145	6,937	5,547	-22%
Commercial On-road Vehicles	4,300	2,313	2,283	-47%
Off-road Equipment	691	339	414	-40%
Water	**825**	**691**	**567**	**-31%**
Wastewater Process and Fugitive	358	372	381	6%
Wastewater Collection and Treatment	209	163	101	-51%
Potable Water Consumption	259	156	85	-67%
Waste	**1,461**	**1,007**	**1,446**	**-1%**
Landfilled Waste Decomposition	1,441	989	1,429	-1%
Landfill Process Emissions	20	17	16	-19%
Total[1]	**33,979**	**21,991**	**18,167**	**-47%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

Values may not add up due to rounding

1. Emissions from Wastewater Collection and Treatment and Potable Water Consumption are not added into the total emission for the jurisdiction and are provided here for informational purposes. The emissions from these sources are from the consumption of electricity and are therefore captured under Non-residential Electricity.

8.2 City of Westmorland GHG Emissions by Scope

The total GHG emissions in Westmorland primarily result from scope 2 emission sources in 2005, which consists of electricity consumption, with scope 1 emission sources becoming the largest contributor to total emissions in 2012 and 2018. Scope 1 emission sources include direct emissions from combustion of fossil fuels in vehicles and buildings and process and fugitive emissions from the City of Westmorland Water Pollution Control Plant. The scope 2 emissions have decreased by 61% between 2005 and 2018. Scope 1 emissions were the second largest sources of emissions in 2005 and becoming the largest in 2018, contributing 51% of total emissions in 2018. This is a result of scope 2 emissions decreasing at a faster rate than scope 1 emissions. Scope 3 emission decreased by 32% between 2005 and 2018. Scope 3 emissions contribute the least to the total emissions (12% of total 2018 emissions), compared to scope 1 and 2 emission sources. The inventory results by scope for Westmorland are provided in Figure 14, with the total emissions by scope and the percent change between 2005 and 2018 provided in Table 14.

Figure 14 City of Westmorland GHG Emissions by Scope

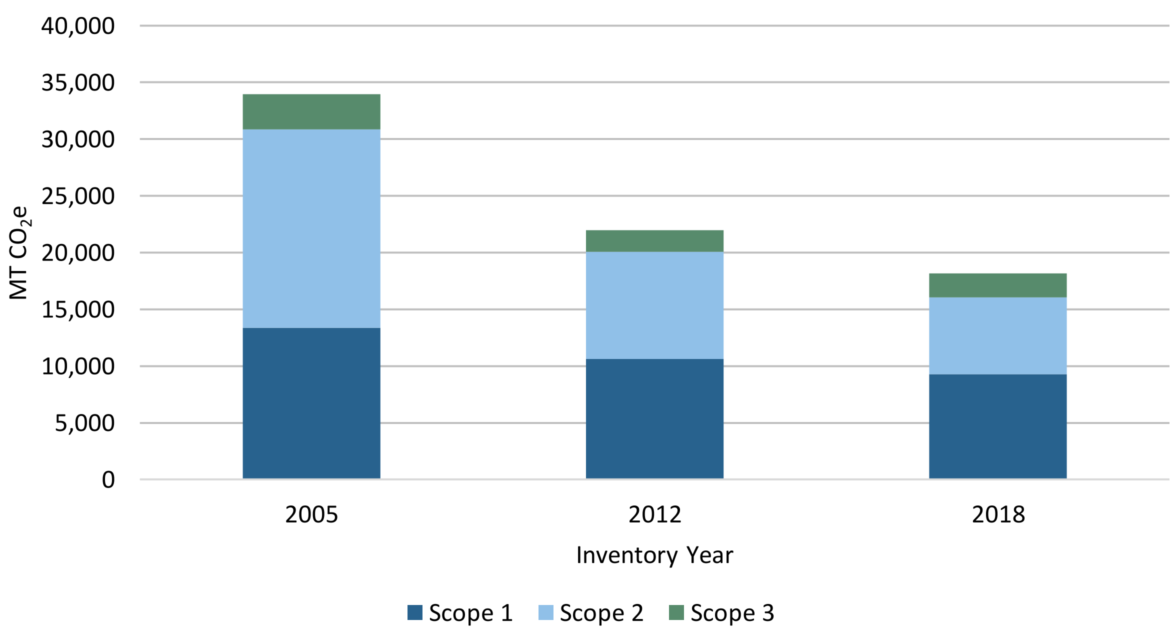

Table 14 City of Westmorland GHG Emissions by Scope

Emissions Scope	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)	Percent Change (2005 – 2018)
Scope 1	13,336	10,626	9,268	-31%
Scope 2	17,527	9,446	6,784	-61%
Scope 3	3,116	1,920	2,115	-32%
Total	**33,979**	**21,991**	**18,167**	**-47%**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

8.3 City of Westmorland GHG Emission Summary

The total GHG emission of the City of Westmorland have decreased by 47%, from 33,979 MT CO_2e in 2005 to 18,167 MT CO_2e in 2018, with nearly all emission sources decreasing during this time period. Westmorland experienced one of the lowest population growth rates in Imperial Valley, between 2005 and 2018, with a decreasing number of jobs that is in contrast to the County job growth of 35%. This flat population growth and negative job growth were the primary drivers for emissions reductions, due to a general decrease in overall activity data.

The emission reduction seen in the energy sector, specifically emissions from electricity consumption (scope 2), were a result of increased renewable energy procurement by IID, effectively reducing the GHGs per unit of energy in half between 2005 and 2018, and an overall decrease in energy consumption. This combination resulted in a 20% reduction in natural gas emissions and a 61% decrease in overall electricity emissions (including residential, non-residential and T&D losses).

Transportation (scope 1) emissions contributed to 44% of the total emissions in 2018 (8,244 MT CO_2e), with passenger vehicles generating 31% of the total emissions (5,547 MT CO_2e). Travel by passenger car (VMT) decreased by 3% between 2005 and 2018, with increased fuel efficiency contributing to further emission reductions of 22% between 2005 and 2018. Commercial on-road transportation VMT decreased with employment between 2005 and 2018 , with commercial VMT decreasing by 41% and total commercial transportation emissions decreasing by 47%. Off-road equipment, the smallest transportation sector source of emissions (2% of total emissions in 2018), trended with jobs and population between 2005 and 2018, decreasing by 40%.

Emissions from the disposal of solid waste remained about constant (1% decrease) between 2005 and 2018, contributing to 8% of the total 2018 GHG emissions. While there was a decrease of total waste landfilled (19% reduction between 2005 and 2018), variance in the landfill gas capture rate at disposal facilities, or lack thereof, influenced the small overall change in emissions. This scope 3 emission source is largely out of the control of Westmorland, however future efforts to increase landfill gas capture at waste disposal sites and increase waste diversion could further reduce this emission source.

Emissions from the water sector , which includes electricity from the treatment and distribution of potable water (scope 2), electricity from treatment and collection of wastewater (scope 2), and wastewater treatment process and fugitive emissions (scope 1 and 3), made up about 3% of the total emissions in 2018, decreasing by 31% from the 2005 sector emissions of 825 MT CO_2e. The water sector sources associated with electricity consumption generally decreased between 2005 and 2018 due to increased water efficiency and the decreased emissions associated with electricity generation. Wastewater process and fugitive emission increased by 6% over the same period, as these emissions generally scale with population.

Westmorland has reached the state's GHG reduction targets for 2020 set by AB 32 and is near reaching the target for 2030 established by SB 32. AB 32 set a short-term target of reducing statewide GHG emissions to 1990 levels by 2020, or 15% below 2005 GHG emission levels, and a long-term target of 80% reduction below 1990 GHG emission levels by 2050. Westmorland had reached the AB 32 target for 2020 by 2012 and is in good position to reach the 2030 targets established by SB 32 well ahead of time. Based on guidance of the CARB 2017 *Climate Change*

Scoping Plan, under SB 32 jurisdictions will be required to reduce GHG emissions to 40% below 1990 levels by the year 2030, or 49% below 2005 levels.[15]

The development of the current RCAP will present opportunity for Westmorland to establish emission reduction targets consistent AB 32 and SB 32, and, as growth continues, establish policies that will maintain the emission reductions experienced thus far. State legislation will help reduce future GHG emissions in Westmorland with increased renewable energy procurement though SB 100, reduced waste emissions through SB 1383, and reduced transportation emissions through advancing fuel efficiency and Low Carbon Fuel Standards. However, to reach the targets established by SB 32, it is imperative that new and existing buildings are decarbonized as growth in Westmorland continues. Additionally, ensuring development is focused towards VMT reduction through infill and more dense zoning will allow reduction in scope 1 transportation emissions. Since Westmorland is near reaching the 2030 SB 32 targets far ahead of schedule, this allows time for pursuing grants and funding opportunities to modernize the water and transportation sectors for further future emissions reductions.

[15] California Air Resources Board (CARB). 2017. California's 2017 Climate Change Scoping Plan. https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf

9 Unincorporated Imperial County

The unincorporated areas and communities of Imperial County (unincorporated County) presented here represent the emissions generated in Imperial County that are not attributed to the incorporated cities. The unincorporated County contains about 21% of the total County population (40,007 residents) and 24% of the total Imperial Valley employment (18,387 jobs) in 2018. Between 2005 and 2018, the unincorporated County has experienced both population and job growth at a rate of rate of about 17%. Similar to the incorporated cities, the weak economy of the late 2000's and early 2010's results in a net loss of jobs. The total number of jobs has generally since recovered to pre financial crisis levels.[16]

9.1 Unincorporated Imperial County GHG Emissions by Sector

The unincorporated County has reduced its total GHG emission by 17% between 2005 and 2018, from 602,603 MT CO_2e to 497,169 MT CO_2e. Transportation sector emissions were the largest source in 2005, 2012 and 2018, making up 46%, 56% and 69% of total emissions, respectively. This increase in emissions is a result of increased VMT in for both passenger and commercial vehicles, even while increased fuel efficiency has reduced emission per mile. The respective 33% and 40% increases in passenger and commercial VMT have resulted in an 18% and 30% increase in emissions between 2005 and 2018, respectively. Increases in off-road equipment activity have also contributed to the increased transportation emissions. Energy sector emissions have remained the second largest emission source in 2005, 2012 and 2018, generating a respective 36%, 32% and 20% of total emissions. These energy emissions have decreased by 55% since 2005, with 217,854 MT CO_2e emitted in 2005 and 98,708 MT CO_2e emitted in 2018. Increased renewable energy procurement by the energy provider, IID, and relatively constant electricity consumption over time were the primary driver for emission reductions in the energy sector. Waste has remained the third largest emissions source in the unincorporated County each year, generating 98,583 MT CO_2e in 2005 (16% of total emissions), 55,249 MT CO_2e in 2012 (11% of total emissions), and 49,635 MT CO_2e in 2018 (10% of total emissions). The water sector has remained the smallest source of emissions each year making up only 2% of total emissions in 2018. Unlike the inventories for the incorporated cities, the unincorporated County inventory does not present emissions from electricity used to treat and deliver potable water. It is assumed that the majority of potable water consumed in the unincorporated County is treated within the County, and therefore this energy consumption would be captured in the non-residential electricity consumption. Between 2005 and 2018, waste sector emissions have decreased by 50%, while water sector emissions have remained constant. The inventory results by sector for the unincorporated County are provided in Figure 15. GHG emission results by sector are provided in Table 15, including total emissions by source for each inventory year and the percent change in emissions between 2005 and 2018 for each source.

[16] Southern California Association of Governments (SCAG). 2019. Profile of Unincorporated Imperial County. https://www.scag.ca.gov/Documents/UnIncAreaImperialCounty.pdf

Figure 15 Unincorporated Imperial County GHG Emissions by Sector

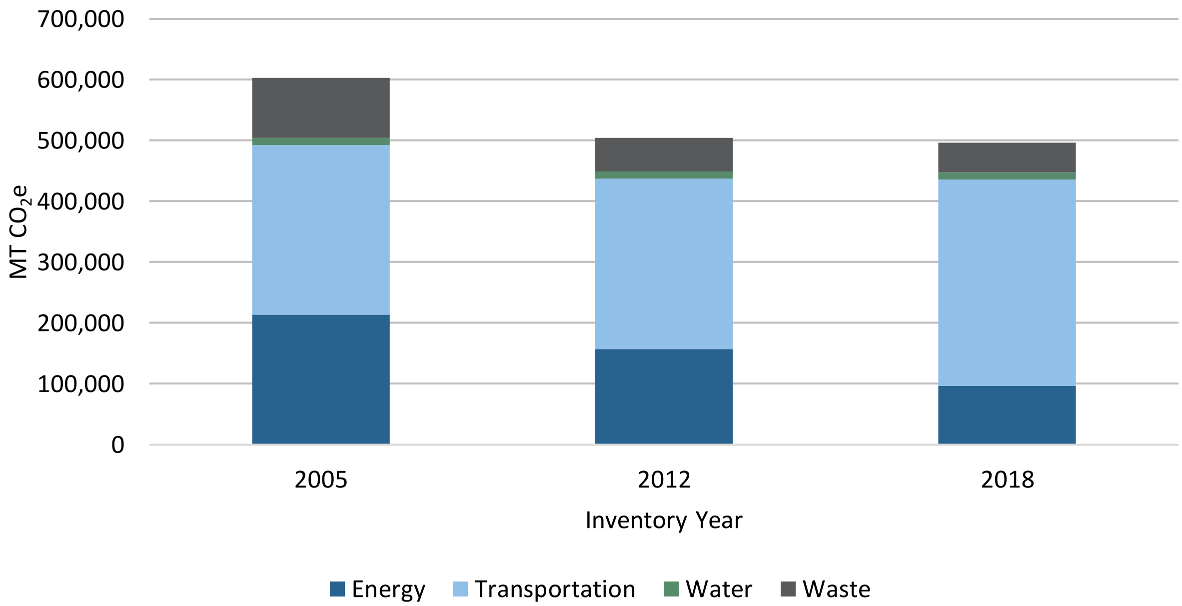

Table 15 Unincorporated Imperial County GHG Emissions by Sector

Emission Sector	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)	Percent Change (2005 – 2018)
Energy	**217,854**	**160,494**	**98,708**	**-55%**
Natural Gas	9,794	8,349	8,019	-18%
Residential Propane	211	328	408	94%
Non-residential Propane	3,634	3,702	4,253	17%
Residential Electricity	63,610	53,215	28,435	-55%
Non-residential Electricity	123,400	82,422	50,345	-59%
Electricity T&D Losses	17,205	12,479	7,248	-58%
Transportation	**278,059**	**280,188**	**339,132**	**22%**
Passenger On-road Vehicles	165,452	169,241	195,747	18%
Commercial On-road Vehicles	80,323	79,769	104,672	30%
Off-road Equipment	32,284	31,178	38,713	20%
Water	**14,135**	**14,460**	**14,714**	**4%**
Wastewater Process and Fugitive	8,106	8,850	9,694	20%
Wastewater Collection and Treatment	3,518	2,887	1,880	-47%
On-site Septic Fugitive	2,511	2,723	3,139	25%
Waste	**98,583**	**55,249**	**49,635**	**-50%**
Landfilled Waste Decomposition	97,230	54,305	49,074	-50%
Landfill Process Emissions	1,353	944	561	-59%
Total[1]	**602,603**	**504,780**	**497,169**	**-17%**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

Values may not add up due to rounding

1. Emissions from Wastewater Collection and Treatment are not added into the total emission for the jurisdiction and are provided here for informational purposes. The emissions from these sources are from the consumption of electricity and are therefore captured under Non-residential Electricity.

9.2 Unincorporated Imperial County GHG Emissions by Scope

The total GHG emissions in the unincorporated County are primarily generated by scope 1 emission sources in all inventory years. Scope 1 emission sources include direct emissions from combustion of fossil fuels in vehicles and buildings and process and fugitive emissions from centralized WWTPs and on-site septic wastewater treatment systems. Scope 1 emission sources have increase by 21% since 2005, with 299,141 MT CO_2e emitted in 2005 and 360,730 MT CO_2e emitted in 2018. The second largest emission sources each year is scope 2 emission sources, which consists of electricity consumption. The scope 2 emissions have decreased by 58% between 2005 and 2018, from 187,011 MT CO_2e in 2005 to 78,780 MT CO_2e in 2018. Scope 3 emission decreased by 50% between 2005 and 2018. Scope 3 emissions contribute the least to the total emissions (12% of total 2018 emissions), compared to scope 1 and 2 emission sources. The inventory results by scope for the unincorporated County are provided in Figure 16, with the total emissions by scope and the percent change between 2005 and 2018 provided in Table 16.

Figure 16 Unincorporated Imperial County GHG Emissions by Scope

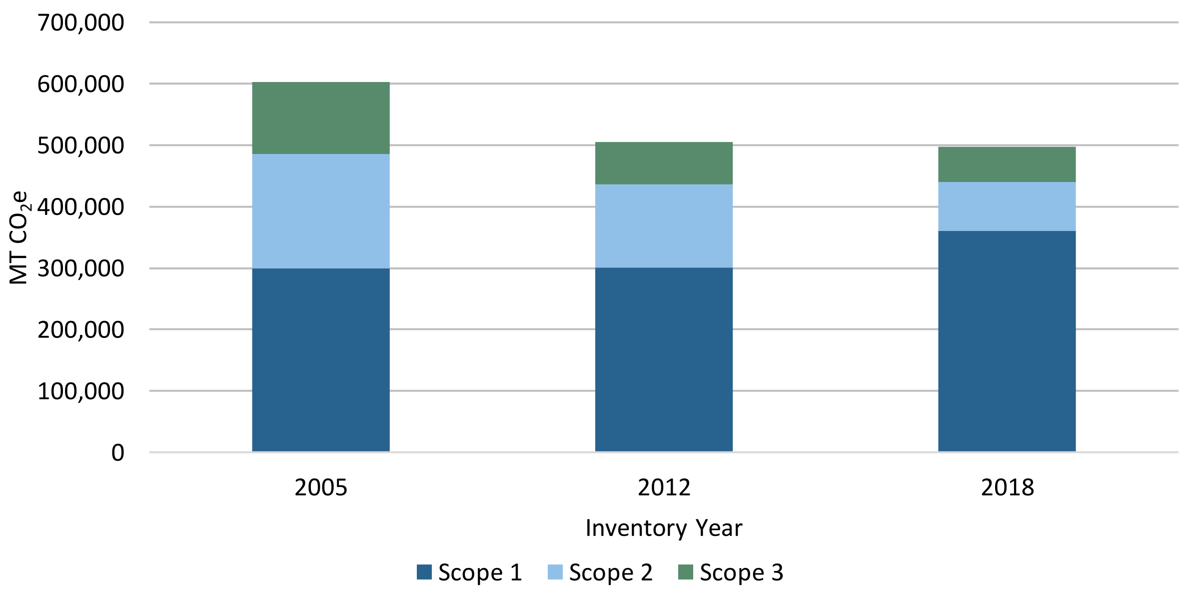

Table 16 Unincorporated Imperial County GHG Emission by Scope

Emissions Scope	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)	Percent Change (2005 – 2018)
Scope 1	299,141	300,690	360,730	21%
Scope 2	187,011	135,637	78,780	-58%
Scope 3	116,451	68,454	57,659	-50%
Total	**602,603**	**504,780**	**497,169**	**-17%**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

9.3 Unincorporated Imperial County GHG Emissions Summary

The total GHG emission of the unincorporated County have decreased by 27%, from 602,603 MT CO_2e in 2005 to 497,169 MT CO_2e in 2018, with the majority of emission reductions coming from the energy and waste sectors. The constant job and population growth in the unincorporated County resulted in increased activity in the transportation sector, while energy consumption remained fairly constant and solid waste generation dropped significantly.

The emission reduction seen in the energy sector, specifically emissions from electricity consumption (scope 2), were a result of increased renewable energy procurement by IID, effectively reducing the GHGs emitted per unit of energy in half between 2005 and 2018. Increased efficiency resulted in decreased natural gas consumption and constant electricity consumption, which would have otherwise increased with population and job growth. Between 2005 and 2018, the unincorporated County had an 18% reduction in natural gas emissions and a 58% decrease in overall electricity emissions (including residential, non-residential and T&D losses).

Transportation (scope 1) emissions contributed to 69% of the total emissions in 2018 (339,132MT CO_2e), with passenger vehicles generating 40% of the total emissions (195,747 MT CO_2e). VMT increased across both passenger and commercial travel between 2005 and 2018, 33% and 40%, respectively. Increased fuel efficiency offset some of the increased activity, resulting in an emission increase of 18% for passenger vehicles and a 30% increase of emissions from commercial vehicles between 2005 and 2018. Off-road equipment, the smallest transportation sector source of emissions (8% of total emissions in 2018), trended with jobs and population between 2005 and 2018, increasing by 20%.

Emissions from the disposal of solid waste significantly decreased between 2005 and 2018 (50% decrease), from 98,583 MT CO_2e in 2005 to 49,635 MT CO_2e in 2018. In 2018, waste emissions contributed approximately 10% of the total unincorporated County emissions. The majority of reductions were a result of the significant decrease in landfilled waste, from approximately 273,000 short tons in 2005 to 152,000 short tons in 2018. This scope 3 emission can be influenced by policies that increase diversion and source reduction, however future efforts to increase landfill gas capture at waste disposal sites could further reduce this emission source.

Emissions from the water sector, which includes electricity from treatment and collection of wastewater (scope 2), and wastewater treatment process and fugitive emissions (scope 1 and 3),and fugitive emissions from on-site septic systems (scope 1), made up about 1% of the total emissions in 2018. Water emissions have remained nearly constant since 2005 with 11,624 MT CO_2e emitted in 2005 and 11,575 MT CO_2e emitted in 2018. Emissions from on-site septic and fugitive and process emissions from wastewater treatment plants increased with population growth. This increase in emissions was generally offset by the reduction in emissions associated with electricity generation.

The Unincorporated County has reached the state's GHG reduction targets for 2020 set by AB 32 but will need to make considerable progress to reach the target for 2030 established by SB 32. AB 32 set a short-term target of reducing statewide GHG emissions to 1990 levels by 2020, or 15% below 2005 GHG emission levels, and a long-term target of 80% reduction below 1990 GHG emission levels by 2050. The unincorporated County had reached the AB 32 target for 2020 by 2012. Based on guidance of the CARB 2017 *Climate Change Scoping Plan,* under SB 32 jurisdictions will be required to reduce GHG emissions to 40% below 1990 levels by the year 2030, or 49% below 2005 levels.[17]

The development of the current RCAP will present opportunity for unincorporated County to establish emission reduction targets consistent AB 32 and SB 32, and, as growth continues, establish policies that will maintain the emission reductions experienced thus far. State legislation will help reduce future GHG emissions in the unincorporated County with increased renewable energy procurement though SB 100, reduced waste emissions through SB 1383, and reduced transportation emissions through advancing fuel efficiency and Low Carbon Fuel Standards. However, to reach the targets established by SB 32, the unincorporated County will need to establish policies that allow for decarbonization of new and existing buildings. Ensuring new development is focused towards VMT reduction through infill and more dense zoning will allow reduction in scope 1 transportation emissions. Additionally, as the majority of the landfills in Imperial Valley lie in unincorporated areas and communities, pursuing funding for landfill gas capture and other emissions reduction technologies will be an essential aspect of reducing scope 3 emissions for all jurisdictions within Imperial Valley.

[17] California Air Resources Board (CARB). 2017. California's 2017 Climate Change Scoping Plan. https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf

Appendix B

Community Inventory Detailed Methodology

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Table of Contents

Tables

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1 Community GHG Inventory Methodology Overview

Calculation methodologies are detailed in the following section for all Community Inventory Greenhouse gas (GHG) emission sectors for the years of 2005,2012, and 2018. The jurisdictions included in the GHG emission inventory methodology are:

- The City of Brawley,
- The City of Calexico,
- The City of Calipatria,
- The City of El Centro,
- The City of Holtville,
- The City of Imperial,
- The City of Westmorland, and
- All unincorporated communities and areas under the jurisdiction of Imperial County.

Community GHG emissions are calculated and reported based on the recommendations of the International Council for Local Environmental Initiatives (ICLEI) *U.S. Community Protocol*. Activity data and data sources are provided along with discussion on emission factors and calculation methodologies. Some activity data was estimated using demographics data that is provided for reference. The methodologies are categorized under the four main emission sectors:

- Energy (*Energy Sector Methodology*)
- Transportation (*Transportation Sector Methodology*)
- Water (*Water Sector Methodology*)
- Waste (*Waste Sector Methodology*)

The GHG emission calculation methodology provides a transparent description of the activity data, equations, and assumptions used to estimate GHG emissions for subsequent inventories or necessary adjustment to these inventories. Emissions calculations for each jurisdicitons were performed using the same data sets and methdologies where available; however, due to the magnitude of data required to accurately calculate GHG emissions from multiple jurisidcitons over multiple years and inconsistent reporting of some data, it was neccesary to make assumptions that are clearly identified. It is also important to note that GHG emissions calculations methodologies can evolve over time, so transparency in methodology is essential for consistency in future GHG inventories.

2 Demographics Data

Calculations for the energy, waste and water sectors of the Community Inventory require use of jurisdiction-specific demographics data, including population, number of households, and number of jobs. This data was obtained from the respective 2019 *Local Profiles* developed by Southern California Association of Governments (SCAG).[1] Employment data was not available for years prior to 2007 or post 2017. Values were obtained for 2005 by calculating the annual change in employment between 2007 and 2008 and backcasting to 2005. The same was done to obtain 2018 values, using the annual change for 2016 and 2017 and projecting forward to 2018. Demographic data, as used in inventory calculations, are provided in Table 1, Table 2 and Table 3, which provide population, number of household and employment, respectively, for each jurisdiction. The population and employment for 2009 and 2015 are also provided in the following tables, as they are used for the calculation of wastewater production volumes for inventory years 2005 and 2018 in Section *Wastewater Activity Data*.

Table 1 Demographic Data - Population

Jurisdiction	2005 Population	2009 Population[1]	2012 Population	2015 Population[1]	2018 Population
City of Brawley	22,909	24,555	25,465	26,232	27,417
City of Calexico	34,492	32,939	29,533	40,388	41,199
City of Calipatria	7,554	7,558	7,980	7,493	7,488
City of El Centro	39,273	41,736	43,396	44,741	46,315
City of Holtville	5,408	5,910	6,049	6,124	6,501
City of Imperial	10,289	14,241	15,353	17,437	19,372
City of Westmorland	2,184	2,235	2,270	2,279	2,325
Unincorporated Communities	34,147	37,338	37,395	38,561	40,007
Imperial Valley Total	**156,256**	**166,512**	**167,441**	**183,255**	**190,624**

Data Source:
SCAG. 2019. Local Profiles. https://www.scag.ca.gov/DataAndTools/Pages/LocalProfiles.aspx. Accessed May 30, 2020.
1. 2009 and 2015 population data are provided as these values are used to estimate the total wastewater flow activity data for the 2005 and 2018 inventory years.

[1] SCAG. 2019. Local Profiles. https://www.scag.ca.gov/DataAndTools/Pages/LocalProfiles.aspx. Accessed May 30, 2020.

Table 2 Demographic Data – Number of Households

Jurisdiction	2005 Households	2012 Households	2018 Households
City of Brawley	7,031	7,606	7,700
City of Calexico	8,987	10,044	9,928
City of Calipatria	967	995	978
City of El Centro	12,172	13,049	13,113
City of Holtville	1,593	1,771	1,808
City of Imperial	3,137	4,484	5,315
City of Westmorland	641	621	608
Unincorporated Communities	9,463	10,586	10,641
Imperial Valley Total	**43,991**	**49,156**	**50,091**

Data Source:

SCAG. 2019. Local Profiles. https://www.scag.ca.gov/DataAndTools/Pages/LocalProfiles.aspx. Accessed May 30, 2020.

Table 3 Demographic Data – Total Employment

Jurisdiction	2005 Employment[1]	2009 Employment[3]	2012 Employment	2015 Employment[3]	2018 Employment[2]
City of Brawley	6,907	7,257	8,031	10,057	9,219
City of Calexico	8,555	8,732	8,256	10,236	12,106
City of Calipatria	2,239	2,341	1,257	1,393	1,894
City of El Centro	18,002	18,128	20,315	25,409	26,437
City of Holtville	1,202	1,389	1,041	1,280	1,984
City of Imperial	2,738	2,871	3,445	4,546	5,318
City of Westmorland	589	604	325	359	344
Unincorporated Communities	16,097	17,418	16,396	20,168	18,840
Imperial Valley Total	**56,329**	**58,740**	**59,066**	**73,448**	**76,142**

Data Source:

SCAG. 2019. Local Profiles. https://www.scag.ca.gov/DataAndTools/Pages/LocalProfiles.aspx. Accessed May 30, 2020.

1. 2005 employment totals were not available and were derived by calculating the annual change in employment between 2007 and 2008 and backcasting to 2005.

2. 2018 employment totals were not available and were derived by calculating the annual change in employment between 2016 and 2017 and projecting forward to 2018.

3. 2009 and 2015 employment data are provided as these values are used to estimate the total wastewater flow activity data for the 2005 and 2018 inventory years.

3 Energy Sector Methodology

The energy sector includes GHG emissions associated with the consumption of electricity natural gas and propane in residential and non-residential buildings in each jurisdiction of Imperial Valley. Imperial Irrigation District (IID) is the primary electricity provider in Imperial Valley, and Southern California Gas (SoCal Gas), also known as The Gas Company, is the primary provider of natural gas in the County. Energy consumption is broken down into the residential and non-residential customer classes. GHG emissions for energy sector were obtained by applying the electricity, natural gas and propane specific emission factors to the consumption in each jurisdiction.

In addition to energy consumption, the amount of emissions generated due to electricity transmission and distribution (T&D) losses were determined. T&D losses occur as electricity is transported from its generation source to its final end-use destination. Transmission losses occur in the form of heat as electricity meets the small resistance in wires, and distribution losses occur when electricity is transformed from higher to lower voltage wires. Although emissions generated due to electricity T&D losses are outside of a jurisdiction's operational control, emissions related to T&D losses are directly related to electricity use within the community and should be included in the community emissions.[2]

3.1 Natural Gas Activity Data

Due to data retention policies at the utility provider, SoCal Gas, natural gas consumption data was available for only the 2018 inventory year, from which consumption for the prior inventory years was estimated. Natural gas usage data was provided by SoCal Gas for each jurisdiction, aggregated annually by the commercial and residential sectors. This data was requested through the Energy Data Request Program (EDRP) for the 2018 calendar year. Due to anonymization and aggregation standards set by the California Public Utilities Commission for reports requested through the EDRP, industrial natural gas usage was not available for the jurisdictions in Imperial Valley.[3] Natural gas consumption data is not included in this document as SoCal Gas required each jurisdiction to sign a non-disclosure agreement which prohibits the publication of any natural gas usage data.

It was not possible to obtain data prior to 2014 that accurately attributes natural gas use to specific jurisdictions; therefore, publicly available data from the California Energy Commission (CEC) was used to estimate natural gas consumption for 2005 and 2012.[4] The CEC publishes natural gas

[2] ICLEI 2019. U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Pg. 36.

[3] Data for industrial natural gas use was not available due to either not meeting the 100/10 Rule, or the 5/25 rule which state:

- **100/10 Rule**: Anonymized over a group consisting of 100 accounts in a single customer class. No single account amounts to more than 10 percent of the total energy consumption in an individual month. Such data should be aggregated to at least the monthly level.
- **5/25 Rule**: Aggregated over a group consisting of five customers in a single customer class. No single customer accounts for more than 25 percent of the total energy consumption in an individual month. Such data should be aggregated to at least the monthly level.

[4] Data retention policies at SoCal Gas limit the past years for which data is stored to 5 years prior to the data request date.

consumption at the county level, going as far back as 1990.[5] Efficiency metrics were derived for each of the inventory years by dividing the total County consumption as reported by the CEC for both residential and non-residential uses by the total Imperial Valley number of households and employment. Under the assumption that the energy consumption per employment and per household in each jurisdiction would have changed over time similar to countywide trends, the change in efficiency from the CEC data was applied to the known 2018 natural gas consumption to estimate past consumption. It was assumed that natural gas usage on a per household and per employment basis has decreased with time due to increasingly efficient residential and commercial equipment, and increasingly stringent building efficiency standards for new construction within Title 24 of the California Code of Regulations, published by the California Building Standards Commission.

3.2 Natural Gas GHG Emission Calculations

Emissions generated by combustion of natural gas are calculated by multiplying the natural gas consumption by the natural gas fuel specific emission factor. As recommended in the *ICLEI U.S. Community Protocol* Method BE.1.1, emissions resulting from the combustion of natural gas were calculated by multiplying annual natural gas consumption by the most recent natural gas emissions factors available, which are 53.06 kg CO_2/mmBtu, 1.0 g CH_4/mmBtu and 0.1 g N_2O/mmBtu.[6] The emission factors were multiplied by their respective global warming potentials, and converted from mmBtu to therms, to obtain an emission factor of 0.005313 MT CO_2e/therm.[7] Estimated emissions from natural gas consumption for all customer classes in each of the inventory years for each jurisdiction are provided in Table 4.

[5] CEC. Gas Consumption by County. http://www.ecdms.energy.ca.gov/gasbycounty.aspx. Accessed March 23, 2020.

[6] The Climate Registry 2016 Default Emission Factors (Table 12.1 & Table 12.9.1), April 2016. https://www.theclimateregistry.org/wp-content/uploads/2014/11/2016-Climate-Registry-Default-Emission-Factors.pdf

[7] 1 mmBtu = 10 therms

Table 4 Natural Gas Combustion GHG Emissions for All Jurisdictions

Jurisdiction	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)
City of Brawley	10,349	9,505	9,289
City of Calexico	12,974	11,793	11,850
City of Calipatria	1,015	874	844
City of El Centro	21,310	18,853	19,161
City of Holtville	1,248	1,138	1,200
City of Imperial	3,919	4,715	5,487
City of Westmorland	737	616	588
Unincorporated Communities	9,794	8,349	8,019
Imperial Valley Total	**61,345**	**55,843**	**56,438**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

3.3 Propane Activity Data

Residential propane consumption estimates were calculated based on the number of households projected to be fueled primarily by propane, and average consumption for households in the corresponding climate region. The estimated number of households that are primarily fueled by propane was obtained from the United States Census American Community Surveys for the years 2012 (1,056 households) and 2018 (1,334 households).[8] 2005 data was not available, so the number of households using propane in 2005 was estimated from the proportion of households using propane to total households in 2012, applied to the total number of households in 2005. The number of households using propane in each jurisdiction was then estimated by applying the percentage of total County households in a jurisdiction to the estimated county-wide number of households using propane. Propane consumption in each jurisdiction was then calculated using the Unites States Energy Information Administration (EIA) Residential Energy Consumption Survey reported average residential propane usage rate for a Mixed-Hot/Dry Climate Region, of 251 gallons per year per household.[9] The total number of households in the County and each jurisdiction, as well as the resulting estimated residential annual consumption is provided in Table 5.

[8] United States Census Bureau. American Communities Survey 5-year estimates. House Heating Fuel. Imperial County.
2012: https://data.census.gov/cedsci/table?q=water%20heating&g=0500000US06025&tid=ACSDT1Y2012.B25040&hidePreview=false
2018: https://data.census.gov/cedsci/table?q=water%20heating&g=0500000US06025&tid=ACSDT5Y2018.B25040&hidePreview=false
Accessed December 23, 2020.

[9] Unites States Energy Information Administration (EIA). 2015. Residential Energy Consumption Survey. Consumption and Expenditures Table. https://www.eia.gov/consumption/residential/data/2015/index.php?view=consumption. Accessed December 23, 2020.

Table 5 Residential Propane Activity Data for All Jurisdictions

	2005		2012		2018	
Jurisdiction	Households Using Propane	Propane Consumption (gallons)	Households Using Propane	Propane Consumption (gallons)	Households Using Propane	Propane Consumption (gallons)
City of Brawley	109	27,311	163	41,013	205	51,471
City of Calexico	139	34,909	216	54,159	264	66,364
City of Calipatria	15	3,756	21	5,365	26	6,537
City of El Centro	188	47,281	280	70,362	349	87,654
City of Holtville	25	6,188	38	9,549	48	12,086
City of Imperial	49	12,185	96	24,178	142	35,528
City of Westmorland	10	2,490	13	3,349	16	4,064
Unincorporated Communities	146	36,758	227	57,081	283	71,130
Imperial Valley Total	**681**	**170,877**	**1,056**	**265,056**	**1,334**	**334,834**

Data Source: United States Census Bureau. American Communities Survey 5-year estimates. House Heating Fuel. Imperial County.
2012: https://data.census.gov/cedsci/table?q=water%20heating&g=0500000US06025&tid=ACSDT1Y2012.B25040&hidePreview=false
2018: https://data.census.gov/cedsci/table?q=water%20heating&g=0500000US06025&tid=ACSDT5Y2018.B25040&hidePreview=false

Non-residential propane consumption was estimated from state-wide non-residential propane consumption, attributing propane consumption to Imperial Valley by juridiction employment. Statewide non-residential propane sales were available for the year 2017 from the Propane Education and Research Council *Annual Retail Propane Sales Report*, which estimates that 212,000,000 gallons of propane were sold in the cylinder, commerical and industrial markets.[10] Using the total employmemt in California in 2017, 5,389,200 jobs, a non-residential propane use per job of 39 gallons can be obtained.[11] Using the statewide propane consumption per job, the non-residential propane consumption of each jurisdiction was calculated, as provided in Table 6.

[10] Propane Education and Research Council. 2019. Annual Retail Propane Sales Report: U.S. Odorized Propane Sales by State and End-Use Sector. Reporting Year 2017. https://propane.com/wp-content/uploads/2019/03/2017-Annual-Retail-Propane-Sales-Report.pdf. Accessed December 23, 2020.

[11] State of California Employment Development Department (EDD). 2020. Labor Force and Unemployment Rate for Cities and Census Designated Places. https://www.labormarketinfo.edd.ca.gov/data/labor-force-and-unemployment-for-cities-and-census-areas.html. Accessed December 23, 2020.

Table 6 Non-Residential Propane Activity Data for All Jurisdictions

Jurisdiction	2005 (gallons)	2012 (gallons)	2018 (gallons)
City of Brawley	271,707	315,923	362,656
City of Calexico	336,536	324,774	476,225
City of Calipatria	88,078	49,448	74,506
City of El Centro	708,162	799,150	1,039,977
City of Holtville	47,284	40,951	78,046
City of Imperial	107,707	135,519	209,199
City of Westmorland	23,170	12,785	13,532
Unincorporated Communities	633,223	644,985	741,127
Imperial Valley Total	**271,707**	**315,923**	**362,656**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

3.4 Propane Combustion GHG Emission Calculations

As recommended in the *ICLEI U.S. Community Protocol* Method BE.1.1, emissions resulting from the combustion of propane were calculated by multiplying annual propane consumption by the most recent propane emissions factors available, which are 5.72 kg CO_2/gallon, 0.27 g CH_4/gallon and 0.05 g N_2O/gallon.[12] The emission factors were multiplied by their respective global warming potentials to obtain an emission factor of 0.005739 MT CO_2e/gallon. Estimated emissions from residential and non-residential propane consumption in each of the inventory years for each jurisdiction are provided in Table 7.

[12] United States Environmental Protection Agency. 2020. Emission Factors for Greenhouse Gas Inventories. Table 1. https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf.

Table 7 Residential and Non-Residential Propane GHG Emissions for All Jurisdictions

Jurisdiction	2005 Emissions ($MT\ CO_2e$)		2012 Emissions ($MT\ CO_2e$)		2018 Emissions ($MT\ CO_2e$)	
	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential
City of Brawley	157	1,559	235	1,813	295	2,081
City of Calexico	200	1,931	311	1,864	381	2,733
City of Calipatria	22	505	31	284	38	428
City of El Centro	271	4,064	404	4,586	503	5,968
City of Holtville	36	271	55	235	69	448
City of Imperial	70	618	139	778	204	1,201
City of Westmorland	14	133	19	73	23	78
Unincorporated Communities	211	3,634	328	3,702	408	4,253
Imperial Valley Total	**981**	**12,717**	**1,521**	**13,335**	**1,922**	**17,190**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

3.5 Electricity Activity Data

Electricity usage data was provided by IID for each jurisdiction, aggregated annually for the years 2012 and 2018. IID is not an inventory owned utility and therefore does not have the data disclosure restrictions as investor owned utilities such as SoCal Gas have with their EDRP. Accordingly, it is appropriate to publish the activity data used to calculate electricity GHG emissions. Data broken down by jurisdiction was not available for 2005; therefore, electricity consumption was estimated. Due to data tracking methodologies by IID, accurate data disaggregated by customer class (residential and non-residential) for individual jurisdictions was also not available. However, data is tracked regionally by customer class (i.e. residential, commercial, industrial, etc.), which was used to estimate the proportion of total electricity consumption in each jurisdiction that was attributed to residential and non-residential customers. The electricity consumption for each jurisdiction as provided by IID is provided in Table 8, with the estimates for the 2005 consumption provided as well.

Table 8 Jurisdiction-Specific Electricity Consumption Totals

Jurisdiction	2005 Consumption (kWh)[1]	2012 Consumption (kWh)	2018 Consumption (kWh)
City of Brawley	220,755,877	231,049,441	222,123,271
City of Calexico	228,181,945	222,301,125	249,113,060
City of Calipatria	85,144,951	54,348,655	50,088,949
City of El Centro	408,655,113	416,022,858	390,817,411
City of Holtville	71,728,121	67,906,875	71,657,792
City of Imperial	97,750,456	123,553,487	146,817,040
City of Westmorland	29,472,684	21,193,279	25,003,535
Unincorporated Communities	314,462,375	304,322,788	290,350,145

Notes: **kWh** = kilowatt-hour

Data Source: Data was provided upon request by IID. IID indicates that this data does not include all customers within the County, and the regional data in Table 9 better reflects entire consumption within the County. However, IID indicated that the data included in this table is the best data available that attributes electricity use to a specific jurisdiction.

1. 2005 data was estimated based on the 2012 residential and non-residential breakdown that provided in Table 11. By deriving per household and per job energy efficiency metrics from the data in Table 11, and applying the change in per household and per job energy efficiency between 2012 and 2005 as derived from the known County-wide IID data provided in Table 9, a breakdown of energy consumption by customer class was obtained that matched the known IID data in Table 9 within 5%.

Estimates of the customer class breakdown are provided to gain a general estimate of how electricity may be consumed in each jurisdiction. These estimates do not change the overall consumption within a jurisdiction; therefore, not changing the overall GHG emissions for any jurisdiction. This breakdown provides some basis for energy related reduction strategies of the Climate Action Plan.

Electricity consumption for residential and non-residential uses were estimated from the total energy consumption for each jurisdiction by using the proportion of households to employment. The regionally tracked energy consumption data provided by IID shows that the proportion of all residential energy consumption in Imperial Valley, shown in Table 9, resembles the proportion of the total number of households in the County to employment, as shown in Table 10. Assuming that the energy consumption per household is similar to the energy consumption per employment throughout the County, then the proportion of households to employment in each jurisdiction will provide a general estimate of the residential and non-residential consumption in each jurisdiction.

Table 9 Regional Electricity Data Used for Jurisdiction Customer Class Estimates

Year	Residential Consumption (kWh)	Non-residential Consumption (kWh)
2005	545,858,699	904,176,276
	38%	62%
2012	610,408,492	811,703,962
	43%	57%
2018	620,130,585	743,787,256
	45%	55%

Notes: **kWh** = kilowatt-hour

Data Source: Data was provided upon request by IID in the form of the “KILOWATT HOUR BILLING SUMARY” spreadsheet. The consumption is the sum of totals under the “Imperial Valley” service region. The non-residential customer class totals include all non-residential consumption, excluding agricultural, which is not reported consistently across all inventory years.

Table 10 Total County Households and Employment

Year	Total County Households	Total County Employment
2005	43,989	61,756
	42%	58%
2012	49,300	59,000
	46%	54%
2018	66,175	91,025
	42%	58%

Data Source: SCAG Demographic Data. See Section *Demographics Data*

Table 11 provides the estimated electricity consumption by customer class in each jurisdiction. The demographic data used for these calculations are included in the *Demographics Data* Section. The electricity consumption by jurisdiction for 2005 was estimated based on the consumption values for 2012, provided in Table 11, and the change in consumption per household and per job, as provided in the regional energy data in Table 9. Accordingly, it was estimated that electricity consumption per household had increased by 0.2% between 2005 and 2012, and the electricity consumption per job had increased by 14.3%. This change in efficiency was applied to the 2012 consumption by customer class, as provided in Table 9 to obtain the 2005 electricity consumption values provided in Table 8 and Table 11.

Table 11 Estimated Electricity Consumption by Customer Class

	2005 Consumption (kWh)[1]		2012 Consumption (kWh)		2018 Consumption (kWh)	
Jurisdiction	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential
City of Brawley	116,641,838	104,114,039	118,664,581	112,384,860	121,032,829	101,090,442
City of Calexico	118,774,715	109,407,230	100,290,606	122,010,519	136,868,599	112,244,461
City of Calipatria	61,757,246	23,387,705	30,335,817	24,012,838	33,032,197	17,056,752
City of El Centro	256,550,728	152,104,386	253,312,084	162,710,774	261,239,947	129,577,464
City of Holtville	33,175,411	38,552,710	25,139,067	42,767,808	37,491,840	34,165,951
City of Imperial	48,762,217	48,988,238	53,681,645	69,871,842	73,429,231	73,387,808
City of Westmorland	15,081,194	14,391,490	7,280,989	13,912,290	9,034,891	15,968,644
Unincorporated Communities	207,500,283	106,962,092	184,926,115	119,396,673	185,549,905	104,800,241
Imperial Valley Total	**858,243,632**	**597,907,890**	**786,312,377**	**654,386,131**	**872,189,834**	**573,781,369**

Notes: **kWh** = kilowatt-hour

Estimates of the customer class breakdown are provided to gain a general estimate of how electricity may be consumed in each jurisdiction. These estimates do not change the overall consumption within a jurisdiction; therefore, not changing the overall GHG emissions for each jurisdiction. This breakdown provides some basis for energy related reduction strategies of the Climate Action Plan.

1. 2005 electricity consumption disaggregated by jurisdiction was not available from IID and was therefore estimated.

3.6 Electricity GHG Emission Calculations

Emissions resulting from electricity consumption were estimated by multiplying annual electricity consumption by the electricity emissions factor, as recommended in *Community Protocol* Method BE.2.1. Electricity is supplied to all of Imperial Valley by IID. Emission factors used to calculate GHG emissions were provided by IID, which capture the carbon intensity of electricity for the year based on the mix of renewable and fossil fuel electricity generation sources. The IID emission factors in 2012 and 2018, used in this inventory, were 0.00044570 MT CO_2e/kWh and 0.00021733 MT CO_2e/kWh respectively.[13] A 2005 inventory year emission factor was not available from IID; therefore, the 2005 emission factor of 0.0005947 MT CO_2e/kWh for the eGRID WECC Southwest region was used for the 2005 inventory year.[14] These emissions factors were used for all electricity related emissions calculations. Table 12 provides the total emissions from electricity use per jurisdiction, and Table 13 provides the electricity consumption emissions as estimated for the residential and non-residential customer classes in each jurisdiction.

[13] Emission factors provided upon request by IID.

[14] USEPA. 2008. eGRID2007 Version 1.1 Year 2005 Summary Tables. p.4. https://www.epa.gov/sites/production/files/2015-01/documents/egrid2007v1_1_year05_summarytables.pdf. Accessed May 20, 2020.

Table 12 Total Electricity GHG Emissions for All Jurisdictions

Jurisdiction	2005 Emissions ($MT\ CO_2e$)[1]	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)
City of Brawley	131,284	102,979	60,268
City of Calexico	135,700	99,080	67,591
City of Calipatria	50,636	24,223	13,590
City of El Centro	243,027	185,421	106,039
City of Holtville	42,657	30,266	19,443
City of Imperial	58,132	55,068	39,835
City of Westmorland	17,527	9,446	6,784
Unincorporated Communities	187,011	135,637	78,780
Imperial Valley Total	**865,973**	**642,119**	**392,331**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

1. 2005 electricity consumption disaggregated by jurisdiction was not available from IID and was therefore estimated.

Table 13 Residential and Non-Residential Electricity GHG Emissions for All Jurisdictions

	2005 Emissions ($MT\ CO_2e$)[1]		2012 Emissions ($MT\ CO_2e$)		2018 Emissions ($MT\ CO_2e$)	
Jurisdiction	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential
City of Brawley	61,917	69,367	50,090	52,889	27,429	32,839
City of Calexico	65,064	70,635	54,380	44,700	30,455	37,136
City of Calipatria	13,909	36,727	10,703	13,521	4,628	8,963
City of El Centro	90,456	152,571	72,520	112,901	35,158	70,881
City of Holtville	22,927	19,729	19,062	11,204	9,270	10,173
City of Imperial	29,133	28,999	31,142	23,926	19,912	19,923
City of Westmorland	8,559	8,969	6,201	3,245	4,333	2,451
Unincorporated Communities	63,610	123,400	53,215	82,422	28,435	50,345
Imperial Valley Total	**355,576**	**510,397**	**297,312**	**344,807**	**159,619**	**232,712**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

1. 2005 electricity consumption disaggregated by jurisdiction was not available from IID and was therefore estimated.

3.7 Transmission and Distribution Losses Activity Data

Transmission and distribution (T&D) loss data accounts for the amount of energy lost through heat when electricity is transported through transmission lines over long distances (transmission losses), and the energy lost when electricity is transferred from higher voltage to lower voltage transmission lines for consumption by end users (distribution losses). Activity data for T&D losses was determined by applying a general grid loss factor of 9.2% to the total electricity activity within the jurisdiction. This grid loss factor was provided through email correspondence with IID's Resource Planning and Acquisition Supervisor.[15] The T&D losses for each jurisdiction for each of the inventory years are provided in Table 14.

Table 14 Transmission and Distribution Losses Activity Data Totals

Jurisdiction	2005 T&D Losses (kWh)	2012 T&D Losses (kWh)	2018 T&D Losses (kWh)
City of Brawley	20,309,541	21,256,549	20,435,341
City of Calexico	20,992,739	20,451,704	22,918,402
City of Calipatria	7,833,335	5,000,076	4,608,183
City of El Centro	37,596,270	38,274,103	35,955,202
City of Holtville	6,598,987	6,247,433	6,592,517
City of Imperial	8,993,042	11,366,921	13,507,168
City of Westmorland	2,711,487	1,949,782	2,300,325
Unincorporated Communities	28,930,538	27,997,696	26,712,213
Imperial Valley Total	**133,965,940**	**132,544,263**	**133,029,351**

Notes: **kWh** = kilowatt-hour

Data Source: Transmission and Distribution Losses were derived by applying the estimated T&D loss factor of 9.2% for IID (as provided by IID) to the electricity consumption totals provided in Table 8.

3.8 Transmission and Distribution Losses GHG Emission Calculations

Transmission and distribution (T&D) losses emissions were calculated by applying the relevant electricity emission factor to the amount of electricity lost, based on the grid loss factor, as recommended in *Community Protocol* Method BE.4.1. The emission factors for 2005, 2012 and 2018 are provided in *Electricity GHG Emission* Calculations Section. The T&D losses for each jurisdiction in each inventory year are shown in Table 15.

[15] The IID T&D losses factor of 9.2% was provided by email correspondence with the IID's Resource Planning and Acquisition Supervisor on December 13th, 2019.

Table 15 Total T&D Losses GHG Emissions for All Jurisdictions

Jurisdiction	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)
City of Brawley	12,078	9,474	5,545
City of Calexico	12,484	9,115	6,218
City of Calipatria	4,658	2,229	1,250
City of El Centro	22,359	17,059	9,756
City of Holtville	3,924	2,784	1,789
City of Imperial	5,348	5,066	3,665
City of Westmorland	1,613	869	624
Unincorporated Communities	17,205	12,479	7,248
Imperial Valley Total	**79,670**	**59,075**	**36,094**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

4 Transportation Sector Methodology

Transportation emissions are generated in Imperial Valley primarily through combustion of fuel in the engines of on-road vehicles and off-road equipment. On-road transportation emissions include both passenger and commercial vehicle trips with orgins and/or destinations within Imperial Valley. Off-road equipment includes various classes of vehicles and equipment, which are included in the inventory based on their inclusion in the CARB OFFROAD2007 off-road vehicle emissions model.

4.1 On-Road Transportation Activity Data

On-road transportation vehicle miles traveled (VMT) activity data was obtained through analysis performed by Southern California Association of Governments (SCAG) Transportation Modelers, which attributes VMT to each jurisdiction based on the origin and destination of vehicle trips. The analysis utilized the SCAG Trip Based Regional Travel Demand Model developed for the 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), which utilizes socio-economic data (i.e. population, employment, households, workers, school enrollment, etc.) and Traffic Analysis Zones (TAZs) to model regional traffic demand. The model output for each year attributes a traffic volume to a trip length that corresponds to the distance between two TAZs within the SCAG planning area. The traffic volume multiplied by trip length provides a daily VMT value which is used to obtain an annual VMT between two TAZs.[16] VMT was provided for passenger and commercial vehicles.

VMT was attributed to a jurisdiction utilizing the California Air Resources Board (CARB) recommended SB 375 Regional Targets Advisory Committee (RTAC) methodology. The SB 375 RTAC methodology provides a framework for attributing VMT to a jurisdiction based on the origin and destination of a vehicle trip. Trips that begin and end in a TAZ within a specific jurisdiction are considered Internal-Internal (I-I), and all of the trip's VMT is fully attributed to the jurisdiction. Trips that begin or end in a TAZ within a specific jurisdiction but terminate or originate in a TAZ outside of the jurisdiction and considered Internal-External (I-X) or External-Internal (X-I), and half of the trip's VMT is attributed to the jurisdiction. Trips that begin and end in TAZs outside of a specific jurisdiction and only "pass-through" the jurisdiction are considered External-External (X-X), and no VMT is attributed to the jurisdiction. This methodology allows the summing of VMT for each jurisdiction within the region to obtain regional VMT values, without risk of double counting. The VMT analysis was performed for each of the incorporated cities and the unincorporated County for the years 2012 and 2018. Table 16 and Table 17 provide the results of the analysis, showing daily VMT with I-X and X-I trips already adjusted based on the SB375 RTAC Methodology. VMT analysis was not performed for 2005 because the SCAG transportation model is primarily used for forecasting travel and does not contain data from before its original functional use in 2012.

[16] Annual VMT is obtained by multiplying the daily VMT by 347 days per year. CARB https://www.arb.ca.gov/cc/scopingplan/document/measure_documentation.pdf, page 14

Table 16 2012 VMT Activity Data

Jurisdiction	Passenger VMT I-X (Daily)	Passenger VMT X-I (Daily)	Passenger VMT I-I (Daily)	Passenger VMT Total Annual	Commercial VMT I-X (Daily)	Commercial VMT X-I (Daily)	Commercial VMT I-I (Daily)	Commercial VMT Total Annual
City of Brawley	143,282	143,295	44,561	114,904,935	20,099	19,842	1,042	14,221,306
City of Calexico	144,404	142,313	62,767	121,271,129	23,211	22,195	1,746	16,361,628
City of Calipatria	46,508	51,390	9,759	37,357,241	3,307	3,254	185	2,340,542
City of El Centro	241,803	230,249	83,161	192,658,875	26,389	26,101	2,110	18,946,518
City of Holtville	46,449	43,292	3,383	32,313,798	4,756	4,719	219	3,363,672
City of Imperial	79,326	80,818	14,374	60,557,753	10,816	10,657	261	7,541,693
City of Westmorland	24,596	21,894	969	16,467,956	2,431	2,393	41	1,688,263
Unincorporated Communities	450,399	454,857	252,574	401,767,026	79,501	76,142	12,130	58,217,294
Imperial Valley Total	**1,176,767**	**1,168,108**	**471,548**	**977,298,713**	**170,510**	**165,303**	**17,734**	**122,680,916**

Notes: **I-X** = Internal-External trips; **X-I** = External-Internal trips; **I-I** = Internal-Internal trips

Total Annual VMT is obtained from summing the I-X, X-I and I-I daily VMT and then multiplying the sum by 347 days per year. Annual miles are calculated using 347 days to account for reduced weekend and holiday mileage.

Table 17 2018 VMT Activity Data

Jurisdiction	Passenger VMT I-X (Daily)	Passenger VMT X-I (Daily)	Passenger VMT I-I (Daily)	Passenger VMT Total Annual	Commercial VMT I-X (Daily)	Commercial VMT X-I (Daily)	Commercial VMT I-I (Daily)	Commercial VMT Total Annual
City of Brawley	162,871	205,790	54,927	146,985,040	25,409	25,474	1,740	18,260,218
City of Calexico	178,022	175,717	79,621	150,375,710	32,034	31,324	2,615	22,893,091
City of Calipatria	49,973	45,918	11,412	37,234,196	4,541	4,549	230	3,234,042
City of El Centro	263,373	247,603	100,268	212,101,469	33,263	33,447	3,373	24,318,494
City of Holtville	42,422	41,402	5,449	30,977,787	6,286	6,361	238	4,471,150
City of Imperial	91,589	94,021	19,425	71,147,172	14,305	14,352	489	10,113,741
City of Westmorland	22,629	20,354	1,222	15,339,243	2,588	2,594	39	1,811,503
Unincorporated Communities	578,753	615,834	365,435	541,327,653	110,701	108,254	20,415	83,061,454
Imperial Valley Total	**1,389,632**	**1,446,639**	**637,759**	**1,205,488,270**	**229,127**	**226,355**	**29,139**	**168,163,693**

Notes: **I-X** = Internal-External trips; **X-I** = External-Internal trips; **I-I** = Internal-Internal trips
Total Annual VMT is obtained from summing the I-X, X-I and I-I daily VMT and then multiplying the sum by 347 days per year. Annual miles are calculated using 347 days to account for reduced weekend and holiday mileage.

The earliest year of available data for the SCAG 2016 RTP/SCS Trip Based model is 2012, therefore VMT for 2005 was estimated by backcasting from 2012 VMT and demographic data. This was done by deriving jurisdiction-specific backcasting factors for passenger VMT per resident and commercial VMT per employment for 2012 and applying these factors to the population and total employment in the respective jurisdiction in 2005. These jurisdiction-specific backcasting factors are provided in Table 18. The demographic estimates used for this calculation are provided in Section *Demographics Data*. The estimated VMT activity data for the 2005 inventory year is provided in Table 19.

Table 18 VMT Backcasting Factors

Jurisdiction	2012 Annual Passenger VMT per Resident	2012 Annual Commercial VMT per Employment
City of Brawley	4,512	1,771
City of Calexico	4,106	1,982
City of Calipatria	4,681	1,862
City of El Centro	4,440	933
City of Holtville	5,342	3,231
City of Imperial	3,944	2,189
City of Westmorland	7,255	5,195
Unincorporated Communities	10,744	3,551

Notes: **VMT** = Vehicle Miles Traveled

Table 19 2005 Estimated Annual VMT Activity Data

Jurisdiction	2005 Annual Passenger VMT	2005 Annual Commercial VMT
City of Brawley	103,371,575	12,230,926
City of Calexico	141,634,232	16,954,182
City of Calipatria	35,362,982	4,169,032
City of El Centro	174,354,595	16,789,329
City of Holtville	28,889,572	3,883,895
City of Imperial	40,583,516	5,993,949
City of Westmorland	15,844,060	3,059,651
Unincorporated Communities	366,870,935	57,155,634
Imperial Valley Total	**906,911,468**	**120,236,598**

Notes: **VMT** = Vehicle Miles Traveled

4.2 On-Road Transportation GHG Emission Calculations

Emissions due to passenger vehicle operation were calculated using *Community Protocol* Method TR.1.A where VMT data was converted into emission data using Equations TR.1.B.2 and TR.1.B.3 and regional emission factors from CARB's most recent EMission FACtors (EMFAC2017) model. EMFAC2017 VMT-based emission rates are dependent on the vehicle class, model years, speed, and fuel type. Fleet-wide emission factors were calculated using the mix of vehicle classes specific to the EMFAC2017 model output for Imperial County for each inventory year. Emissions from freight and service trucks (i.e. medium and heavy-duty trucks) were calculated using *Community Protocol* Method TR.2.C, which is similar to assigning passenger emissions.

Emission factors used in calculations for the two vehicle classes (passenger and commercial) were obtained by taking the average EMFAC2017 emission factors for all of the vehicle types under these classes, weighted by the EMFAC2017 modeled VMT and aggregated by fuel type. Emission factors for CO_2, CH_4, and N_2O were combined to calculate a carbon dioxide equivalent (CO_2e) factor using the appropriate global warming potentials. Reporting emissions in CO_2e allows the reporting of multiple GHGs in a common metric, taking into account the atmospheric lifetime and ability to trap heat for each gas. Table 20 provides the vehicle types from the EMFAC2017 model output that were attributed to the two vehicle classes. EMFAC2017 model runs were chosen to provide emission factors using the EMFAC2007 categories for vehicle classification.

Table 21 provides the emission factors used to calculate on-road transportation GHG emissions.

Table 20 Vehicle Class Attribution from EMFAC2017 Model Output

Inventory Vehicle Class	Model Output Category (Abbreviation)
Passenger Vehicle	Passenger Cars (LDA)
	Light-Duty Trucks 1 (LDT1)
	Light-Duty Trucks 2 (LDT2)
	Medium Duty Vehicles (MDV)
	Motorcycle (MCY)
Commercial Vehicles	Light-Heavy Duty Trucks 1 (LHDT1)
	Light-Heavy Duty Trucks 2 (LHDT2)
	Medium-Heavy-Duty Trucks (MHDT)
	Heavy-Heavy Duty Trucks (HHDT)
	Other Buses (OBUS)
	Urban Buses (UBUS)
	School Buses (SBUS)

Table 21 On-road Transportation GHG Emission Factors

Vehicle Class	2005 Emission Factor (g of CO_2e/mile)	2012 Emission Factor (g of CO_2e/mile)	2018 Emission Factor (g of CO_2e/mile)
Passenger Vehicle	450.98	421.24	361.61
Commercial Vehicle	1405.35	1370.20	1260.18

Notes: **g of CO_2e** = Grams of Carbon Dioxide Equivalent

On-road transportation GHG emissions were calculated by mulitplying the fleet GHG emission factors for passenger and comerical vehciles by the VMT activity data, and converting from grams to metric tons of CO_2e. Calculation results are provided in Table 22.

Table 22 On-road Transportation GHG Emissions for All Jurisdictions

	2005 Emissions (MT CO_2e)		2012 Emissions (MT CO_2e)		2018 Emissions (MT CO_2e)	
Jurisdiction	Passenger	Commercial	Passenger	Commercial	Passenger	Commercial
City of Brawley	46,619	17,189	48,403	19,486	53,151	23,011
City of Calexico	63,874	23,826	51,084	22,419	54,377	28,849
City of Calipatria	15,948	5,859	15,736	3,207	13,464	4,075
City of El Centro	78,631	23,595	81,156	25,960	76,697	30,646
City of Holtville	13,029	5,458	13,612	4,609	11,202	5,634
City of Imperial	18,302	8,424	25,509	10,334	25,727	12,745
City of Westmorland	7,145	4,300	6,937	2,313	5,547	2,283
Unincorporated Communities	165,452	80,323	169,241	79,769	195,747	104,672
Imperial Valley Total	**409,000**	**168,974**	**411,678**	**168,097**	**435,912**	**211,916**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

4.3 Off-Road Equipment Activity Data

Activity data for off-road equipment was provided in the form of Countywide fuel consumption obtained from the CARB OFFROAD2007 and OFFROAD2017 models. The models provide estimates of county-wide of-road vehicle fuel consumption for different activity categories, such as recreational vehicles or industrial activities, based on the expected existence of the activities in the region. The OFFROAD2017 model provides updated information on emission reduction technology in equipment but does not provide data for all activity categories included in OFFROAD2007. As such, OFFROAD2007 data is used where activity categories are not included in OFFROAD2017. OFFROAD2007 provides fuel consumption in gallons per day, which was converted to gallons per year multiplying by 365.25 days per year. Both models provide gasoline, diesel and natural gas fuel consumption.

Fuel consumption was attributed to each jurisdiction based on the proportion of activities in that jurisdiction compared to the entire County, using various metrics relevant to the off-road equipment class as recommended by *Community Protocol* Method TR.8. Recreational and entertainment equipment emissions were attributed based on population. Lawn and garden equipment emissions were attributed based on number of households. Light commercial, industrial, mining and construction equipment and transportation refrigeration units were based on the number of jobs. Airport ground support equipment emissions were attributed based on the proportion of aviation fuel volumes sold, which was provided by the Airport Managers of the Brawley Municipal Airport, Calexico International Airport and the Imperial County Airport.[17] All activity in the oil drilling class of off-road equipment was attributed to the unincorporated County, based on there being no active oil and gas wells existing in incorporated cities.[18] Pleasure craft class of off-road equipment was attributed entirely to the unincorporated County, as no significant bodies of water exist within the incorporated cities. These attribution metrics are summarized in Table 23, along with other equipment classes that are not included in this inventory and the model from which fuel consumption data was obtained.

17 In 2018, the sales of aviation fuel at Imperial County airports were: 52,881 gallons at Calexico International Airport (1.5%), 52,211 gallons of fuel at Brawley Municipal Airport (1.5%), and 3,232,502 gallons at Imperial county Airport (97%).

18 Based on assessment of the California Department of Conservation web-based Well Finder mapping application. https://maps.conservation.ca.gov/doggr/wellfinder/#openModal/-115.38080/33.20168/10. Accessed March 31, 2020.

Table 23 Attribution Metric for Off-road Equipment Emissions

Equipment Class	Attribution Metric	Model Data Source
Agricultural Equipment	Included in Agricultural Inventory	OFFROAD2017
Airport Ground Support Equipment	Aviation Fuel Sold	OFFROAD2017
Construction and Mining Equipment	Employment	OFFROAD2017
Dredging	No Activity	OFFROAD2007
Entertainment Equipment	Population	OFFROAD2007
Industrial Equipment	Employment	OFFROAD2017
Lawn and Garden Equipment	Households	OFFROAD2007
Light Commercial Equipment	Employment	OFFROAD2017
Logging Equipment	No Activity	OFFROAD2007
Military Tactical Support Equipment	No Activity	OFFROAD2007
Oil Drilling	Active Wells	OFFROAD2017
Other Portable Equipment	Employment	OFFROAD2017
Pleasure Craft	Area of Recreational Waterways	OFFROAD2007
Railyard Operations	De Minimis	OFFROAD2007
Recreational Equipment	Population	OFFROAD2007
Transportation Refrigeration Units	Employment	OFFROAD2017

4.4 Off-Road Equipment GHG Emission Calculations

GHG emissions for off-road equipment were calculated by multiplying the appropriate emission factor for each fuel and equipment type with the total fuel consumption as obtained from the OFFROAD2007 and OFFROAD2017 models.[19] Table 24, Table 25 and Table 26 show the total emissions for each off-road equipment class and attribution to each jurisdiction for the respective 2005, 2012 and 2018 inventory years.

[19] United States Environmental Protection Agency. 2020. Emission Factors for Greenhouse Gas Inventories. Table 2 and Table 5. https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf.

Table 24 2005 Off-road Equipment GHG Emissions Attribution to Jurisdiction

Equipment Class	County-wide	Brawley	Calexico	Calipat-ria	El Centro	Holtville	Imperial	Westm-orland	Uninco. County
Airport Ground Support Equipment	100%	1.5%	1.5%	0%	0%	0%	0%	0%	97.0%
	54.64	1	1	0	0	0	0	0	53
Construction and Mining Equipment	100%	12.3%	15.2%	4.0%	32.0%	2.1%	4.9%	1.0%	28.6%
	27,962	3,429	4,247	1,111	8,936	597	1,359	292	7,991
Entertainment Equipment	100%	14.7%	22.1%	4.8%	25.1%	3.5%	6.6%	1.4%	21.9%
	79.70	12	18	4	20	3	5	1	17
Industrial Equipment	100%	12.3%	15.2%	4.0%	32.0%	2.1%	4.9%	1.0%	28.6%
	1,064	130	162	42	340	23	52	11	304
Lawn and Garden Equipment	100%	16.0%	20.4%	2.2%	27.7%	3.6%	7.1%	1.5%	21.5%
	2,493	398	509	55	690	90	178	36	536
Light Commercial Equipment	100%	12.3%	15.2%	4.0%	32.0%	2.1%	4.9%	1.0%	28.6%
	2,845	349	432	113	909	61	138	30	813
Oil Drilling	100%	0%	0%	0%	0%	0%	0%	0%	0%
	10.54	0	0	0	0	0	0	0	0
Pleasure Craft	100%	12.3%	15.2%	4.0%	32.0%	2.1%	4.9%	1.0%	28.6%
	28,414	3,484	4,315	1,129	9,081	606	1,381	297	8,120
Other Portable Equipment	100%	0%	0%	0%	0%	0%	0%	0%	100%
	14,070	0	0	0	0	0	0	0	14,070
Recreational Equipment	100%	14.7%	22.1%	4.8%	25.1%	3.5%	6.6%	1.4%	21.9%
	1,680	246	371	81	422	58	111	23	367
Transportation Refrigeration Units	100%	12.3%	15.2%	4.0%	32.0%	2.1%	4.9%	1.0%	28.6%
	9	1	1	0	3	0	0	0	3
Total Emissions	**78,692**	**8,050**	**10,056**	**2,536**	**20,401**	**1,438**	**3,224**	**691**	**32,284**

Notes: For each equipment class, both the percentage of county-wide emissions that are attributed to each jurisdiction (top row) and the resulting emissions in metric tons of carbon dioxide equivalent are provided. Totals in the county-wide column are the total emissions calculated from the total fuel consumption provided by the OFFROAD2007 and OFFROAD2017 models. Some totals may not add up due to rounding.

Table 25 2012 Off-road Equipment GHG Emissions Attribution to Jurisdiction

Equipment Class	County-wide	Brawley	Calexico	Calipat-ria	El Centro	Holtville	Imperial	Westm-orland	Uninco. County
Airport Ground Support Equipment	100%	1.5%	1.5%	0%	0%	0%	0%	0%	97.0%
	52.94	1	1	0	0	0	0	0	51
Construction and Mining Equipment	100%	13.6%	14.0%	2.1%	34.4%	1.8%	5.8%	0.6%	27.8%
	18,998	2,583	2,655	404	6,534	335	1,108	105	5,274
Entertainment Equipment	100%	15.2%	17.6%	4.8%	25.9%	3.6%	9.2%	1.4%	22.3%
	79.34	12	14	4	21	3	7	1	18
Industrial Equipment	100%	13.6%	14.0%	2.1%	34.4%	1.8%	5.8%	0.6%	27.8%
	1,290	175	180	27	444	23	75	7	358
Lawn and Garden Equipment	100%	15.5%	20.4%	2.0%	26.5%	3.6%	9.1%	1.3%	21.5%
	2,880	446	589	58	765	104	263	36	620
Light Commercial Equipment	100%	13.6%	14.0%	2.1%	34.4%	1.8%	5.8%	0.6%	27.8%
	2,819	383	394	60	969	50	164	16	782
Oil Drilling	100%	0%	0%	0%	0%	0%	0%	0%	0%
	10.57	0	0	0	0	0	0	0	0
Pleasure Craft	100%	13.6%	14.0%	2.1%	34.4%	1.8%	5.8%	0.6%	27.8%
	26,419	3,592	3,693	562	9,087	466	1,541	145	7,334
Other Portable Equipment	100%	0%	0%	0%	0%	0%	0%	0%	100%
	16,248	0	0	0	0	0	0	0	16,248
Recreational Equipment	100%	15.2%	17.6%	4.8%	25.9%	3.6%	9.2%	1.4%	22.3%
	2,148	327	379	102	557	78	197	29	480
Transportation Refrigeration Units	100%	13.6%	14.0%	2.1%	34.4%	1.8%	5.8%	0.6%	27.8%
	10	1	1	0	3	0	1	0	3
Total Emissions	**70,966**	**7,520**	**7,906**	**1,219**	**18,379**	**1,057**	**3,356**	**339**	**31,178**

Notes: For each equipment class, both the percentage of county-wide emissions that are attributed to each jurisdiction (top row) and the resulting emissions in metric tons of carbon dioxide equivalent are provided. Totals in the county-wide column are the total emissions calculated from the total fuel consumption provided by the OFFROAD2007 and OFFROAD2017 models. Some totals may not add up due to rounding.

Table 26 2018 Off-road Equipment GHG Emissions Attribution to Jurisdiction

Equipment Class	County-wide	Brawley	Calexico	Calipat-ria	El Centro	Holtville	Imperial	Westm-orland	Uninco. County
Airport Ground Support Equipment	100%	1.5%	1.5%	0%	0%	0%	0%	0%	97.0%
	54.74	1	1	0	0	0	0	0	53
Construction and Mining Equipment	100%	12.1%	15.9%	2.5%	34.7%	2.6%	7.0%	0.5%	24.7%
	25,563	3,095	4,064	636	8,875	666	1,785	115	6,325
Entertainment Equipment	100%	14.4%	21.6%	3.9%	24.3%	3.4%	10.2%	1.2%	21.0%
	79.19	11	17	3	19	3	8	1	17
Industrial Equipment	100%	12.1%	15.9%	2.5%	34.7%	2.6%	7.0%	0.5%	24.7%
	1,436	174	228	36	499	37	100	6	355
Lawn and Garden Equipment	100%	15.4%	19.8%	2.0%	26.2%	3.6%	10.6%	1.2%	21.2%
	3,214	494	637	63	842	116	341	39	683
Light Commercial Equipment	100%	12.1%	15.9%	2.5%	34.7%	2.6%	7.0%	0.5%	24.7%
	2,851	345	453	71	990	74	199	13	705
Oil Drilling	100%	0%	0%	0%	0%	0%	0%	0%	0%
	10.46	0	0	0	0	0	0	0	0
Pleasure Craft	100%	12.1%	15.9%	2.5%	34.7%	2.6%	7.0%	0.5%	24.7%
	45,719	5,536	7,269	1,137	15,874	1,191	3,193	207	11,312
Other Portable Equipment	100%	0%	0%	0%	0%	0%	0%	0%	100%
	18,692	0	0	0	0	0	0	0	18,692
Recreational Equipment	100%	14.4%	21.6%	3.9%	24.3%	3.4%	10.2%	1.2%	21.0%
	2,654	382	574	104	645	91	270	32	557
Transportation Refrigeration Units	100%	12.1%	15.9%	2.5%	34.7%	2.6%	7.0%	0.5%	24.7%
	10	1	2	0	4	0	1	0	3
Total Emissions	**100,294**	**10,039**	**13,245**	**2,050**	**27,747**	**2,179**	**5,897**	**414**	**38,713**

Notes: For each equipment class, both the percentage of county-wide emissions that are attributed to each jurisdiction (top row) and the resulting emissions in metric tons of carbon dioxide equivalent are provided. Totals in the county-wide column are the total emissions calculated from the total fuel consumption provided by the OFFROAD2007 and OFFROAD2017 models. Some totals may not add up due to rounding.

5 Water Sector Methodology

Water sector GHG emissions include those generated from electricity used in water consumption, centralized wastewater treatment plant (WWTP) stationary, processes and fugitive emissions, and on-site septic system fugitive emissions. The inclusion of these emission sources in the water sector is based on the guidance of the ICLEI *U.S. Community Protocol*.

GHG emissions from water consumption in Imperial Valley result from the consumption of electricity used to treat and deliver water for potable uses. The County lies within Imperial Valley, which is at a lower elevation than its water source, the Colorado River. This unique geography results in the County's raw water being supplied purely from the force of gravity. Thus, energy is used only to treat and distribute water for potable uses. IID is the primary water supplier in the valley, and reports that the conveyance of water from its source to destination is a net generator of energy.[20] As IID is also Imperial Valley's electricity supplier, it is assumed that this electricity source is accounted for in IID's electricity emission factor; therefore, the generation of electricity is excluded from emission calculations.

Since GHG emissions associated with potable water supply are from the consumption of electricity, the emissions calculated for potable water are considered a subset of the energy sector emissions. These calculations are included to provide information for the development of GHG reduction measures in the Imperial Valley Regional Climate Action Plan and are not intended to be added to the total emissions. In order to show the magnitude of water sector emissions compared to the other emissions sectors, the total electricity emissions reported in the figures in this report have had these potable water emissions backed out from the total. However, in cases where data is reported in tables, it will indicate if potable water emissions have been added to the totals or are included for informational purposes. Additionally, due to a lack of reliable data, potable water consumption emissions are not calculated for unincorporated areas and communities of Imperial County. Since the total electricity consumption of the County already includes the electricity used in the treatment and distribution of potable water, assuming this potable water is treated within the County, excluding this subset of emissions does not change the total emissions of the unincorporated County or Imperial Valley as a whole.

Imperial County's incorporated cities, and the majority of unincorporated communities, are served by their own centralized WWTPs. Some households in unincorporated areas are served by on-site septic systems. Emissions from centralized WWTPs in Imperial Valley include process emissions in the form of CH_4 from wastewater treatment lagoons, N_2O from nitrification-denitrification; fugitive emissions from the effluent discharge; and energy required to collect and treat influent wastewater. Emissions from on-site septic systems are primarily generated by fugitive CH_4.

Wastewater treatment technology in Imperial Valley varies between the centralized treatment plants of the seven incorporated cities. A review of various sources concluded that the majority of these treatment plants utilize primary and secondary effluent treatment with activated sludge

[20] Imperial Irrigation District. November 2012. Imperial Integrated Regional Water Management Plan. Appendix O. pp. O-20. https://www.iid.com/water/water-supply/water-plans/imperial-integrated-regional-water-management-plan.

technology with aerated lagoons, without nitrification-denitrification processes.[21] In 2017, the City of Holtville commissioned a new WWTP which contains nitrification-denitrification treatment.[22] Accordingly, process and treatment emissions for all WWTPs will include process emissions associated with aerobic lagoon treatment, with the exception of Holtville which includes emissions associated with nitrification-denitrification emissions.

Wastewater treatment technology specifications can vary widely between jurisdictions, as a result of process specifics, influent characteristics and the age of infrastructure. As noted in the *Community Protocols*, the wastewater emissions calculation methodologies used here were designed as a generalized top-down approach for countries where detailed information was not available; they are a simplified approach that sacrifice accuracy. These methods have a range of accuracy for CH_4 emissions of +37% to -47% and +76% to -93% for N_2O, compared to direct source measurements.[23] While there is significant uncertainty in the fugitive and process emissions associated with wastewater treatment, providing estimates of their emissions provides a general understanding of the magnitude of this emission source in comparison to others.

5.1 Potable Water Consumption Activity Data

Water is supplied to the region from various water suppliers, with the majority of incorporated cities obtaining water from IID. The few exceptions are Calipatria and the unincorporated community of Niland, which are supplied by Golden State Water Company; and other unincorporated portions of the County, which are supplied by Palo Verde Irrigation District and Bard Water District. Water supplied by Golden State Water Company in Imperial Valley is purchased from IID.

The majority of the incorporated cities in Imperial County act as the water suppliers within their jurisdictions and internally track water consumption. Activity data for the 2018 inventory year was provided by the water suppliers. Water volumes for the 2012 and 2005 inventory years were obtained primarily from Urban Water Management Plans (UWMPs) and the 2012 *Imperial Integrated Regional Water Management Plan* (IRWMP).[24] Where data was not available for the 2012 inventory year for some jurisdictions a per service population consumption metric was derived for the 2018 and 2005 consumption values, and a linear interpolation was used to obtain a per service person water consumption. Potable water consumption data was not readily available for unincorporated communities and is therefore not provided in this inventory. The sources for water consumption volumes for each jurisdiction and each inventory year are shown in Table 27 and the potable water consumption volumes are provided in

[21] Sources reviewed include - Imperial Irrigation District. November 2012. Imperial Integrated Regional Water Management Plan. Appendix C. https://www.iid.com/home/showdocument?id=9556.

[22] El Centro Chamber of Commerce. November 26, 2017. *Holtville ribbon cutting clarifies the opening of water treatment plant.* http://www.elcentrochamber.org/news/details/holtville-ribbon-cutting-clarifies-the-opening-of-water-treatment-plant.

[23] ICLEI 2019. U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Appendix F – Wastewater and Water Emission Activities and Sources.

[24] Imperial Irrigation District. November 2012. Imperial Integrated Regional Water Management Plan. https://www.iid.com/water/water-supply/water-plans/imperial-integrated-regional-water-management-plan.

Table 28.

Table 27 Potable Water Consumption Activity Data Sources

	Inventory Year		
Jurisdiction	**2005**	**2012**	**2018**
Brawley	2010 City of Brawly UWMP, Table 14	Provided by City	Provided by City
Calexico	2015 City of Calexico UWMP, Table 5.1	2015 City of Calexico UWMP, Table 5.2	Provided by City
Calipatria[1]	Provided by GSW	Provided by GSW	Provided by GSW
El Centro	2015 City of El Centro UWMP, Table 4-1	Provided by City	Provided by City
Holtville	IID 2012 Imperial IRWMP, Appendix D, Table D-12	Interpolation between 2005 and 2018 based on per SP consumption	Provided by City
Imperial	IID 2012 Imperial IRWMP, Appendix D, Table D-12	Provided by City	Provided by City
Westmorland	IID 2012 Imperial IRWMP, Appendix D, Table D-12	Interpolation between 2005 and 2018 based on per SP consumption	Provided by City
Unincorporated County	Data unavailable	Data unavailable	Data unavailable

Notes: **UWMP** = Urban Water Management Plan; **GSW** = Golden State Water Company; **IID** = Imperial Irrigation District; **IRWMP** = Integrated Regional Water Management Plan; **SP** = Service Population

[1] Water is supplied to Calipatria by GSW in the Calipatria Service Area, which encompasses the incorporated city of Calipatria and unincorporated community of Niland. Water deliveries are tracked at the distribution system that serves both communities, and a breakdown of the total water delivered to each community is not available. GSW estimates that roughly 80% of the service area customers are in Calipatria, while the remaining 20% are in Niland.

Table 28 Potable Water Consumption Activity Data

Jurisdiction	2005 Consumption (MG)	2012 Consumption (MG)	2018 Consumption (MG)
City of Brawley	2,549	2,852	2,185
City of Calexico	2,290	2,183	2,335
City of Calipatria	800	405	312
City of El Centro	2,982	2,685	2,526
City of Holtville	552	436	362
City of Imperial	940	930	961
City of Westmorland	358	289	257
Unincorporated County[1]	NA	NA	NA
Imperial Valley Total	**10,472**	**9,780**	**8,937**

Notes: **MG** = Million Gallons; **NA** = Not Available

1. Potable water consumption data for unincorporated Imperial County was not available for all unincorporated communities and areas and was therefore excluded from this inventory.

5.2 Potable Water Consumption GHG Emission Calculations

Water consumption emissions are calculated from the electricity required to treat and deliver water, which is obtained by multiplying the volume of water delivered in an inventory year by the regional specific water supply energy intensity. This method is consistent with *Community Protocol* Method WW.14. As mentioned previously, due to the geography of the region surface water supplies require zero energy to reach their destination of distribution. Accordingly, only the energy required to treat and distribute water for potable uses in incorporated cities is accounted for in this inventory. It is also assumed that the only energy required for agricultural irrigation is in the use of irrigation pumps to draw water from canals, which is captured in the *Agricultural Inventory and not included in the community inventories*.

The energy intensity factor used for all jurisdictions is 1,214 kWh per million gallons (MG), obtained from the California Public Utilities Commission (CPUC) 2010 *Embedded Energy Water Study*. This value is the higher range observed energy intensity for water treatment and distribution, obtained from the City of Calexico Agency Profile.[25] Using this energy intensity factor, and energy consumption for potable water treatment and distribution was determined for each jurisdiction, which are provided in Table 29. GHG emissions for potable water supply, as provided in Table 30, were calculated by multiplying the appropriate IID electricity emission factor, as provided in Section *Electricity GHG Emission* Calculations, by the total electricity use for potable water treatment and

[25] CPUC 2010. Embedded Energy Water Studies Study 2: Water Agency and Function Component Study and Embedded Energy-Water Load Profiles; Appendix B-Agency Profiles. https://www.cpuc.ca.gov/general.aspx?id=4388. Accessed March 20, 2020.

distribution. These emissions are considered a subset of the energy sector emissions and are not added to the total emissions for any jurisdictions.

Table 29 Electricity Consumption for Water Treatment and Distribution

Jurisdiction	2005 Consumption (kWh)	2012 Consumption (kWh)	2018 Consumption (kWh)
City of Brawley	3,095,026	3,462,304	2,653,076
City of Calexico	2,780,554	2,650,162	2,834,353
City of Calipatria	970,756	491,670	378,401
City of El Centro	3,620,377	3,259,748	3,066,564
City of Holtville	669,722	529,292	439,493
City of Imperial	1,141,257	1,128,691	1,166,570
City of Westmorland	434,746	350,827	311,452
Unincorporated County[1]	NA	NA	NA
Imperial Valley Total	**12,712,438**	**11,872,693**	**10,849,909**

Notes: **kWh** = Kilowatt-hour; **NA** = Not Available

1. Potable water consumption data for unincorporated Imperial County was not available for all unincorporated communities and areas and was therefore excluded from this inventory.

Table 30 Potable Water Consumption GHG Emissions

Jurisdiction	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)
City of Brawley	1,841	1,543	720
City of Calexico	1,654	1,181	769
City of Calipatria	577	1,181	103
City of El Centro	2,153	1,453	832
City of Holtville	398	236	119
City of Imperial	679	503	317
City of Westmorland	259	156	85
Unincorporated County[1]	NA	NA	NA
Imperial Valley Total	**7,560**	**6,254**	**2,944**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent; **NA** = Not Available

1. Potable water consumption data for unincorporated Imperial County was not available for all unincorporated communities and areas and was therefore excluded from this inventory.

5.3 Wastewater Activity Data

The majority of the population in incorporated cities of Imperial County are served by centralized WWTPs; however, a portion of the unincorporated County population uses on-site septic systems. Wastewater generation volumes specific to jurisdictions were obtained from Table N-20 of Appendix N of the IID 2012 IRWMP, which provides the average influent flow of wastewater for each jurisdiction based off interviews of plant chief operators and supervisors in July of 2009. Where a range of values was provided, the mean value is used. The cities of Brawley, Calexico and El Centro also provide total wastewater flows for the year 2015 in their respective UWMPS. The wastewater inflow values and sources for the data are provided in Table 31.

Table 31 Wastewater Generation Activity Data Sources

Jurisdiction	2009[1]	2015[2]
Brawley[2]	4.0 MGD	2.2 MGD
Calexico[3]	2.7 to 2.9 MGD	2,876 AFY
Calipatria	0.75 MGD	-
El Centro[4]	3.6 MGD	1,752 MGY
Holtville	0.6 to 0.65 MGD	-
Imperial	1.4 to 1.6 MGD	-
Westmorland	0.5 MGD	-
Unincorporated County[5]	-	-

Notes: **MGD** = Million Gallons per Day; **AFY** = Acre Feet per year; **MGY** = Million Gallons per Year
1 Acre foot = 0.325851 Million Gallons

1. Source: IID. 2012. Integrated Regional Water Management Plan. Appendix N IID Capital Projects. Table N-20. pp. N-53. https://www.iid.com/home/showdocument?id=9548. Accessed May 15, 2020.

2. Source: City of Brawley. 2015 Urban Water Management Plan. Figure 34. https://wuedata.water.ca.gov/public/uwmp_attachments/6569211661/Brawley%202015%20UWMP%20Final%20Report.pdf. Accessed May 15, 2020.

3. Source: City of Calexico. 2015 urban Water Management Plan. Table 3.1. https://wuedata.water.ca.gov/public/uwmp_attachments/8748310685/CITY%20OF%20CALEXICO%20FINAL%202015%20UWMP%20%28ERRATA%20FEB.%202018%29.pdf. Accessed May 15, 2020.

4. Source: City of El Centro. 2015 Urban water Management Plan. Table 21. https://wuedata.water.ca.gov/public/uwmp_attachments/4364942252/6-23-16%20FINAL%20El%20Centro%202015%20UWMP.pdf. Accessed May 15, 2020.

5. Many wastewater treatment facilities exist in communities in unincorporated Imperial County which do not have clearly reported service populations. The wastewater flows assumed for unincorporated Imperial County are the average per capita wastewater generation rate for all incorporated cities.

The known wastewater flows were converted to gallon per day (GPD) per capita, using the demographic data in Section *Demographics Data*, to obtain a jurisdiction-specific wastewater generation factor. For jurisdictions where values were available for the year 2009 only, this value was used to derive a 2009 wastewater generation per service population to be used for all inventory years. For the jurisdictions where wastewater flow data was available additionally for 2015, the wastewater generation factor derived from 2009 data was used for the 2005 and 2012 inventory years, while an additional wastewater generation factor was derived from the 2015 year, to be used for the 2018 inventory year. While there are multiple WWTP throughout the unincorporated areas and communities, the population served by these facilities is not readily available. Therefore, wastewater generation factor used for the unincorporated County, used for all inventory years, is the average of the 2009 value used for all jurisdictions. The wastewater per capita factors used for wastewater emission calculations in each inventory year are provided in Table 32.

Table 32 Per Capita Wastewater Generation Activity Data

Jurisdiction	2005 Generation (gallons/person/day)	2012 Generation (gallons/person/day)	2018 Generation (gallons/person/day)
City of Brawley	163	163	84
City of Calexico	85	85	64
City of Calipatria	99	99	99
City of El Centro	86	86	107
City of Holtville	106	106	106
City of Imperial	105	105	287
City of Westmorland	98	98	98
Unincorporated Communities	106	106	106

5.4 Wastewater Generation GHG Emissions Calculations

GHG emissions associated with the generation of wastewater include emissions generated by electricity used to collect and treat wastewater and process and fugitive emissions associated with the treatment of wastewater. Emission from electricity consumption are captured in energy sector emissions reporting and are provided here for informational purposes. The energy related emissions for wastewater collection and treatment are not added to community-wide emission totals.

5.4.1 Energy Used for Wastewater Collection and Treatment

Emissions associated with electricity consumed for the collection and treatment of wastewater are calculated using *Community Protocol* Method WW.15. This requires knowing the per capita wastewater generation rate, the population served by the WWTP and the energy intensity of collection and treatment processes. The energy intensity of collection and treatment was obtained from the CPUC 2010 *Embedded Energy Water Study* using the higher range observed energy intensities obtained from the City of Calexico Agency Profile. This energy intensity factor of 4,472 kWh per MG, was assumed for all wastewater treatment in Imperial Valley. The resulting energy used per person per year to treat and collect wastewater was multiplied by the jurisdiction's population served by a centralized WWTP to obtain the energy consumed, as provided in Table 33. The total energy consumed was then multiplied by the appropriate IID electricity emissions factor to obtain GHG emissions, provided in Table 34. Unincorporated communities have a portion of households utilizing on-site septic (further detail in *Wastewater Treatment Fugitive Methane Emissions from Septic* Section below), for which the estimated population using septic was subtracted from the total unincorporated County population.

Table 33 Wastewater Collection and Treatment Energy Consumption

Jurisdiction	2005 Consumption (kWh)	2012 Consumption (kWh)	2018 Consumption (kWh)
City of Brawley	6,091,452	6,771,087	3,753,236
City of Calexico	4,785,867	4,097,791	4,275,078
City of Calipatria	1,223,562	1,292,564	1,212,872
City of El Centro	5,529,431	6,109,927	8,110,579
City of Holtville	933,521	1,044,169	1,122,193
City of Imperial	1,768,962	2,639,603	3,330,580
City of Westmorland	350,907	364,725	373,562
Unincorporated County	2,334,789	2,595,886	2,454,783
Imperial Valley Total	**23,018,492**	**24,915,753**	**24,632,883**

Notes: **kWh** = Kilowatt-hour

Table 34 Wastewater Collection and Treatment Energy GHG Emissions

Jurisdiction	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)
City of Brawley	3,623	3,018	1,018
City of Calexico	2,846	1,826	1,160
City of Calipatria	728	576	329
City of El Centro	3,288	2,723	2,201
City of Holtville	555	465	304
City of Imperial	1,052	1,176	904
City of Westmorland	209	163	101
Unincorporated County	1,388	1,157	666
Imperial Valley Total	**13,689**	**11,105**	**6,684**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

5.4.2 Wastewater Treatment Plant Process Methane Emissions from Treatment Lagoons

Lagoons treat wastewater through a combination of processes, with both aerobic and anaerobic conditions. CH_4 emissions are generated during the anaerobic conditions of treatment.[26] WWTP process emissions from treatment lagoons are calculated for all jurisdictions based on the population of each jurisdiction. Calculations utilize *Community Protocol* Method WW.6(alt), which uses a default value for biochemical oxygen demand (BOD_5), the fraction of BOD_5 removed in primary treatment and the maximum CH_4 producing capacity for domestic wastewater. Table 35 provides the equation used to calculate emissions and the values used for inputs.

Table 35 Wastewater Treatment Lagoon Process Methane Emissions Calculation Equation

Equation Inputs	Values
Calculation Equation	**Annual CH_4 Emissions = ((P x $F_{ind\text{-}com}$) x BOD_5load x (1 - FP) x Bo x MCF_a x 365.25 x 10^{-3}) x GWP**
Population (P)	Jurisdiction-Specific
Factor for significant industrial and commercial co-discharge waste ($F_{ind\text{-}com}$)	1 (not significant input)
Amount of BOD_5 treated per day (BOD_5load)	0.090 (kg BOD_5/person/day)
Fraction of BOD_5 removed in primary treatment (F_p)	0.325
Maximum CH_4 producing capacity for domestic wastewater (Bo)	0.6 (kg CH_4/kg BOD_5)
CH_4 correction factor for anaerobic systems (MCF_a)	0.8
Global Warming Potential (GWP)	28 (MT CO_2e/MT CH_4)

GHG emission calculations use the jurisdiction populations as provided in Section *Demographics Data.* The unincorporated County population used in these calculations has the population served by septic subtracted from population totals. This equates to a total unincorporated County population served by centralized WWTPs of 13,478, 14,985 and 14,170 persons for 2005, 2012 and 2018, respectively. The total population served by on-site septic is detailed in Section *Wastewater Treatment Fugitive Methane Emissions from Septic*. The resulting process GHG emissions from wastewater treatment lagoons is provided in each jurisdiction in Table 36.

[26] ICLEI 2019. U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Appendix F – Wastewater and Water Emission Activities and Sources.

Table 36 Wastewater Treatment Lagoon Process Methane Emissions

Jurisdiction	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)
City of Brawley	3,289	3,656	3,937
City of Calexico	4,953	4,241	5,916
City of Calipatria	1,085	1,146	1,075
City of El Centro	5,639	6,231	6,650
City of Holtville	777	869	933
City of Imperial	1,477	2,204	2,782
City of Westmorland	314	326	334
Unincorporated County	1,935	2,152	2,035
Imperial Valley Total	**19,468**	**20,825**	**23,661**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

5.4.3 Wastewater Treatment Plant Nitrous Oxide Process Emissions

Various wastewater treatment processes generate N_2O emissions. WWTPs in Imperial Valley do not include nitrification or denitrification processes, with the current Holtville WWTP being the exception. Therefore, *Community Protocol* Method WW.8 is used to calculate the process N_2O emissions associated with centralized WWTPs. Table 37 provides the equation used to calculate emissions and the values used for equation inputs.

Table 37 Wastewater Treatment Plant Nitrous Oxide Process GHG Emissions Calculation Equation

Equation Inputs	Values
Calculation Equation	**Annual N_2O Emissions = ((P x $F_{ind\text{-}com}$) x EF x 10^{-6}) x GWP**
Population (P)	Jurisdiction-Specific
Factor for significant industrial and commercial co-discharge waste ($F_{ind\text{-}com}$)	1 (not significant input)
Emission Factor for WWTP without nitrification or denitrification (EF)	3.2 (kg N_2O/person/year)
Global Warming Potential (GWP)	265 ($MT\ CO_2e/MT\ N_2O$)

GHG emission calculations use the jurisdiction populations as provided in Section *Demographics Data.* The unincorporated County population used in these calculations has the population served by septic subtracted from population totals. This equates to a total unincorporated County population served by centralized WWTPs of 13,478, 14,985 and 14,170 persons for 2005, 2012 and 2018, respectively. The total population served by on-site septic is detailed in Section *Wastewater*

Treatment Fugitive Methane Emissions from Septic. The resulting process GHG emissions from wastewater treatment lagoons is provided in each jurisdiction in Table 38.

Table 38 Wastewater Treatment Plant Nitrous Oxide Process GHG Emissions

Jurisdiction	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)
City of Brawley	19	22	23
City of Calexico	29	25	35
City of Calipatria	6	7	6
City of El Centro	33	37	39
City of Holtville	5	5	Not Included
City of Imperial	9	13	16
City of Westmorland	2	2	2
Unincorporated County	11	13	12
Imperial Valley Total	**115**	**123**	**146**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

5.4.4 Wastewater Treatment Plant Process Nitrous Oxide Emissions from Nitrification-Denitrification

In Imperial Valley, only the City of Holtville WWTP includes nitrification-denitrification processes for wastewater treatment. The Holtville WWTP became operational in 2017, therefore, these emissions are calculated only for the 2018 inventory year. WWTP process emissions from nitrification or denitrification treatment are calculated based on the population of the jurisdiction, utilizing *Community Protocol* Method WW.7. Table 39 provides the equation used to calculate emissions and the values used for inputs. Using this information, it is estimated that the City of Holtville generated 12 MT CO_2e from nitrification-denitrification processes for wastewater treatment in 2018.

Table 39 Wastewater Nitrification-Denitrification Process Nitrous Oxide Emissions Calculation Equation

Equation Inputs	Values
Calculation Equation	**Annual N_2O Emissions = $((P \times F_{ind\text{-}com}) \times EF \times 10^{-6}) \times GWP$**
Population (P)	6,700
Factor for significant industrial and commercial co-discharge waste ($F_{ind\text{-}com}$)	1 (not significant input)
Emission Factor for WWTP with nitrification or denitrification (EF)	7 (kg N_2O/person/year)
Global Warming Potential (GWP)	265 (MT CO_2e/MT N_2O)

5.4.5 Wastewater Treatment Fugitive Methane Emissions from Septic

A portion of unincorporated households are served by on-site septic systems, from which anaerobic conditions produce CH_4 fugitive emissions. These emissions are calculated based on the population served by on-site septic using *Community Protocol* Method WW.11(alt). According to the 2015 Imperial County Public Health Department, it was estimated that 6,608 occupied housing units were served by on-site septic in unincorporated communities and areas of the County in 2015, and an average of 88 new systems are installed each year.[27] This growth rate of new system installations was used to backcast the number of systems in 2005 and 2012 and forecast the number of systems in 2018. In order to obtain the population served by septic, the number of septic systems was multiplied by the total number of residents living in the unincorporated County, then dividing by the total number of households or each inventory year. Table 40 provides the number of households using on-site septic and the associated population using on-site septic for calculations.

Table 40 Unincorporated Population Using On-site Septic

Metric	2005	2012	2018
Households Using Septic	5,728	6,344	6,872
Total Population	34,147	37,395	40,007
Total Households	9,463	10,586	10,641
Population Using Septic	**20,669**	**22,410**	**25,837**

Notes: Population Using Septic is calculated by multiplying the number of households using on-site septic by the total population and then dividing by the total households.

[27] Imperial County Public Health Department. 2015. Onsite Wastewater Treatment Systems: Local Agency Management Program/Advanced Protection Management Program. pp.5. http://www.icphd.org/media/managed/environmentalhealth/Imperial_County_Local_Agency_Management_Program.pdf. Accessed May 25th, 2020.

Total fugitive methane emissions from on-site septic in unincorporated Imperial County were estimated to be 2,511 MT CO_2e in 2005, 2,723 MT CO_2e in 2012, and 3,139 MT CO_2e in 2018. The equation used to calculate emissions, along with the equation inputs are provided in Table 41.

Table 41 Wastewater Treatment On-site Septic Fugitive Methane Emissions Calculation Equation

Equation Inputs	Values
Calculation Equation	**Annual CH_4 Emissions = (P x BOD_5load x Bo x MCFs x 365.25 x 10^{-3}) x GWP**
Population (P)	See Table 40
Amount of BOD_5 treated per day (BOD_5load)	0.090 (kg BOD_5/person/day)
Maximum CH_4 producing capacity for domestic wastewater (Bo)	0.6 (kg CH_4/kg BOD_5)
CH_4 correction factor for septic systems (MCFs)	0.22
Global Warming Potential (GWP)	28 (MT CO_2e/MT CH_4)

5.4.6 Wastewater Treatment Fugitive Nitrous Oxide Emissions from Discharge

Treated wastewater that flows from a treatment facility, or effluent discharge, generates N_2O emissions as reactions with nitrogen contained in the discharge occur in the natural watershed.[28] These emissions are calculated based on the population served using *Community Protocol* Method WW.12(alt). Emission calculation equations vary slightly depending on the wastewater treatment process. The use of nitrification or denitrification processes accounts for nitrogen removal with an additional nitrogen removal factor. Additionally, a nitrogen uptake factor accounts for nitrogen uptake in cell growth in aerobic, anaerobic or lagoon systems. Calculations consider the nitrification or denitrification removal of nitrogen only for Holtville in 2018. All calculation use the nitrogen uptake factor for lagoon systems. Table 42 provides the equation used to calculate emissions and the values used for inputs.

[28] ICLEI 2019. U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Appendix F – Wastewater and Water Emission Activities and Sources.

Table 42 Wastewater Treatment Fugitive Nitrous Oxide Emissions Calculation Equation

Equation Inputs	Values
Calculation Equation	**Annual N_2O Emissions = ((P x $F_{ind\text{-}com}$) x (Total N load – N uptake x BOD_5load) x EF x 44/28 x (1 – $F_{nit/denite}$) x 365.25 x 10^{-3}) x GWP**
Population (P)	Jurisdiction-Specific
Factor for significant industrial and commercial co-discharge waste ($F_{ind\text{-}com}$)	1 (not significant input)
Average total nitrogen per day (Total N Load)	0.026 (kg N/person/day)
Nitrogen uptake for cell growth in lagoon system (N uptake)	0.005 (kg N/kg BOD_5)
Amount of BOD_5 treated per day (BOD_5load)	0.090 (kg BOD_5/person/day)
Emission Factor for River Discharge (EF)	0.005 (kg N_2O-N/kg sewage-N discharged)
Fraction of nitrogen removed with nitrification/denitrification ($F_{nit/denite}$)	0.0 [1]
Molecular weight ratio of N_2O to N_2 (44/28)	44/28
Global Warming Potential (GWP)	265 (MT CO_2e/MT N_2O)

Notes:

1. Only the City of Holtville uses nitrification-denitrification at their WWTP for the 2018 inventory year, for which the value of Fraction of nitrogen removed is 0.7.

GHG emission calculations use the jurisdiction populations as provided in Section *Demographics Data.* The unincorporated County population used in these calculations has the population served by septic subtracted from population totals. This equates to a total unincorporated County population served by centralized WWTPs of 13,478, 14,985 and 14,170 persons for 2005, 2012 and 2018, respectively. The total population served by on-site septic is detailed in Section *Wastewater Treatment Fugitive Methane Emissions from Septic*. The resulting process N_2O emissions from wastewater treatment lagoons is provided in each jurisdiction in Table 43.

Table 43 Wastewater Treatment Fugitive Nitrous Oxide Emissions from Discharge

Jurisdiction	2005 Emissions ($MT\ CO_2e$)	2012 Emissions ($MT\ CO_2e$)	2018 Emissions ($MT\ CO_2e$)
City of Brawley	445	494	532
City of Calexico	670	573	800
City of Calipatria	147	155	145
City of El Centro	762	842	899
City of Holtville	105	117	38
City of Imperial	200	298	376
City of Westmorland	42	44	45
Unincorporated County	262	291	275
Imperial Valley Total	**2,632**	**2,816**	**3,111**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

6 Waste Sector Methodology

Emissions associated with the solid waste sector result from the decomposition of waste at a landfill and waste processing equipment. Emissions calculated for waste decomposition represent the methane commitment of waste landfilled in the corresponding inventory year. These emissions do not necessarily occur in the same year as the inventory but occur over the lifetime of the decaying waste.

6.1 Waste Sector Activity Data

Activity data for the waste sector of GHG emissions consist of solid waste landfilled by each jurisdiction. For inventory year 2005, the amount of waste sent to landfills was available through the California Department of Resources Recycling and Recovery (CalRecycle) Single-year Countywide Destination Detail Report.[29] After 2005, the jurisdictions in Imperial Valley began reporting to CalRecycle collectively under the Imperial Valley Resource Management Agency, and jurisdiction-specific data was not available through CalRecycle. For 2018, the tonnage of waste disposed in landfills was provided by each jurisdiction. The 2012 landfilled waste was estimated by deriving a per service population disposal metric for 2005 and 2018 and performing a linear interpolation to obtain a per service person disposal metric for 2012, which was then multiplied by the 2012 service population. The service population for each jurisdiction is the population plus the number of employees, which was obtained from SCAG demographic data, as described in Section *Demographics Data*. Table 44 provides the total waste disposed by each jurisdiction in each inventory year.

[29] CalRecycle. Local Government Central: Single-year Countywide Destination Detail. Imperial County, 2005. https://www2.calrecycle.ca.gov/LGCentral/DisposalReporting/Destination/DisposalByFacility. Accessed December 2019.

Table 44 Solid Waste Disposal Activity Data

Jurisdiction	2005 Waste Landfilled (short tons)	2012 Waste Landfilled (short tons)	2018 Waste Landfilled (short tons)
City of Brawley	25,614	24,712	23,218
City of Calexico	30,530	22,358	26,167
City of Calipatria	3,974	2,688	1,807
City of El Centro	68,138	50,213	32,299
City of Holtville	6,890	4,643	2,739
City of Imperial	13,053	14,291	13,654
City of Westmorland	1,822	1,564	1,485
Unincorporated County	122,975	85,855	50,976
Imperial Valley Total	**272,996**	**206,324**	**152,345**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

6.2 Waste Sector GHG Emission Calculations

Waste sector GHG emissions were calculated based on the waste landfilled by each jurisdiction, using regional specific waste and landfill data. Emissions from the disposal of solid waste are calculated for methane emissions from solid waste sent to landfills and process emissions from landfilling.

6.2.1 Solid Waste Landfill Methane Emissions

The methane emissions from landfilled waste were calculated using *Community Protocol* Method SW.4.1. This method requires the knowing the landfill gas (LFG) capture rate of the landfills which the waste is sent to and the characterization of the waste stream for developing a regionally accurate emission factor. Waste from Imperial Valley jurisdictions is sent to many landfills; however, the majority each year is sent to two landfills, the Monofill Facility and Imperial Landfill.[30] Since the facilities that waste was sent to each year is only tracked at the County level, an LFG capture rate was derived for the entire County based on a weighted average of total waste sent to these facilities. The Monofill facility does not have LFG capture, while the Imperial Landfill does.[31] The LFG capture rate for 2012 and 2018 were obtained from the US Environmental Protection Agency (USEPA) Facility Level Information on GreenHouse gases Tool (FLIGHT), and the 2005 value used was the average of these values.[32] Table 45 provides the proportion of total waste sent to these two

[30] CalRecycle. Local Government Central: Jurisdiction Disposal and Alternative Daily Cover (ADC) Tons by Facility. Imperial County, 2005, 2012 and 2018. https://www2.calrecycle.ca.gov/LGCentral/DisposalReporting/Destination/DisposalByFacility. Accessed December 2019.

[31] CalRecycle. 2020. SWIS Facility/Site Search. SWIS Data File. https://www2.calrecycle.ca.gov/SWFacilities/Directory/. Accessed March 25th, 2020.

[32] This facility did not report emissions in 2012; therefore 2013 LFG capture rate was used as proxy. USEPA. 2020. Facility Level Information on GreenHouse gases Tool (FLIGHT). Accessed May 25th, 2020.

landfills, and the landfill gas capture rate for the Imperial Landfill. The resulting weighted LFG Capture rate was used as the LFG capture rate for emissions calculations in all jurisdictions.

Table 45 Solid Waste Landfill Gas Capture Rates

Jurisdiction	Percentage of Total County Waste	Facility LFG Capture Rate	Weighted LFG Capture Rate
2005			
Imperial Landfill	61%	0.615	
Monofill Facility	31%	0	0.375
Brawley Solid Waste Site	6%	0	
2012			
Imperial Landfill	60%	0.833	
Monofill Facility	35%	0	0.500
Salton City Solid Waste Site	2%	0	
2018			
Imperial Landfill	60%	0.398	
Monofill Facility	33%	0	0.239
Salton City Solid Waste Site	5%	0	

Waste characteristics and the associated emission factors were obtained from CalRecycle's Waste Characterization Web Tool.[33,34] The waste characterization used the sum of the commerical waste stream and residential waste stream for Imperial County. Emission factors were obtained from the California Landfill Gas Tool.[35] Table 46 provides the proportion of each waste category that make up the Imperial Valley waste stream, the associated emission factors, and the weighted emission factor for the entire waste stream used for emission calculations.

2013 data: https://ghgdata.epa.gov/ghgp/service/html/2013?id=1006197&et=undefined
2018 data: https://ghgdata.epa.gov/ghgp/service/html/2018?id=1006197&et=undefined

[33] CalRecycle Waste Characterization Web Tool: Commercial Waste Stream – Materials Type Data Export. https://www2.calrecycle.ca.gov/WasteCharacterization/MaterialTypeStreams%3fcy%3d13%26lg%3d1013%26bg%3d%26mtf%3d. Accessed March 31st, 2020.

[34] CalRecycle Waste Characterization Web Tool: Residential Waste Stream Data Export. https://www2.calrecycle.ca.gov/WasteCharacterization/ResidentialStreams%3fcy%3d13%26lg%3d1013. Accessed March 31st, 2020.

[35] CARB. 2010. Landfill Gas Tool. https://www.arb.ca.gov/cc/landfills/landfills.htm. Accessed May 25th, 2020.

Table 46 Solid Waste Characterization and Methane Emission Factors

Waste Type	Percentage of Waste Stream	Emission Factor (MT CH_4/ short ton of waste)
Food	22%	0.0776
None (inert)	21%	0.0000
Coated Paper	16%	0.0486
Lumber	8%	0.0605
Other Organics	6%	0.0476
Textiles	5%	0.0726
Leaves and Grass	5%	0.0255
Branches	5%	0.0619
Construction/Demolition	3%	0.0121
Corrugated Boxes	2%	0.1200
Uncategorized	2%	0.0631
Newspaper	2%	0.0429
Office Paper	2%	0.2029
Medical Waste	0%	0.0454
Sludge/Manure	0%	0.0151
Total	**100%**	**0.0502**

Data Sources:

CalRecycle Waste Characterization Web Tool: Commercial Waste Stream – Materials Type Data Export. https://www2.calrecycle.ca.gov/WasteCharacterization/MaterialTypeStreams%3fcy%3d13%26lg%3d1013%26bg%3d%26mtf%3d. Accessed March 31st, 2020.

CalRecycle Waste Characterization Web Tool: Residential Waste Stream Data Export. https://www2.calrecycle.ca.gov/WasteCharacterization/ResidentialStreams%3fcy%3d13%26lg%3d1013. Accessed March 31st, 2020.

CARB. 2010. Landfill Gas Tool. https://www.arb.ca.gov/cc/landfills/landfills.htm. Accessed May 25th, 2020.

Emissions associated with landfilled waste, using *Community Protocol* Method SW.4.1, are calculated by multiplying the amount of waste landfilled by the waste stream emission factor, while accounting for the LFG capture rate and oxidation factor. The equations used and inputs are provided in Table 47, and the calculation results are provided in Table 48.

Table 47 Solid Waste Landfill Methane Emissions Calculation Equation

Equation Inputs	Values
Calculation Equation	**Annual CH_4 Emissions = (1 - CE) x M x EF x (1-OX) x GWP**
LFG Collection Efficiency (CE)	See Table 45
Total mass of waste entering landfill (M)	See Table 44 (short tons)
Waste stream emission factor (EF)	0.0502 (MT CH_4/short tons of waste)
Oxidation rate (OX)	0.10
Global Warming Potential (GWP)	28 (MT CO_2e/MT CH_4)

Table 48 Solid Waste Landfill Methane Emissions

Jurisdiction	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)
City of Brawley	20,252	15,631	22,352
City of Calexico	24,139	14,142	25,191
City of Calipatria	3,142	1,700	1,739
City of El Centro	53,873	31,761	31,095
City of Holtville	5,448	2,937	2,637
City of Imperial	10,320	9,039	13,145
City of Westmorland	1,441	989	1,429
Unincorporated County	97,230	54,305	49,074
Imperial Valley Total	**215,844**	**130,504**	**146,662**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

6.2.2 Solid Waste Landfilling Process Emissions

Emissions generated by equipment used at landfills are calculated using *Community Protocol* Method SW.5. This method provides an emissions factor for compressed natural gas (CNG) fuled landfilling equipment based on the total mass of solid waste that enters the landfill. Emissions in carbon dioxide equivalent are calculated by mulitplying the mass of solid waste landfilled by each jursidcition with the emission factor of 0.011 MT CO_2e per short ton of waste.[36] Emissions associated with landfill process equipment are provided in Table 49.

[36] ICLEI 2019. U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Appendix F – Wastewater and Water Emission Activities and Sources.

Table 49 Solid Waste Landfill Process GHG Emissions

Jurisdiction	2005 Emissions (MT CO_2e)	2012 Emissions (MT CO_2e)	2018 Emissions (MT CO_2e)
City of Brawley	282	272	255
City of Calexico	336	246	288
City of Calipatria	44	30	20
City of El Centro	750	552	355
City of Holtville	76	51	30
City of Imperial	144	157	150
City of Westmorland	20	17	16
Unincorporated County	1,353	944	561
Imperial Valley Total	**3,003**	**2,270**	**1,676**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

Appendix C

Imperial Valley Agricultural GHG Emissions Inventory

This report prepared on 50% recycled paper with 50% post-consumer content.

Table of Contents

Tables

Figures

1 Introduction

Agriculture is the primary economic driver and one of the identifying characteristics of the Imperial Valley. In 2017, Imperial County was ranked the 10th highest producing county for gross value of agricultural production in California; and was the top producer of alfalfa hay, alfalfa seed, Sudan hay, sweet corn and wheat. Additionally, cattle was the number one gross value commodity produced in the County.[1] Considering the importance of agriculture in Imperial Valley, understanding the greenhouse gas (GHG) emissions resulting from these activities is an important aspect of the climate action planning process.

The Agricultural Inventory includes GHG emissions generated by the following sources:

- Stationary Fuel Combustion
- Agricultural Off-Road Equipment
- Crop Production
- Livestock Enteric Fermentation
- Livestock Manure Management

These agricultural emission sources and methodologies are consistent with reporting in the *California GHG Emissions Inventory*, with the exception of off-road equipment.[2] To maintain consistency with the Community Inventory, GHG emissions are calculated for the years 2018, 2012 and 2005.

1.1 Reporting Emissions

California's 2017 Climate Change Scoping Plan Update emphasized the critical role that managing our natural and working lands to reduce greenhouse gases and maintain them as a resilient carbon sink has in complementing the measures described in the Scoping Plan and mitigate many of the agricultural GHG emission sources.[3] However, specific analysis related to agricultural GHG emission sequestration is critical to develop a comprehensive mitigation strategy for agricultural emissions. This level of analysis was not included in this scope. Thus, inventory and agricultural emission reduction strategies inventory presents agricultural GHG emissions separate from the Community Inventories completed for each jurisdiction

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[1] Imperial County Agricultural Commissioner Sealer of Weights and Measures. 2019. Imperial County Agricultural Crop and Livestock Report. https://www.co.imperial.ca.us/ag/docs/spc/crop_reports/2018_Imperial_County_Crop_and_Livestock_Report.pdf.

[2] The California Greenhouse Gas Emissions Inventory reports agricultural off-road equipment under transportation sector emissions. Source: California Air Resources Board. 2019. 2019 Edition, California Greenhouse Gas Emission Inventory: 2000-2017. https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2017/ghg_inventory_trends_00-17.pdf.

[3] California Air Resources Board (CARB). 2017. California's 2017 Climate Change Scoping Plan. https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf

At this time, California Air Resources Board (CARB) has developed a draft Natural and Working Lands Implementation Plan intended to evaluate a range of implementation scenarios for natural and working lands and to identify long-term sequestration goals that can be incorporated into future climate policy.[4] Inclusion of the state's Natural and Working Lands analysis will be important to achieving the Imperial Valley's longer-term climate goals.

The ICLEI *U.S. Community Protocol* recommends reporting GHG emissions resulting from agricultural activities in a community inventory.[5] Data used to generate agricultural GHG emissions are generally only available at the county scale and are not disaggregated for each of the jurisdictions in Imperial Valley. Thus, this inventory presents agricultural GHG emissions separate from the Community Inventories completed for each jurisdiction.

The majority of agricultural emission occur within the unincorporated County, with some of the incorporated Cities in Imperial County having agricultural activities within their boundaries. However, agricultural data is not consistently tracked by all jurisdictions within the Imperial Valley; therefore, emissions are reported for the entire Imperial Valley based on available county-wide data. GHG emissions from agricultural activities are considered scope 1 emission sources, as they are generally direct emissions that occur within the jurisdiction boundary. While this inventory encompasses most agricultural emission sources within Imperial Valley, availability of complete data sets results in some emission sources not being reported.

1.2 Calculating Emissions

Emissions are estimated using calculation-based methodologies to derive emissions using activity data and emissions factors. To estimate emissions, the following general equation is used:

$$Activity\ Data\ \times Emission\ Factor = Emissions$$

Activity data refer to the relevant measurement of energy use or other GHG-generating processes such as fuel consumption, tons of fertilizer applied, and heads of livestock. Emission factors are used to convert energy usage or other activity data into associated emissions quantities. They are usually expressed in terms of emissions per unit of activity data (e.g., pounds [lbs] of CO_2/kilowatt hour [kWh]).

1.2.1 Agricultural Emissions Activity Data

Activity data for calculating agricultural GHG emissions in Imperial Valley was obtained from multiple sources, including the Imperial County Agricultural Commissioner and United States Department of Agriculture. The type of activity data used to calculate GHG emissions is summarized in Table 1, while the values and direct data sources are outlined further in the following discussion of data sources for each emission source. Activity data was not available for all activities for all years; therefore, available data was used to derive estimates for the missing data points. The assumptions used for these estimates are provided where applicable.

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[4] California Air Resources Board (CARB). 2019. California 2030 Natural and Working Lands Climate Change Implementation Plan . https://ww2.arb.ca.gov/sites/default/files/2019-06/draft-nwl-ip-040419.pdf

[5] ICLEI. 2019. US Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Version 1.2. https://icleiusa.org/publications/us-community-protocol/

Table 1 Summary of Activity Data Used for Agricultural Emission Calculations

Emissions Source	Activity Data	Units
Stationary Fuel Combustion	Diesel Agricultural Pumps	Number of Pumps
Off-road Equipment	County-wide Fuel Consumption	Gallons
Crop Production – Residue Burning	Acres of Cropland Burned	Acre
Crop Production – Fertilizer Application	Tons of Nitrogen in Fertilizer Applied	MT N
Crop Production – Liming	Tons of Liming Material Applied	MT Material
Livestock Enteric Fermentation	Livestock Population	Heads
Livestock Manure Management	Livestock Population in Manure Management System	Heads

MT CO_2e = Metric Tons of Carbon Dioxide Equivalent; **MT N**= Metric Tons of Nitrogen

1.2.2 Agricultural Emission Factors

Emission factors used to calculate GHG emissions in the Agricultural Inventory were obtained from the *California GHG Emissions Inventory* where applicable. Emission factors used in this inventory are summarized in Table 2, converted to MT CO_2e using the appropriate Global Warming Potential where applicable.

Table 2 Summary of Emission Factors Used for Agricultural Emission Calculations

Emissions Source	Emission Factor	Units
Stationary Fuel Combustion	Emissions per hour of operation at brake horsepower	grams CO_2e/brake horsepower-hour
Off-road Equipment	Fuel specific emission factors	MT CO_2e/gallon of fuel
Crop Production – Residue Burning	Emissions per acre of crop type	MT CO_2e/tons of crop
Crop Production – Fertilizer Application	Nitrogen emitted per ton of nitrogen fertilizer applied	MT CO_2e/MT N
Crop Production – Liming	Carbon dioxide emitted per ton of liming material	MT CO_2/MT Material
Livestock Enteric Fermentation	Emissions per livestock head	MT CO_2e/Head
Livestock Manure Management	Emissions per mass of manure produced	MT CO_2e/Manure Mass

MT CO_2e = Metric Tons of Carbon Dioxide Equivalent; **MT N**= Metric Tons of Nitrogen

2 Agricultural Emissions Methodology

Agricultural GHG emission calculations for each category of agricultural emissions source are detailed below. Each emission source has a description of the activity data used, the sources of the data, and the calculation methodology. Calculations are performed with methodologies utilized by CARB to complete previous GHG emissions inventories, as provided in the *Documentation of California's GHG Inventory Index*, and 2003 *CARB Emission Inventory Methodology*.

2.1 Stationary Fuel Combustion

Stationary fuel combustion considered in this inventory includes the use of diesel agricultural pumps. This emission source is expected to cover the emissions required to draw water from local waterways.

2.1.1 Stationary Fuel Combustion Activity Data

GHG Emissions from fuel combustion were estimated from average operation hours and load for the total number of agricultural irrigation pumps in Imperial County. The number of pumps was obtained from the 2006 *CARB Emission Inventory Methodology*[6] and the subsequent 2018 update to the *CARB Emission Inventory Methodology*[7], which provided the populations of agricultural irrigation pumps in Imperial County for the years 2003.[8] The 2003 population data was then scaled with the with the annual total harvested acres in Imperial County, as obtained from the 2003, 2005, 2012 and 2018 *Imperial County Crop Reports*.[9]

Agricultural pumps are separated into stationary and portable categories A stationary pump is fixed in place; a portable pump engine is one that is mounted on a mobile piece of equipment or on skids and is moved from place to place depending on the need. For this inventory, the split in population between stationary and portable for all inventory years is estimated based on the population reported in Table D-2 of the 2006 *CARB Emission Inventory Methodology*, which is 40 percent portable and 60 percent stationary.

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[6] California Air Resources Board. August 2006. Emission Inventory Methodology: Agricultural Irrigation Pumps – Diesel. https://ww3.arb.ca.gov/regact/agen06/attach2.pdf

[7] California Air Resources Board. August 2018. . Emission Inventory Methodology: Agricultural Irrigation Pumps – Diesel. https://ww3.arb.ca.gov/ei/areasrc/fullpdf/full1-1.pdf

[8] Typically, permit data accounting for the number of diesel agricultural pumps in the County is used to estimate GHG emissions from; however, this data was not available through the Imperial County Air Pollution Control District.

[9] County of Imperial Agricultural Commissioner Sealer of Weights and Measures. Imperial County Crop Reports. https://agcom.imperialcounty.org/crop-reports/.

2.1.2 Stationary Fuel Combustion Calculations

Emissions from the stationary combustion of diesel fuel in irrigation pumps were estimated by multiplying the number of pump engines by their horsepower rating, load factor, annual operating hours, and emission factor.[10] The basic equation for calculating these emissions is:

$$Emissions = Pop \times EF \times Hrs \times HP \times LF$$

where:

Pop = population of diesel agricultural irrigation pump engines
EF = emission factor (units of grams/brake horsepower-hour)
Hrs = average annual hours in use
HP = average brake horsepower of engine
LF = average engine load factor

The 2003 *CARB Emission Inventory Methodology* provides pump population estimates for the year 2003, average brake horsepower of engines, average engine load factors, emission factors, and average annual hours in use. It is assumed that pumps in all inventory years operate for 1000 hours annually and operate with an average load factor of 0.65 and an emission factor of 568.3 grams of CO_2 per brake horsepower-hour. As described in *Stationary Fuel Combustion Activity Data*, agricultural irrigation pumps in Imperial County are broken down by whether they are stationary or portable, due to the different average horsepower. The average horsepower of portable pumps used to calculate emissions is 114 HP, derived by obtaining the average horsepower of the portable pump types reported in from Table D-5 of the 2003 *CARB Emission Inventory Methodology*. The estimated horsepower of stationary pumps used for calculations is 155 HP, obtained from Table D-4 of the same document. The horsepower of an engine relates to its fuel consumption, with higher horsepower rated engines consuming more fuel than lower horsepower rated engines an equivalent operating time period. Table 3 provides inventory year specific calculation data and results, including the 2003 data used to estimate the number of pumps in each inventory year.

[10] California Air Resources Board. August 2006. 2003 Emission Inventory Methodology: Agricultural Irrigation Pumps – Diesel. https://ww3.arb.ca.gov/regact/agen06/attach2.pdf

Table 3 Agricultural Irrigation Pump Calculation Data and GHG Emission Results

Year	Pump Type	Annual Acres Harvested in County	Population	Emissions (MT CO_2e)[1]
2003	**Total**	**542,121**	**200**	**N/A**
2005	Stationary	-	69	N/A
2005	Portable	-	46	N/A
2005	**Total**	**513,970**	**190**	**9,134**
2005	Stationary	-	114	4,791
2005	Portable	-	76	4,343
2012	**Total**	**565,372**	**209**	**10,047**
2012	Stationary	-	125	5,270
2012	Portable	-	83	4,777
2018	**Total**	**537,193**	**198**	**9,546**
2018	Stationary	-	119	5,007
2018	Portable	-	79	4,539

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; N/A = Not Applicable

1. Emissions for 2003 are not calculated since it is not one of the inventory years in the scope of this report. 2003 values are provided to show the baseline data from which emissions in 2005, 2012, and 2018 were calculated.

GHG emissions from agricultural irrigation pumps are estaimted to be approximately 9,134 MT CO_2e, 10,047 MT CO_2e, and 9,546 MT CO_2e for the years 2005, 2012 and 2018, respectivley.

2.2 Agricultural Off-road Equipment

Agricultural off-road equipment emissions include the combustion of fossil fuels in equipment used in regular agricultural operations.

2.2.1 Agricultural Off-Road Equipment Activity Data

GHG emissions from fuel combustion in off-road equipment used in agricultural operations were estimated using the CARB OFFROAD2017 modeling tool. The model runs used included only agricultural emission sources in Imperial County for the three inventory years. Model outputs included the total annual gasoline and diesel fuel consumption for agricultural equipment.

2.2.2 Agricultural Off-road Equipment Calculations

Agricultural off-road equipment emissions were calculated by multiplying the fuel consumption totals by the appropriate emission factors and global warming potentials to obtain emissions in carbon dioxide equivalent. Table 4 provides the fuel consumption, emission factors and GHG emissions for agricultural equipment in 2005, 2012 and 2018. Agricultural off-road equipment in

Imperial Valley generated approximately 65,118 MT CO_2e in 2005, 64, 283 MT CO_2e in 2012, and 63,588 MT CO_2e in 2018, showing a slight decrease in emissions over time.

Table 4 Agricultural Off-road Equipment GHG Emissions Forecast

Data Type	2005	2012	2018
Diesel Fuel			
Fuel Consumption (gallons)	6,215,874	6,134,444	6,067,452
CO_2 Emission Factor (kg CO_2/gallon)		10.21	
CH_4 Emission Factor (g CH_4/gallon)		0.28	
N_2O Emission Factor (g N_2O/gallon)		0.49	
Diesel GHG Emissions (MT CO_2e)	**63,464**	**62,633**	**61,949**
Gasoline Fuel			
Fuel Consumption (gallons)	188,362	187,993	186,661
CO_2 Emission Factor (kg CO_2/gallon)		8.78	
CH_4 Emission Factor (g CH_4/gallon)		12.96	
N_2O Emission Factor (g N_2O/gallon)		0.21	
Gasoline GHG Emissions (MT CO_2e)	**1,654**	**1,651**	**1,639**
Total Emissions (MT CO_2e)	**65,118**	**64,283**	**63,588**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; **kg** = kilograms; **CO_2** = Carbon Dioxide; **CH_4** = Methane; **N_2O** = Nitrous Oxide.
IPCC 5th Assessment Report Global Warming Potentials used for GHG emission calculations (1 kg CO_2 = 1 kg CO_2e; 1 kg CH_4 = 21 kg CO_2e; 1 kg N_2O = 265 kg CO_2e).
GHG Emission Factors obtained from Environmental Protection Agency 2018 Emission Factors for Greenhouse Gas Inventories. CO_2 values were obtained from Table 4 and CH_4 and N_2O values were obtained from the average of the appropriate equipment class in Table 5. https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf.

Data Sources: CARB. 2017. OFFROAD2017 - ORION. Mobile Source Emissions Inventory Program. https://www.arb.ca.gov/orion/.

2.3 Crop Production

Crop production GHG emissions are calculated for crop residue burning and soil management based on the acres of crops burned and the tons of nitrogen fertilizer and liming material applied to crops.

2.3.1 Crop Production Activity Data

The acres of crops burned in Imperial County for which burn permits were obtained during the inventory years were provided by Imperial County Air Pollution Control District (ICAPCD). The acres of crops for which burn permits were obtained are broken down by crop type.

Tons of nitrogen fertilizer applied were derived based on the acres of crops harvested in Imperial County for an inventory year and the recommended per acre nitrogen fertilizer application rate for each crop type. Acres of crops harvested were obtained from the annual *Imperial County Crop and Livestock Reports*, produced by the Imperial County Agricultural Commissioner Sealer of Weights and Measures, which detail the number of acres harvested of each crop type in Imperial County for a specific year. The per acre recommendations of nitrogen fertilizer application for each crop type were obtained from the Cost and Return Studies published by the University of California Cooperative Extension, accessed through the University of California Davis Agricultural and Resource Economics Archived Cost and Return Studies database.[11] Recommended fertilizer application rates were obtained from studies specific to southeastern California where available, including Imperial Valley and Riverside County. Where a range of fertilizer application rates were provided in the study, the mean of the range was used; and where an “up to” rate was provided, this “up to” rate was used. Orchard trees require different fertilizer application rates depending on age; thus, a single fertilizer application rate was derived as the average of the recommended application rate for each tree age group, weighted by the estimated fruit production for that age group.

The amount of liming material applied to soils in Imperial County was obtained directly from the California Department of Food and Agriculture *Fertilizing Material Tonnage Report* for 2018.[12] Liming material includes both dolomite and limestone applied to soils for pH balancing purposes.

Data sources for acres harvested and fertilizer application rates and liming material applied are detailed in Table 5.

[11] https://coststudies.ucdavis.edu/en/archived/

[12] California Department of Food and Agriculture (CDFA). 2019. 2018 Fertilizing Material Tonnage Report. https://www.cdfa.ca.gov/is/ffldrs/pdfs/2018_Tonnage.pdf

Table 5 Summary of Crop Production Activity Data Sources

Activity Data	Data Source	Web Address
Acres Burned		
All Crops	Burn permits provided by ICAPCD	N/A
Acres Harvested		
All Crops - 2018	2018 Imperial County Agricultural Crop and Livestock Report	https://www.co.imperial.ca.us/ag/docs/spc/crop_reports/2018_Imperial_County_Crop_and_Livestock_Report.pdf
All Crops - 2012	2012 Imperial County Agricultural Crop and Livestock Report	https://www.co.imperial.ca.us/ag/docs/spc/crop_reports/2012_Imperial_County_Crop_and_Livestock_Report.pdf
All Crops - 2005	2005 Imperial County Agricultural Crop and Livestock Report	https://www.co.imperial.ca.us/ag/docs/spc/crop_reports/2005_Imperial_County_Crop_and_Livestock_Report.pdf
Nitrogen Fertilizer Application Rate		
Alfalfa	Sample Cost to Establish and Produce Alfalfa Hay, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/ef/fc/effc7ea2-5387-4b00-8730-9758b1d7bb27/alfalfahaybed03.pdf
Bermuda	Sample Cost to Establish and Produce Bermudagrass Hay, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/9a/bd/9abdbf16-08b2-4a39-91bf-001e2cda6bc7/bermhay03.pdf
Cotton	Sample Cost to Establish and Produce Cotton, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/b5/82/b58230d6-7614-4b34-9af1-32a96176dc66/cottonim03.pdf
Kleingrass	Sample Cost to Establish and Produce Kleingrass, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/e2/44/e244021e-fd2e-4bec-8b7a-257420b2a0c8/kleingrass03.pdf
Sudangrass	Sample Cost to Establish and Produce Sudangrass, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/3e/76/3e760e51-7e18-4373-b038-c27cd756d125/sudangrass03.pdf
Sugar Beets	Sample Cost to Establish and Produce Sugar Beets, Imperial County - 2000	https://coststudyfiles.ucdavis.edu/uploads/cs_public/10/48/10489d39-a14f-44f7-8d0f-b7d79c08cd06/sugarbeets.pdf
Wheat	Cereal Crops Projected Production Costs 1991-1992	https://coststudyfiles.ucdavis.edu/uploads/cs_public/11/ed/11edce72-ce67-4ee4-bb2e-a546dc9c1ef0/ce-si-92-cereal-1992-wheatbarleysoutheastinlandimperialcounty.pdf
Misc. Field Crops	Average of Field Crops in this table	N/A
Asparagus	Sample Cost to Establish and Produce Asparagus, Imperial County – 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/4a/84/4a84760e-b7e7-4d5e-8c77-79f7169a6ab3/asparagus03.pdf
Broccoli	Sample Cost to Establish and Produce Broccoli, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/35/4f/354f4e31-f192-4ed3-ba0d-68f06da0a630/broccoli03.pdf
Cabbage	Sample Cost to Establish and Produce Cabbage, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/2c/b2/2cb21113-a5d7-439d-b4bd-2bced52e3776/cabbage03.pdf
Carrots	Sample Cost to Establish and Produce Carrots, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/15/7a/157a99be-d9a0-4d1f-8a55-f84e98f5a6b6/carrots03.pdf
Cauliflower	Sample Cost to Establish and Produce Cauliflower, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/d8/5d/d85db417-dd07-4d26-b8c8-19e51637ebb7/cauliflower03.pdf
Nitrogen Fertilizer Application Rate continued		

Activity Data	Data Source	Web Address
Head Lettuce	Iceberg Lettuce Projected Production Costs 1989-1990, Imperial County	https://coststudyfiles.ucdavis.edu/uploads/cs_public/d8/29/d82997d2-6a63-476a-8c86-c64469bc4c83/lt-si-90-1-lettuce-1990-icebergsoutheastinlandimperialcounty.pdf
Leaf Lettuce	Sample Cost to Establish and Produce Leaf Lettuce, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/dd/0c/dd0cbb00-215b-4062-9f2d-67c760697d50/leaflettuce03.pdf
Spring Mix	Assumed to be the same as for Leaf Lettuce	N/A
Onions	Sample Cost to Establish and Produce Onions, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/ca/e8/cae8d9a1-12bf-4ffa-afa1-e3f133941001/mktonion03.pdf
Potatoes	Sample Cost to Establish and Produce Potatoes, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/0b/a5/0ba5f71e-5290-45b5-9b38-7190b7883388/potatoes.pdf
Spinach	Assumed to be the same as for Leaf Lettuce	N/A
Sweet Corn	Field Corn Projected Production Costs 1987-1988 , Imperial County	https://coststudyfiles.ucdavis.edu/uploads/cs_public/4e/2b/4e2b817a-f678-4565-9858-95819fcc1b1f/corn-1988-southeastinterior-imperialcounty.pdf
Romaine Lettuce	Assumed to be the same as for Leaf Lettuce	N/A
Misc. Veg.	Average of vegetable values in this table	N/A
Cantaloupes	Sample Cost to Establish and Produce Cantaloupes, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/7e/4d/7e4ddbb8-258a-441f-aaa0-21815c8bb436/cantaloupemb03.pdf
Honeydew and Melons	Sample Cost to Establish and Produce Mixed Melons, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/6d/36/6d361290-7935-442e-a139-46663366a444/mixmelons03.pdf
Watermelon	Sample Cost to Establish and Produce Watermelon, Imperial County - 2003	https://coststudyfiles.ucdavis.edu/uploads/cs_public/a7/02/a70224a1-88de-4b9f-a314-cf3199341378/watermelon03.pdf
Dates	Sample Costs to Establish a Date Palm Orchard and Produce Dates in the Coachella Valley, Riverside County, 2005-2006	https://coststudyfiles.ucdavis.edu/uploads/cs_public/b5/55/b5553ac8-9aaa-49e1-b617-8e87f0e55bf0/dates_si_2005.pdf
Grapefruit	Establishment and Production Costs, Grapefruit, Western Riverside County, 1998	https://coststudyfiles.ucdavis.edu/uploads/cs_public/e9/9f/e99f1464-c4a7-43f4-bf38-095305c997c0/98grapefruit.pdf
Lemons	Establishment and Production Costs, Lemons, Coachella Valley, Riverside County, 1998	https://coststudyfiles.ucdavis.edu/uploads/cs_public/43/53/4353d9a5-0c65-414f-9f80-e2f8cb819db7/98lemon.pdf
Tangelos	Sample Costs to Establish a Minneola Orchard and Produce Minneola Tangelos, San Joaquin Valley – South, 2002	https://coststudyfiles.ucdavis.edu/uploads/cs_public/f1/bc/f1bc157e-feee-4f4e-9336-e2e8b4571c13/minneolovs02.pdf
Oranges	Establishment and Production Costs, Valencia Oranges, Coachella Valley, Riverside County, 1998	https://coststudyfiles.ucdavis.edu/uploads/cs_public/c7/fe/c7feea56-68df-4d22-aa51-3b96a5bb7396/coachvaloranges.pdf
Tangerines	Assumed to be the same as for Tangelos	N/A
Liming Material Application Rate		
Liming Material	California Department of Food and Agriculture. 2018 Fertilizing Material Tonnage Report.	https://www.cdfa.ca.gov/is/ffldrs/pdfs/2018_Tonnage.pdf

2.3.2 Crop Production Calculations

Two primary emission sources are considered in crop production in this inventory, residue burning and the application of nitrogen fertilizer. Reporting of these emissions sources is consistent with CARB's state GHG inventory. The methodologies and emission calculations are described below for these processes.

2.3.2.1 Residue Burning Emission Calculations

Emissions generated by burning of crop residue were calculated based on methodologies used in the *California GHG Emissions Inventory*. Generally, emissions are calculated based on emission factors that convert the acres of crops burned to a mass emission rate based on crop specific fuel loadings and moistures, utilizing the equation below.

$$Emissions = Acres\ Burned_X \times F\ Load_X \times (1 - F\ Moist_X) \times Fraction_{XY} \times BE \times CE \times ER_Y \times CF_Y$$

where:

Acres $Burned_X$	= acres of crop type for which burning permits were requested
F $Load_x$	= crop specific fuel loading factor (tons/acre)
F $Moist_x$	= crop specific fuel moisture content
$Fraction_{XY}$	=crop specific fraction of specie in fuel (carbon or nitrogen)
BE	= burning efficiency
CE	= combustion efficiency
ER_Y	= emission ratio of pollutant to total mass of specie released
CF_Y	= pollutant specific mass conversion factor

Crop specific fuel loading and fuel moisture values were obtained from a 2000 CARB Agricultural Burning Emission Factors Memo.[13] Other parameters used for calculating emissions were obtained from Chapter 5 of the US EPA *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2017 Methodology*, including: carbon fraction, nitrogen fraction, burning efficiency, combustion efficiency, N_2O:N emission ratio and conversion factors, and CH_4:C emission ratio and conversion factor.[14] The burning efficiency and combustion efficiency factors remain the same for all crop and pollutant types at 0.93 and 0.88, respectively. Table 6 details the crop specific emission and conversion factors, and Table 7 shows the pollutant emission ratios and conversion factors used for calculations.

[13] CARB. 2000. Agricultural Burning Emission Factors Memorandum. https://ww3.arb.ca.gov/smp/techtool/arbef.pdf

[14] Crop specific parameters obtained from Table 5-32, and pollutant emission ratios and conversion factors obtained from Table 5-33. US EPA. 2019. Inventory of US Greenhouse Gas Emissions and Sink: 1990-2017. https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2017. Accessed March 18, 2020.

Table 6 Crop Residue Burning Crop Specific GHG Emission and Conversion Factors

Crop	Fuel Loading (tons/acre)	Fuel Moisture (% weight)	Carbon Fraction	Nitrogen Fraction
Alfalfa	0.8	10.4	0.47	0.02
Asparagus[1]	2.2	10.4	0.47	0.01
Bean	2.5	11.4	0.47	0.01
Bermuda[1]	2.2	10.3	0.47	0.01
Canola[1]	2.2	10.3	0.47	0.01
Celery[1]	2.2	10.3	0.47	0.01
Coriander[1]	2.2	10.3	0.47	0.01
Flax[1]	2.2	10.3	0.47	0.01
Grass[1]	2.2	10.3	0.47	0.01
Jojoba[2]	1.7	28.8	0.47	0.01
Klein[1]	2.2	10.3	0.47	0.01
Milo Straw[1]	2.2	10.3	0.47	0.01
Oats	1.6	9.6	0.47	0.01
Okra[1]	2.2	10.3	0.47	0.01
Rye[3]	1.7	6.9	0.47	0.01
Sespania[1]	2.2	10.3	0.47	0.01
Sudan[1]	2.2	10.3	0.47	0.01
Sugarcane[1]	2.2	10.3	0.47	0.01
Weeds/Tules[1]	2.2	10.3	0.47	0.01
Wheat	1.9	7.3	0.47	0.01

Notes:

1. Fuel Loading and Fuel Moisture derived from the average of those reported for Row Crops in the *Emission Factors for Open Burning of Agricultural Residues* Table in the CARB, 2000 Agricultural Burning Emission Factors Memorandum (https://ww3.arb.ca.gov/smp/techtool/arbef.pdf)

2. Fuel Loading and Fuel Moisture derived from the average of those reported for trees under the Orchard and Vine Crops in the *Emission Factors for Open Burning of Agricultural Residues* Table in the CARB, 2000 Agricultural Burning Emission Factors Memorandum (https://ww3.arb.ca.gov/smp/techtool/arbef.pdf)

3. The Fuel Loading and Fuel Moisture for Barley was used, as Barley and Rye are closely related.

Table 7 Residue Burning GHG Emission Ratios and Conversion Factors

Pollutant	Emission Ratio	Conversion Factor
CH_4:C	0.005	16/12
N_2O:N	0.007	44/28

Notes: Ratios and factors represent to the proportion of the total emitted mass of a species (carbon or nitrogen) that is emitted as the pollutant of concern (CH_4 or N_2O).

Using the above crop and pollutant specific emission and conversion factors, along with the crop burn acrage activity data, it is estimated that crop residue burning emitted 3,327 MT CO_2e in 2005, 6,440 MT CO_2e in 2012 and 2,115 MT CO_2e in 2018. The activity data and emissions for each inventory year are shown in Table 8.

Table 8 Crop Residue Burning GHG Emissions

	2005		2012		2018	
Crop	Acres Burned	Emissions ($MT\ CO_2e$)	Acres Burned	Emissions ($MT\ CO_2e$)	Acres Burned	Emissions ($MT\ CO_2e$)
Alfalfa	182	14	66	5	-	-
Asparagus[1]	926	159	-	-	-	-
Bean	-	-	32	6	-	-
Bermuda[1]	9,599	1,644	13,722	2,350	7,280	1,247
Canola[1]	690	118	-	-	-	-
Celery[1]	-	-	-	-	70	12
Coriander[1]	140	24	-	-	-	-
Flax[1]	82	14	-	-	-	-
Grass[1]	55	9	-	-	30	5
Jojoba[2]	54	6	-	-	-	-
Klein[1]	465	80	471	81	370	63
Milo Straw[1]	-	-	-	-	60	10
Oats	70	9	75	9	-	-
Okra[1]	-	-	-	-	90	15
Rye[3]	-	-	140	19	-	-
Sespania[1]	-	-	29	5	-	-
Sudan[1]	1,855	318	2,199	377	692	119
Sugarcane[1]	-	-	20	3	92	16
Weeds/Tules [1]	284	49	50	9	180	31
Wheat	5,790	885	23,395	3,576	3,903	597
Total	**20,192**	**3,327**	**40,199**	**6,440**	**12,767**	**2,115**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

Crop production is largely driven by market demand, and not all crops are grown in all inventory years. A multitude of factors contribute to what types of crops are burned in any given year.

2.3.2.2 Nitrogen Fertilizer Soil Management Emission Calculations

The production of crops produces GHG emissions through the application of nitrogen fertilizers for soil management. Nitrogen fertilizer produces emissions of nitrous oxide (N_2O) through two pathways, direct emissions associated with natural microbial activity and indirect emissions that occur when nitrogen in soils is transported through runoff from the site of application. The increased nitrogen content of managed soils results in an increase of direct N_2O emissions from nitrification-denitrification processes. This increased nitrogen content can also be transported off-site after it is volatilized and subsequently deposited and undergoes nitrification-denitrification, as well as when surface runoff and leaching move the applied nitrogen into groundwater and surface water, where it is then converted to N_2O.[15] These emissions are calculated using the two equations, below.

$$Direct\ Emissions = Applied\ N \times\ Direct\ ER\ \times N\ Conversion$$

where:

Applied N = mass of nitrogen applied to soil
Direct ER = direct nitrogen emission rate
N Conversion = molecular weight conversion factor of N_2O from N_2

$$Indirect\ Emissions = Applied\ N \times (\ Leach\ EF\ \times Leach\ Rate + V\ Rate \times Redep\ Rate) \times N\ Conversion$$

where:

Applied N = mass of nitrogen applied to soil
Leach EF = leached nitrogen emitted as N_2O
Leach rate = applied nitrogen that is leached
V Rate = applied nitrogen that is volatilized
Redep Rate = volatilized nitrogen redeposited and emitted as N_2O
N Conversion = molecular weight conversion factor of N_2O from N_2

Table 9 provides the activity data used to obtain the total nitrogen applied in each inventory year, and Table 10 provides the emission rate and conversion factors used as calculation parameters.

[15] US EPA. 2018. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3 – part B, Section 3.10 Methodology for Estimating CH_4 Emissions from Enteric Fermentation. https://www.epa.gov/sites/production/files/2018-01/documents/2018_annex_3_-_part_b.pdf

Table 9 Fertilizer Application Activity Data

Crop	Fertilizer Application Rate (lbs/acre)	Acres Harvested		
		2005	2012	2018
Alfalfa	25	139,562	132,737	155,171
Bermuda	600	56,158	46,140	55,838
Cotton	250	10,709	5,233	3,075
Kleingrass	450	14,094	14,778	17,932
Sudangrass	275	64,679	63,765	53,562
Sugar Beets	225	25,795	25,389	34,417
Wheat	250	35,278	95,508	24,932
Misc. Field Crops	296	5,591	13,289	6,502
Asparagus	300	1,140	-	-
Broccoli	80	10,881	13,861	13,726
Cabbage	70	1,525	2,108	2,044
Carrots	70	15,524	12,726	15,881
Cauliflower	200	2,663	4,126	5,091
Head Lettuce	200	17,116	21,167	16,241
Leaf Lettuce	200	14,009	9,660	13,953
Spring Mix	200	2,070	9,235	2,996
Onions	175	9,691	8,503	12,560
Potatoes	250	1,939	2,211	2,087
Spinach	200	3,052	4,106	8,585
Sweet Corn	250	6,008	7,629	8,569
Romaine Lettuce	200	-	7,743	7,787
Misc. Vegetables	175	4,942	8,502	16,098
Cantaloupes	150	7,273	8,502	4,330
Honeydew and	150	669	1,000	1,241
Watermelon	200	1,550	967	1,415
Dates	245	1,338	1,721	2,825
Grapefruit	245	890	510	692
Lemons	518	3,744	2,240	4,612
Tangelos	532	-	-	532
Oranges	450	450	320	-
Tangerines	425	425	190	-
Total	-	**319,203**	**388,023**	**492,494**

Table 10 Nitrogen Fertilizer Emission Calculation Parameters

Parameter	Parameter Value for Calculation
Direct Nitrogen Emission Rate (grams N_2O/grams N applied)	0.01
Leached Nitrogen Emitted as N_2O	0.0075
Leaching Rate	0.3
Volatilization Rate	0.2
Redeposited Nitrogen Emitted as N_2O (grams N_2O/grams N)	0.01
Molecular Weight Conversion Factor from N to N_2O	1.571

Source: CARB. 2019. Documentation of California's Greenhouse Gas Inventory. 11th edition. https://ww3.arb.ca.gov/cc/inventory/doc/doc_index.php. Accessed March 20, 2020.

Soil management in Imperial County generated an estimated 257,516 MT CO_2e in 2005, 291,956 MT CO_2e in 2012 and 274,796 MT CO_2e in 2018, as shown in Table 11

Table 11 Nitrogen Fertilizer Application and Emissions

Year	Fertilizer Applied (MT N)	Direct N_2O Emissions (MT CO_2e)	Indirect N_2O Emissions (MT CO_2e)	Total Emissions (MT CO_2e)
2005	43,404	180,713	76,803	257,516
2012	49,204	204,860	87,066	291,956
2018	46,317	192,840	81,957	274,796

Notes: **MT N** = Metric Tons of Nitrogen; **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

2.3.2.3 Liming Soil Management Emission Calculations

Liming is the practice of applying carbonates to agricultural soils to balance soil pH levels. Adding these carbonates generates carbon emissions as the carbonates dissolve. The total liming material applied in Imperial County was obtained from the California Department of Food and Agriculture *Fertilizing Material Tonnage Report* for 2018.[16] Activity data was only available for the 2018 GHG inventory year; therefore, activity data for the 2012 and 2005 inventory years estimated liming material applied by the scaling with crop production.[17] Emissions from liming are calculated based on the methodology used in the California GHG Emission Inventory for each inventory year, as

[16] California Department of Food and Agriculture (CDFA). 2019. 2018 Fertilizing Material Tonnage Report. https://www.cdfa.ca.gov/is/ffldrs/pdfs/2018_Tonnage.pdf

[17] County of Imperial Agricultural Commissioner Sealer of Weights and Measures. Imperial County Crop Reports. https://agcom.imperialcounty.org/crop-reports/.

reported in the *Documentation of California's GHG Inventory Index*.[18] As such, an emission factor of 0.440 grams of CO_2 per gram of liming material applied is used to calculate GHG emissions. Table 12 provides the total emission from liming, activity data and crop production data sued to estimate activity data. Soil liming in Imperial Valley generated approximately 32,816 MT CO_2e in 2005, 36,098 MT CO_2e in 2012, and 34,299 CO_2e in 2018.

Table 12 Liming Material Application Calculation Data and GHG Emission Results

Year	Annual Acres Harvested in County	Liming Material Applied (MT)[1]	Emissions (MT CO_2e)[1]
2005	513,970	74,633	32,816
2012	565,372	82,097	36,098
2018	537,193	78,005	34,299

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Actual liming material data was only available for 2018 at the County level. 2005 and 2012 liming material was estimated by scaling the 2018 data with crop production data.

2.4 Livestock Enteric Fermentation

Emissions from livestock enteric fermentation consider the CH_4 generated by the digestive process of ruminant animals. This is a primary methane emission source from livestock, which is one of the top agricultural commodities of the Imperial Valley. This emission source varies depending on the type of livestock, its age and class.

2.4.1 Livestock Enteric Fermentation Activity Data

Livestock populations used to estimate emissions from enteric fermentation were based on livestock populations reported in United State Department of Agriculture (USDA) National Agriculture Statistics Service (NASS) Census of Agriculture data. The NASS Census is a complete livestock count of the US farms and ranches taken once every five years, with detailed data available down to the county level. The total number of livestock in Imperial County were obtained from the Census Data Query Tool. The 2018 inventory years livestock totals were assumed to be equivalent to the 2017 NASS Census year data, as this is the most recent NASS Census year, and 2005 inventory year totals were estimated by linear interpolation between the values reported for the 2002 and 2007 NASS Census year data. A NASS Census was performed in 2012; therefore, no additional assumptions were made to estimate livestock population totals for the 2012 inventory year.

As recommended by the ICLEI Community Protocols, livestock population classes that should be reported for enteric fermentation include:

- Dairy cows
- Beef cows
- Swine

[18] CARB. 2019. Documentation of California's 2000-2017 GHG Inventory – Index. https://ww3.arb.ca.gov/cc/inventory/doc/doc_index.php. Accessed March 18th, 2020

- Sheep
- Goats, and
- Horses.

While all of these livestock categories likely exist in Imperial County, the NASS census included complete reporting of livestock populations only for cattle (which includes dairy and beef cows) and sheep; therefore, the other livestock populations were excluded from the inventory due to lack of consistent data for the NASS Census years.

To capture the varied enteric fermentation emission rates from various cattle classes, and to maintain consistency with the California GHG Emission Inventory, cattle populations were broken down into estimates of population age and weight based on those derived in the Cattle Enteric Fermentation Model, as provided in the United States Environmental Protection Agency (US EPA) *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016 Methodology*.[19] The full cattle population age and weight breakdown used to calculate enteric fermentation emissions in the California GHG Emission Inventory for each inventory year, as reported in the *Documentation of California's GHG Inventory Index*, was used to estimate the population age and weight percentage for each age and weight class relative to the total cattle population.[20,21] This breakdown is shown in full detail in Table 13. The population breakdown percentages obtained from the *Documentation of California's GHG Inventory Index* were then applied to the total cattle population reported in, or estimated from, the NASS Census data to obtain a population age and weight breakdown for Imperial County. This population breakdown was used as the activity data for cattle enteric fermentation GHG emission calculations. Enteric fermentation emission factors from sheep are not broken down by population age and weight class in CARB's state GHG inventory; therefore, this exercise was not required to estimate sheep populations.

[19] The CEFM was developed based on recommendations provided in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* and uses information on population, energy requirements, digestible energy, and CH4 conversion rates to estimate CH4 emissions. US EPA. 2018. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2016, Annex 3 – part B, Section 3.10 Methodology for Estimating CH_4 Emissions from Enteric Fermentation. https://www.epa.gov/sites/production/files/2018-01/documents/2018_annex_3_-_part_b.pdf

[20] CARB. 2019. Documentation of California's 2000-2017 GHG Inventory – Index. https://ww3.arb.ca.gov/cc/inventory/doc/doc_index.php. Accessed March 18th, 2020

[21] Emissions calculations and data for the California Greenhouse Gas Emission Inventory use 2017 as the most recent inventory year. Since this is the most recent inventory year available at the time of the 2018 Imperial County inventory, cattle population breakdowns for 2017 are used to calculate 2018 Imperial County livestock populations.

Table 13 California GHG Emission Inventory State-wide Livestock Population Totals

	2017		2012		2005	
Cattle Population Category	Head	Percentage[1]	Head	Percentage[1]	Head	Percentage[1]
Dairy Cow	1,731,338	33.4	1,815,655	33.2	1,731,361	31.4
Dairy Calves	886,202	17.1	919,381	16.8	894,484	16.2
Dairy Replacement (12-24 Months)	510,080	9.8	588,011	10.8	536,254	9.7
Dairy Replacement (0-12 Months)	216,808	4.2	245,262	4.5	232,037	4.2
Beef Calves	264,965	5.1	318,059	5.8	372,787	6.8
Beef Cows	655,000	12.6	630,000	11.5	720,000	13.1
Beef Replacement (12-24 Months)	26,590	0.5	27,501	0.5	31,438	0.6
Beef Replacement (0-12 Months)	61,676	1.2	64,644	1.2	73,112	1.3
Heifer Feedlot	174,028	3.4	166,263	3.0	172,746	3.1
Heifer Stocker	113,678	2.2	105,017	1.9	98,337	1.8
Steer Feedlot	287,478	5.5	301,447	5.5	309,666	5.6
Steer Stocker	260,137	5.0	283,194	5.2	333,041	6.0
Total	5,187,980	100	5,464,434	100	5,505,163	100

Notes: Totals may not add up due to rounding

Data Source: CARB. 2019. Documentation of California's 2000-2017 GHG Inventory – Index. https://ww3.arb.ca.gov/cc/inventory/doc/doc_index.php. Accessed March 18th, 2020

1. Percentages represent the proportion of the total California cattle population that is made up by each category.

2.4.2 Livestock Enteric Fermentation Calculations

Livestock enteric fermentation emissions are calculated using the methodology provided in the *California GHG Emissions Inventory*, where the number of livestock is multiplied by a per head annual methane emission factor. As described in *Livestock Enteric Fermentation Activity Data*, the total number of cattle and sheep in Imperial County were obtained from the USDA NASS Census data, with 2018 livestock totals in this inventory assumed to be equivalent to 2017 NASS totals, and 2005 data obtained from linear interpolation from the livestock head reported in 2002 and 2007. The cattle herd breakdown reported for the respective year in the *Documentation of California's GHG Inventory Index*, was then applied to the total cattle in Imperial County to obtain an estimated herd breakdown for Imperial County. Emission factors were obtained from the *Documentation of California's GHG Inventory Index*.[22] Table 14 provides the herd breakdown , emission factors, and emissions for cattle and sheep in Imperial County. The total emissions from livestock enteric

[22] CARB. 2019. Documentation of California's Greenhouse Gas Inventory. 11th edition. https://ww3.arb.ca.gov/cc/inventory/doc/doc_index.php. Accessed March 20, 2020.

fermentation in Imperial Valley were 870,677 MT CO_2e in 2005, 850,519 MT CO_2e in 2012 and 959,904 MT CO_2e in 2018.

Table 14 Livestock Enteric Fermentation Emissions

	2005			2012			2018		
Livestock Category	Head	Emission Factor (g CH_4/ head)	Emission (MT CO_2e)[1]	Head	Emission Factor (g CH_4/ head)	Emission (MT CO_2e)[1]	Head	Emission Factor (g CH_4/ head)	Emission (MT CO_2e)[1]
Dairy Cow	132,000	131,007	484,202	125,103	144,605	506,535	141,119	144,605	571,706
Dairy Calves	68,200	11,151	21,294	63,348	11,633	20,634	72,274	11,633	23,541
Dairy Replac. (12-24 mos.)	40,887	63,921	73,179	40,515	65,708	74,540	41,600	65,708	76,537
Dairy Replac. (0-12 mos.)	17,692	42,358	20,983	16,899	43,527	20,596	17,682	43,527	21,550
Beef Calves	28,426	10,005	7,962	21,915	10,734	6,587	21,609	10,734	6,495
Beef Cows	54,896	88,636	136,241	43,409	95,445	116,009	53,418	95,445	142,757
Beef Replac. (12-24 mos.)	2,397	55,866	3,750	1,895	61,223	3,248	2,169	61,223	3,718
Beef Replac. (0-12 mos.)	5,574	64,845	10,210	4,454	70,563	8,800	5,030	70,563	9,938
Heifer Feedlot	13,171	37,369	13,781	11,456	41,006	13,153	14,193	41,006	16,296
Heifer Stocker	7,498	56,994	11,966	7,236	61,091	12,378	9,271	61,091	15,858
Steer Feedlot	23,610	36,275	23,981	20,770	39,902	23,205	23,445	39,902	26,194
Steer Stockers	25,393	54,994	39,101	19,513	58,804	32,128	21,215	58,804	34,931
Total cattle	419,741	-	846,560	376,513	-	837,813	423,105	-	949,522
Sheep	107,664	8,000	24,117	56,723	8,000	12,706	46,350	8,000	10,382
Total	**527,405**	**-**	**870,677**	**433,236**	**-**	**850,519**	**469,455**	**-**	**959,904**

Notes: **g CH_4** = Grams of Methane; **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; **Replac.** = Replacement; **mos.** = Months

1. Emissions in MT CO_2e are obtained by multiplying the total grams of CH_4 emitted by the livestock category, converting to MT CH_4 (1 MT = 1,000,000 grams), and multiplying by the Global Warming Potential for CH_4 of 25.

2.5 Livestock Manure Management

Emissions from livestock management consider the CH_4 and N_2O generated by different types of manure management systems for livestock. Manure management refers to the capture, storage, treatment, and utilization of animal manures. CH_4 emissions primarily result from direct emissions, while N_2O emissions are both direct and indirect emissions from runoff and subsequent volatilization. The types of manure management included in this inventory are:

- Anaerobic digester,
- Anaerobic lagoon,
- Daily spreading,
- Dry lot,
- Deep pit,
- Liquid/slurry,
- Pasture, and
- Solid storage.

Details on the exact manure management systems utilized in Imperial Valley were not available, therefore the overall proportion of the types of manure management used throughout the state are used to estimate GHG emissions.

2.5.1 Livestock Manure Management Activity Data

Livestock manure management emission calculations are based on the population of livestock within a specific manure management system. The number of livestock within specific manure management systems was not available specifically for Imperial Valley; therefore, the proportions of livestock in each manure management system used to calculate emissions from manure management for the *California GHG Emissions Inventory* was applied to Imperial County estimated livestock population totals. The Imperial County livestock population estimates used were those derived for the enteric fermentation emission calculations, described above. The proportion of livestock in each manure management system, obtained from the *Documentation of California's GHG Inventory Index*, is shown below in Table 15. The proportion of dairy cows in each manure management system in 2005 is different from those reported for 2012 and 2017 in the *Documentation of California's GHG Inventory Index*. Not all manure management systems are used for all livestock categories; therefore, some sections of Table 15 are blank.

Table 15 California GHG Emission Inventory Manure Management System Proportions

Livestock Population Category	Anaerobic Digester	Anaerobic Lagoon	Daily Spread	Dry Lot	Deep Pit	Liquid /Slurry	Pasture	Solid Storage
Dairy Cow (2017 and 2012)	0.0119	0.582	0.106	-	0.001035	0.202	0.006712	0.091
Dairy Cow (2005)	0.0251	0.575	0.107	-	0.001531	0.202	0.007728	0.0916
Dairy Heifers	-	-	0.108	0.874	-	0.00874	0.009252	-
Feedlot Heifers	-	-	-	0.987	-	0.0128	-	-
Feedlot Steer	-	-	-	0.987	-	0.0128	-	-
Beef Cows	-	-	-	-	-	-	1	-
Calves[1]	-	-	-	-	-	-	1	-
Stocker Heifer	-	-	-	-	-	-	1	-
Stocker Steer	-	-	-	-	-	-	1	-
Sheep	-	-	-	0.311	-	-	0.689	-

Notes:

1. Calves includes both beef and dairy calves

Data Source: CARB. 2019. Documentation of California's 2000-2017 GHG Inventory – Index. https://ww3.arb.ca.gov/cc/inventory/doc/doc_index.php. Accessed March 18th, 2020

2.5.2 Livestock Manure Management Calculations

Manure management produces direct CH_4 and N_2O emissions and indirect N_2O emissions, which are calculated based on the number of livestock in a specific manure management system. Indirect emissions occur when nitrogen in manure undergoes nitrification-denitrification away from the manure management site; which occurs when nitrogen is transported surface runoff into surface and groundwater or is volatilized and deposited elsewhere. Emissions are calculated using the equations below, with parameters obtained from the *Documentation of California's GHG Inventory Index*.[23]

[23] CARB. 2019. Documentation of California's Greenhouse Gas Inventory. 11th edition. https://ww3.arb.ca.gov/cc/inventory/doc/doc_index.php. Accessed March 20, 2020.

$$CH_4\ Emissions = Livestock\ Pop \times\ Volatile\ Solids\ Prod\ \times CF \times Prod\ Cap \times\ D$$

where:

Livestock Pop	= livestock population within manure management system
Volatile Solids Prod	= volatile solids production rate (kg/year)
CF	= methane conversion factor
Prod Cap	= maximum methane production capacity (m^3/kg)
D	= methane density (g/m^3)

$$N_2O\ Emissions = Livestock\ Pop \times ER \times (Direct\ ER + (\ Runoff\ EF\ \times Runoff\ Rate + V\ Rate \times Redep\ Rate)) \times N\ Conversion$$

where:

Livestock Pop	= livestock population within manure management system
ER	= nitrogen excretion rate (g/year)
Direct ER	= direct nitrogen emission rate as N_2O (g N_2O/g N)
Runoff EF	= runoff nitrogen emitted as N_2O
Runoff rate	= nitrogen in manure that leaves site as runoff
V Rate	= nitrogen in manure that is volatilized
Redep Rate	= volatilized nitrogen redeposited and emitted as N_2O
N Conversion	= molecular weight conversion factor of N_2O from N_2

The above equations utilize parameters that vary for different livestock types and manure management systems, but remain constant between years, which are provided in Table 16. As provided in the *Documentation of California's GHG Inventory Index*, the estimated volatile solids production rates and nitrogen excretion vary between inventory years for livestock type, which are provided in Table 17. The remaining calculation parameters, which are constants for all livestock and manure management systems, are provided in Table 18. Not all manure management systems are used for all livestock categories; therefore, some sections of Table 16 are blank.

Table 16 Manure Management Calculation Parameters – by Management System

Livestock Specific Parameter	Anaerobic Digester	Anaerobic Lagoon	Daily Spread	Dry Lot	Deep Pit	Liquid/ Slurry	Pasture	Solid Storage
Methane Conversion Factor (CH_4 emitted/CH_4 producing potential)								
Dairy Cow	0.181	0.731	0.005	-	0.323	0.323	0.015	0.04
Dairy Heifer	-	-	0.005	0.015	-	0.323	0.015	-
Feedlot Heifer	-	-	-	0.015	-	0.415	-	-
Feedlot Steer	-	-	-	0.015	-	0.415	-	-
Beef Cow	-	-	-	-	-	-	0.015	-
Calf	-	-	-	-	-	-	0.015	-
Stocker Heifer	-	-	-	-	-	-	0.015	-
Stocker Steer	-	-	-	-	-	-	0.015	-
Sheep	-	-	-	0.015	-	-	0.015	-
Direct Nitrogen Emission Rate as N2O (g N2O/g N)								
Dairy Cow	-	-	-	-	0.002	0.005	-	0.005
Dairy Heifer	-	-	-	0.02	-	0.005	-	-
Feedlot Heifer	-	-	-	0.02	-	0.005	-	-
Feedlot Steer	-	-	-	0.02	-	0.005	-	-
Sheep	-	-	-	0.02	-	-	-	-
Nitrogen in Manure that Leaves Site as Runoff Fraction								
Dairy Cow	0.008	0.008	-	-	-	0.008	-	-
Dairy Heifer	-	-	-	0.02	-	0.008	-	-
Feedlot Heifer	-	-	-	0.039	-	-	-	-
Feedlot Steer	-	-	-	0.039	-	-	-	-
Sheep	-	-	-	0.039	-	-	-	-
Nitrogen in Manure that is Volatilized (g N_2O-N/g N)								
Dairy Cow	0.43	0.43	0.1	-	0.24	0.26	-	0.27
Dairy Heifer	-	-	0.1	0.15	-	0.26	-	-
Feedlot Heifer	-	-	-	0.23	-	0.26	-	-
Feedlot Steer	-	-	-	0.23	-	0.26	-	-
Sheep	-	-	-	0.23	-	-	-	-

Notes: Nitrogen emission factors are not shown for Beef Cows, Calves and Stocker Heifers and Steer, as they are not a source of N_2O.

Table 17 Manure Management Calculation Parameters – by Year for all Management Systems

	All Years	2005		2012		2018	
Management System Parameter	Maximum Methane Production Capacity (m^3/kg)	Volatile Solids Production Rate (kg/year)	Nitrogen Excretion Rate (g/year)	Volatile Solids Production Rate (kg/year)	Nitrogen Excretion Rate (g/year)	Volatile Solids Production Rate (kg/year)	Nitrogen Excretion Rate (g/year)
Dairy Cow	0.24	2,505	159,037	2,833	157,605	2,857	158,656
Dairy Heifer	0.17	1,162	71,953	1,255	69,046	1,252	68,911
Feedlot Heifer	0.33	673	53,955	675	53,902	682	54,722
Feedlot Steer	0.33	653	54,443	655	55,142	663	56,089
Beef Cow	0.17	1,652	74,383	1,891	59,139	1,891	59,139
Calf	0.17	318	17,779	332	19,395	332	19,395
Stocker Heifer	0.17	1,058	49,238	1,215	38,789	1,211	38,642
Stocker Steer	0.17	976	43,085	1,112	33,231	1,116	33,466
Sheep[1]	See notes	215	11,050	208	11,275	208	11,275

Notes: m^3/kg = Cubic Meters per kilogram; **kg/year**: Kilograms per Year; **g/year**: Grams per Year

1. Two manure management systems are utilized for sheep, Dry Lot and Pasture. Unlike Cattle, these two manure management systems have different Maximum Methane Production Capacities. They are:

Dry Lot: 0.341 m^3/kg

Pasture: 0.17 m^3/kg

Table 18 Manure Management GHG Emission Calculation Parameters - Constants

Parameter	Value
Runoff Nitrogen Emitted as N_2O (grams N_2O/grams N)	0.0075
Volatilized Nitrogen Redeposited and Emitted as N_2O (grams N_2O/grams N)	0.01
Molecular Weight Conversion Factor from N to N_2O	1.571
Methane Density (g/m^3)	662

Source: CARB. 2019. Documentation of California's Greenhouse Gas Inventory. 11th edition. https://ww3.arb.ca.gov/cc/inventory/doc/doc_index.php. Accessed March 20, 2020.

Based on the calculations performed in the State GHG Inventory, manure management emissions are calculated for: Dairy Cows, Dairy Heifers, Feedlot Heifers, Feedlot Steer, Beef Cows, Calves, Stocker Heifer, Stocker Steer and Sheep. The total livestock populations in the County use the same data as the livestock counts shown in Table 14 for enteric fermentation emission calculations, with some minor modifications related to the inclusion of dairy heifers. For the manure management emissions, an estimate of Diary Heifers is derived from the ratios of Dairy Cows to Dairy Heifers provided in the *Documentation of California's GHG Inventory Index*, as shown in Table 19.

Additionally, the Calves livestock population is the sum of both beef and dairy calves from Table 14, in the *Livestock Enteric Fermentation Calculations* section.

Table 19 Imperial Valley Dairy Heifer Estimate Assumptions from State Inventory

	State Inventory Data			Imperial County Data	
Year	Dairy Cow Head	Dairy Heifer Head	Ratio of Dairy Heifer to Dairy Cow	Dairy Cow Head	Diary Heifer Head Estimate
2005	1,731,261	768,290	0.444	132,000	58,578
2012	1,815,655	833,273	0.459	125,103	57,415
2018	1,731,338	749,587	0.433	141,199	61,132

Data Source: CARB. 2019. Documentation of California's Greenhouse Gas Inventory. 11th edition. https://ww3.arb.ca.gov/cc/inventory/doc/doc_index.php. Accessed March 20, 2020.

Livestock manure management in Imperial Valley generated approximately 841,958 MT CO_2e in 2005, 895,088 MT CO_2e in 2012, and 1,009,006 MT CO_2e in 2018. Approximately 90 percent of these emissions were in the form of CH_4 in 2012 and 2018, with approximately 88 percent in the form of CH_4 in 2005. The remaining emissions were from direct and indirect N_2O emissions.Table 20 provides a summary of emissions by livestock for each inventory year. Table 21, Table 22 and Table 23 provide a breakdown of emissions for each livestock class in each manure managment system for 2005, 2012 and, 2018 respectively.

Table 20 Livestock Manure GHG Emissions Summary

Year	CH_4 Emissions (MT CO_2e)	N_2O Emissions (MT CO_2e)	Total Emissions (MT CO_2e)
2005	742,874	99,084	841,958
2012	804,305	90,784	895,088
2018	908,327	100,678	1,009,006

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

Table 21 2005 Livestock Manure Management Emissions

Livestock Class	Anaerobic Digester	Anaerobic Lagoon	Daily Spread	Dry Lot	Deep Pit	Liquid/ Slurry	Pasture	Solid Storage
Methane Emissions (MT CH_4)								
Dairy Cow	239	22,082	28	-	26	3,428	6	192
Dairy Heifer	-	-	4	100	-	22	1	-
Feedlot Heifer	-	-	-	29	-	10	-	-
Feedlot Steer	-	-	-	50	-	18	-	-
Beef Cow	-	-	-	-	-	-	153	-
Calf	-	-	-	-	-	-	52	-
Stocker Heifer	-	-	-	-	-	-	13	-
Stocker Steer	-	-	-	-	-	-	42	-
Sheep	-	-	-	24	-	-	12	-
Total	**239**	**22,082**	**32**	**203**	**26**	**3,478**	**279**	**192**
Nitrous Oxide Emissions (MT N_2O)[1]								
Dairy Cow	4	83	4	-	<1	51	-	23
Dairy Heifer	-	-	1	125	-	<1	-	-
Feedlot Heifer	-	-	-	25	-	<1	-	-
Feedlot Steer	-	-	-	45	-	<1	-	-
Sheep	-	-	-	13	-	-	-	-
Total	**4**	**83**	**4**	**208**	**<1**	**52**	**-**	**23**
Total Emissions (MT CO_2e)[2]								
Dairy Cow	7,639	640,205	1,722	-	791	109,500	171	11,554
Dairy Heifer	-	-	305	36,018	-	723	30	-
Feedlot Heifer	-	-	-	7,400	-	317	-	-
Feedlot Steer	-	-	-	13,258	-	553	-	-
Beef Cow	-	-	-	-	-	-	4,287	-
Calf	-	-	-	-	-	-	1,452	-
Stocker Heifer	-	-	-	-	-	-	375	-
Stocker Steer	-	-	-	-	-	-	1,171	-
Sheep	-	-	-	4,163	-	-	325	-
Total	**7,639**	**640,205**	**2,028**	**60,839**	**791**	**11,093**	**7,810**	**11,554**

Notes: MT CH_4 = Metric Tons of Methane; **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; **MT N_2O** = Metric Tons of Nitrous Oxide

1.N_2O emissions are not shown for Beef Cows, Calves and Stocker Heifers and Steer, as they are not a source of N_2O.

2.Total emissions are obtained by multiplying CH_4 and N_2O emissions by their respective GWP and summing

Table 22 2012 Livestock Manure Management Emissions

Livestock Class	Anaerobic Digester	Anaerobic Lagoon	Daily Spread	Dry Lot	Deep Pit	Liquid/ Slurry	Pasture	Solid Storage
Methane Emissions (MT CH_4)								
Dairy Cow	121	23,957	30	-	189	3,674	57	205
Dairy Heifer	-	-	4	106	-	23	1	-
Feedlot Heifer	-	-	-	25	-	9	-	-
Feedlot Steer	-	-	-	44	-	16	-	-
Beef Cow	-	-	-	-	-	-	139	-
Calf	-	-	-	-	-	-	48	-
Stocker Heifer	-	-	-	-	-	-	15	-
Stocker Steer	-	-	-	-	-	-	37	-
Sheep	-	-	-	12	-	-	14	-
Total	**121**	**23,957**	**34**	**187**	**189**	**3,722**	**310**	**205**
Nitrous Oxide Emissions (MT N_2O)[1]								
Dairy Cow	2	79	3	-	1	48	-	22
Dairy Heifer	-	-	1	118	-	<1	-	-
Feedlot Heifer	-	-	-	22	-	<1	-	-
Feedlot Steer	-	-	-	40	-	<1	-	-
Sheep	-	-	-	7	-	-	-	-
Total	**2**	**79**	**4**	**187**	**1**	**49**	**-**	**22**
Total Emissions (MT CO_2e)[2]								
Dairy Cow	3,822	691,614	1,706	-	5,677	115,574	1,587	11,491
Dairy Heifer	-	-	301	34,208	-	751	32	-
Feedlot Heifer	-	-	-	6,433	-	276	-	-
Feedlot Steer	-	-	-	11,865	-	276	-	-
Beef Cow	-	-	-	-	-	-	488	-
Calf	-	-	-	-	-	-	3,880	-
Stocker Heifer	-	-	-	-	-	-	1,338	-
Stocker Steer	-	-	-	-	-	-	416	-
Sheep	-	-	-	2,219	-	-	384	-
Total	**3,822**	**691,614**	**2,007**	**54,725**	**5,677**	**117,090**	**8,662**	**11,491**

Notes: MT CH_4 = Metric Tons of Methane; **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; **MT N_2O** = Metric Tons of Nitrous Oxide
1.N_2O emissions are not shown for Beef Cows, Calves and Stocker Heifers and Steer, as they are not a source of N_2O.
2.Total emissions are obtained by multiplying CH_4 and N_2O emissions by their respective GWP and summing

Table 23 2018 Livestock Manure Management Emissions

Livestock Class	Anaerobic Digester	Anaerobic Lagoon	Daily Spread	Dry Lot	Deep Pit	Liquid/ Slurry	Pasture	Solid Storage
Methane Emissions (MT CH_4)								
Dairy Cow	138	27,268	34	-	21	4,182	6	233
Dairy Heifer	-	-	5	113	-	24	1	-
Feedlot Heifer	-	-	-	31	-	11	-	-
Feedlot Steer	-	-	-	50	-	18	-	-
Beef Cow	-	-	-	-	-	-	171	-
Calf	-	-	-	-	-	-	53	-
Stocker Heifer	-	-	-	-	-	-	19	-
Stocker Steer	-	-	-	-	-	-	40	-
Sheep	-	-	-	10	-	-	11	-
Total	138	27,268	39	205	21	4,235	301	233
Nitrous Oxide Emissions (MT N_2O)[1]								
Dairy Cow	2	89	4	-	<1	54	-	25
Dairy Heifer	-	-	1	125	-	<1	-	-
Feedlot Heifer	-	-	-	27	-	<1	-	-
Feedlot Steer	-	-	-	46	-	<1	-	-
Sheep	-	-	-	6	-	-	-	-
Total	2	89	5	205	<1	54	-	25
Total Emissions (MT CO_2e)[2]								
Dairy Cow	4,349	787,169	1,940	-	642	131,523	181	13,068
Dairy Heifer	-	-	320	36,350	-	798	33	-
Feedlot Heifer	-	-	-	8,087	-	346	-	-
Feedlot Steer	-	-	-	13,616	-	558	-	-
Beef Cow	-	-	-	-	-	-	4,775	-
Calf	-	-	-	-	-	-	1,473	-
Stocker Heifer	-	-	-	-	-	-	531	-
Stocker Steer	-	-	-	-	-	-	1,119	-
Sheep	-	-	-	1,813	-	-	314	-
Total	4,349	787,169	2,259	59,867	642	133,225	8,426	13,068

Notes: MT CH_4 = Metric Tons of Methane; **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; **MT N_2O** = Metric Tons of Nitrous Oxide
1.N_2O emissions are not shown for Beef Cows, Calves and Stocker Heifers and Steer, as they are not a source of N_2O.
2.Total emissions are obtained by multiplying CH_4 and N_2O emissions by their respective GWP and summing

3 Agricultural GHG Inventory Results

GHG emissions resulting from agricultural activities in Imperial Valley are largely dominated by emissions generated by livestock, including enteric fermentation and manure management. These emission sources generate around 80 percent of agricultural GHG emissions each year. The next largest source of agricultural GHG emissions is crop production, with the application of nitrogen fertilizers and liming for soil management accounting for 13-15 percent of emissions each year. The remaining approximately three percent of agricultural emissions are generated by stationary fuel combustion by irrigation pumps, agricultural off-road equipment, and residue burning for crop production. Table 24 provides the agricultural emissions for each source for the 2005, 2012 and 2018 inventory years.

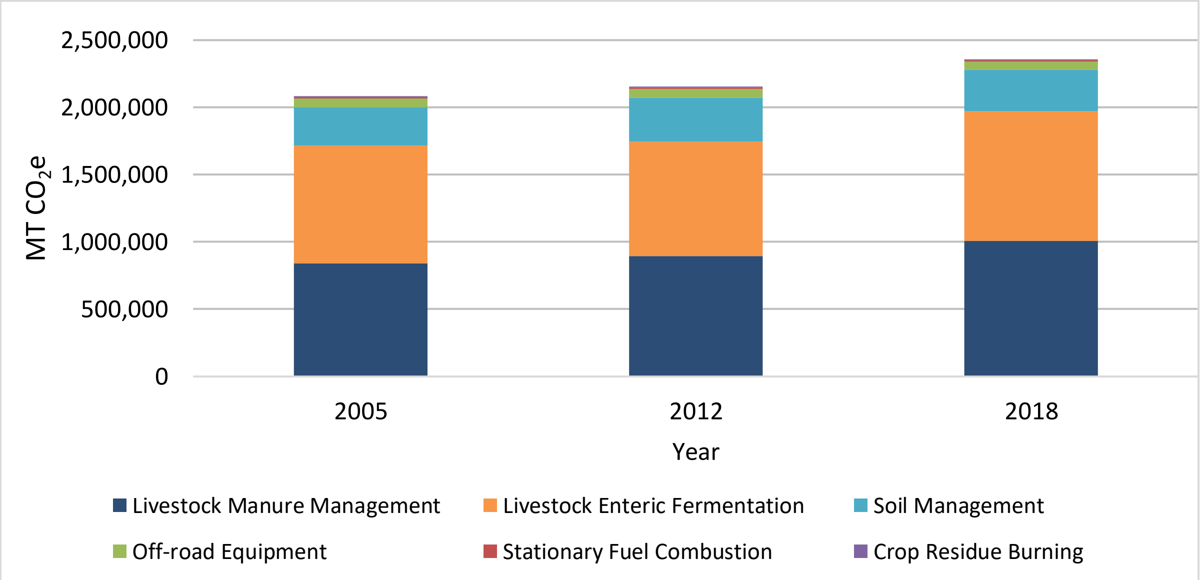
Table 24 Imperial Valley Agricultural Emissions Summary

	2005		2012		2018	
Emission Source	Emissions ($MT\ CO_2e$)	Percent of Total	Emissions ($MT\ CO_2e$)	Percent of Total	Emissions ($MT\ CO_2e$)	Percent of Total
Stationary Fuel Combustion	9,134	0.4%	10,047	0.5%	9,546	0.4%
Off-road Equipment	66,053	3.2%	65,207	3.0%	64,501	2.7%
Crop Residue Burning	3,327	0.2%	6,440	0.3%	2,115	0.1%
Nitrogen Fertilizer Application	257,516	12.4%	291,926	13.5%	274,796	11.7%
Liming	32,816	1.6%	36,098	1.7%	34,299	1.5%
Livestock Enteric Fermentation	870,677	41.8%	850,519	39.5%	959,904	40.8%
Livestock Manure Management	841,958	40.4%	895,088	41.5%	1,009,006	42.9%
Total	2,081,481	100%	2,155,325	100%	2,354,168	100%

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent;
Totals may not add up to 100% due to rounding

Agricultural emissions in Imperial Valley have increased over time, with an estimated 2,081,481 MT CO_2e emitted in 2005, 2,155,325 MT CO_2e in 2012, and 2,354,168 MT CO_2e in 2018. This equates to an overall increase of agricultural emissions of 3.5 percent from 2005 to 2012, and a 9.2 percent increase from 2012 to 2018. Figure 1 shows the Imperial Valley agricultural GHG emissions over time.

Figure 1 Imperial Valley Total Agricultural GHG Emissions



3.1 Stationary Fuel Combustion Results

Stationary fuel combustion emissions from diesel agricultural pumps remained relatively constant between 2005 and 2018. In 2005, diesel irrigation pumps generated an estimated 9,134 MT CO_2e, and in 2018 generated an estimated 9,546 MT CO_2e. Programs such as the Carl Moyer Program for Portable and Stationary Agricultural Pumps may have increased the number of electric and higher tier engine pumps in the County; however, higher tier diesel pumps generally generate lower air pollutant emission rates but maintain similar carbon dioxide emission rates.

3.2 Agricultural Off-road Equipment Results

Agricultural off-road equipment emissions decreased between the years 2005 and 2018, primarily dependent upon reduced fuel consumption. Emissions decreased from 66,053 MT CO_2e in 2005, to 65,207 MT CO_2e in 2012, and 64,501 MT CO_2e in 2018. This is a 2% decrease in emissions, while the overall agricultural off-road equipment population in the County increased by 5%, from 6,256 in 2005 to 6,572 in 2018. Table 25 shows how the total off-road equipment emissions in the County decreased over time from equipment efficiencies, with the average annual fuel consumption per piece of off-road agricultural equipment decreasing by 7% since 2005.

Table 25 Agricultural Off-road Equipment Emissions Summary

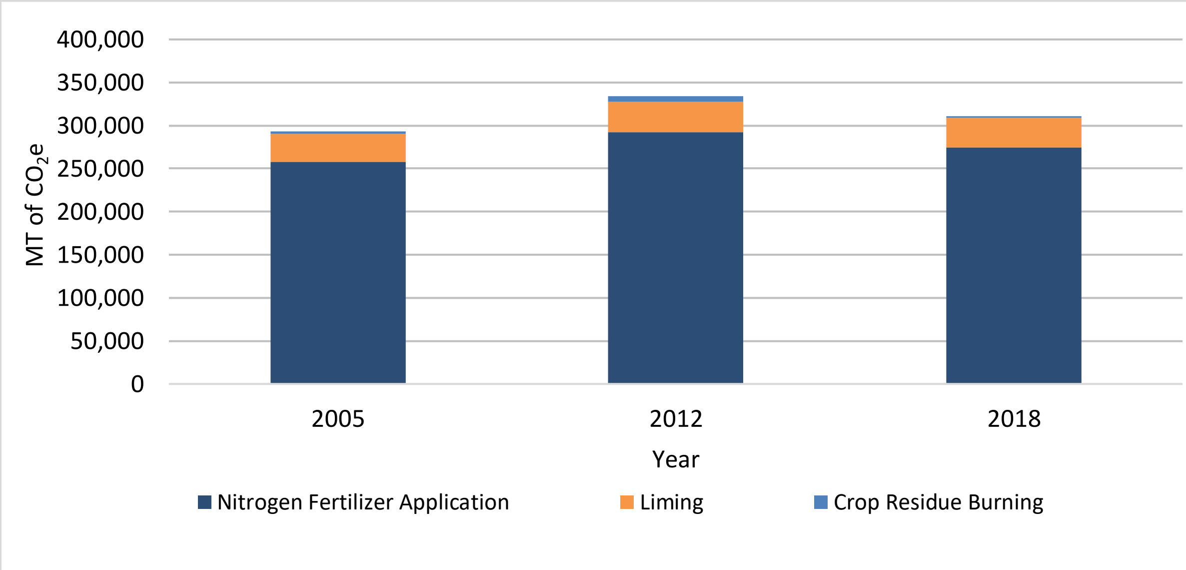
Year	Emissions (MT CO_2e)	Equipment Population	Fleet Fuel Consumption (gallons/year)	Equipment Average Consumption (gallons/year)
2005	66,053	6,256	6,404,236	1,024
2012	65,207	6,435	6,322,437	983
2018	64,501	6,572	6,254,113	952
Percent Change (2005-2018)	-2.35%	5.05%	-2.34%	-7.04%

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

3.3 Crop Production Results

Crop production in Imperial Valley generated approximately 293,660 MT CO_2e in 2005, 334,464 MT CO_2e in 2012 and 311,210 MT CO_2e in 2018, with about 88% of emissions resulting from nitrogen fertilizer application. Each year liming generated about 11% of total emissions, and the remainder from crop residue burning. Emissions from liming were estimated to be 32, 816 MT CO_2e in 2005, 36,098 MT CO_2e in 2012, and 34,299 MT CO_2e in 2018. Emissions from crop residue burning were estimated to be 3,327 MT CO_2e in 2005, 6,440 MT CO_2e in 2012 and 2,115 MT CO_2e in 2018. Figure 2 shows the total emissions from each source per year. Emission trends are correlated to crop production, which varies on an annual basis.

Figure 2 Crop Production GHG Emissions



Soil mangement emissions estimates for the application of nitrogen fertilizer is largely dominated by field crops, with Bermuda grass being the largest contributor in each inventory year. Figure 3 shows the top 5 crops contributing to emissions in each inventory year. While total crop acreage is the primary driver for emissions, the proportion of crops produced that are more fertilizer intensive can influence this emission source. As shown in Table 26, Alfalfa is the crop in Imperial Valley with the most acres harvested in each inventory year; however it contributes less than 5 percent of emissions. Conversely, Bermuda grass constitues 11 to 12 percent of total crop acreage harvested in 2012 and 2018, but contributes 26 to 33 percent of nitrogen fertilizer emissions. As provided in Table 9 in *Nitrogen Fertilizer Soil Management* Emission Calculations, Bermuda grass requires a recommended 600 pounds of ntirogen fertilizer per acre, while Alfalfa requires a recommended 25 pounds of nitrogen fertilizer per acre.

Figure 3 Top Five Crops Contributing to Soil Management Emissions

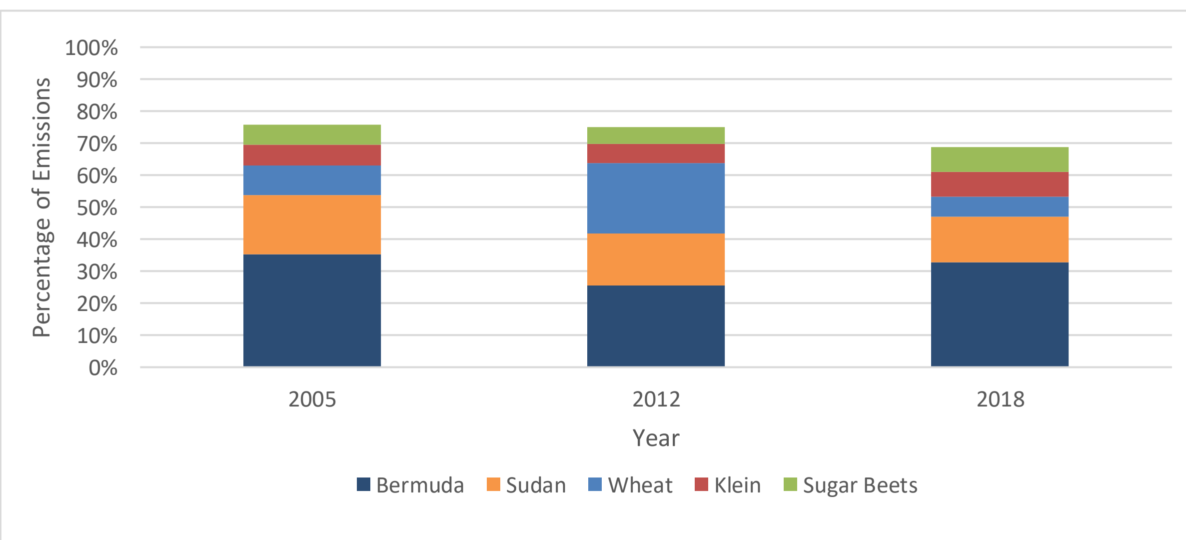


Table 26 Top Contributing Crops to Soil Management GHG Emissions

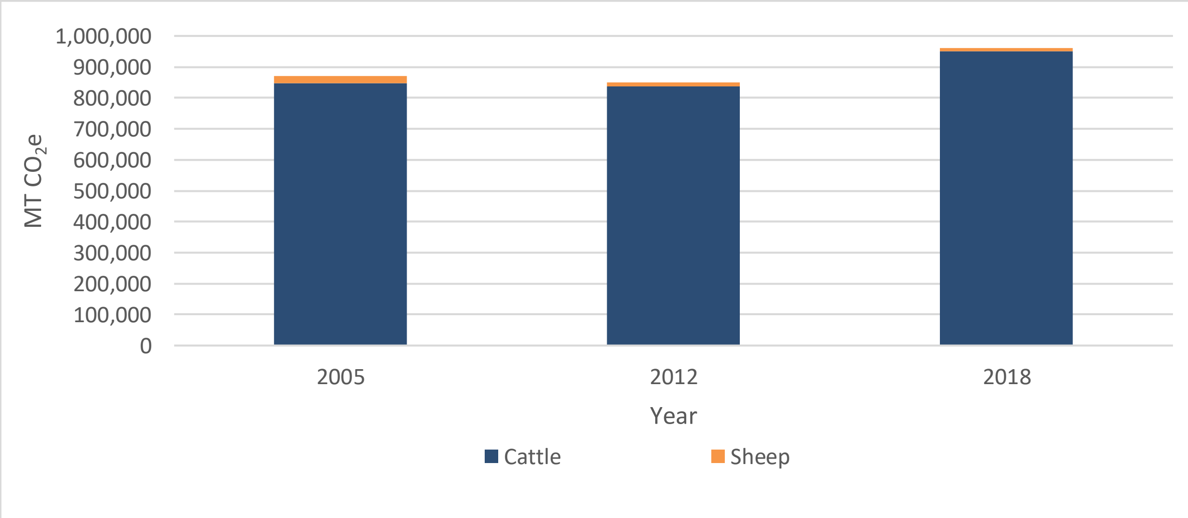
2005			2012			2018		
Crop	Emissions ($MT\ CO_2e$)	Acres Harvested	Crop	Emissions ($MT\ CO_2e$)	Acres Harvested	Crop	Emissions ($MT\ CO_2e$)	Acres Harvested
Bermuda	90,678	56,158	Bermuda	74,502	46,140	Bermuda	89,838	55,638
Sudan	47,867	64,679	Wheat	64,257	95,508	Sudan	39,640	53,562
Wheat	23,735	35,278	Sudan	47,190	63,765	Klein	21,716	17,932
Klein	17,068	14,049	Klein	17,896	14,778	Sugar Beets	20,840	34,417
Sugar Beets	15,619	25,795	Sugar Beets	15,373	25,389	Wheat	16,774	24,932
Alfalfa	9,390	139,562	Head Lettuce	11,393	21,167	Alfalfa	10,440	155,171
Head Lettuce	9,212	17,116	Misc. Field Crops	10,601	13,289	Head Lettuce	8,741	16,241
Leaf Lettuce	7,540	14,009	Alfalfa	8,930	132,737	Misc. Vegetable	7,563	16,098
Cotton	7,205	10,709	Leaf Lettuce	5,199	9,660	Leaf Lettuce	7,510	13,953
Lemons	5,219	3,744	Sweet Corn	5,133	7,629	Lemons	6,429	4,612

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

3.4 Livestock Enteric Fermentation Results

Livestock enteric fermentation emission decreased slightly between 2005 to 2012, from 870,677 MT CO_2e to 850,519 MT CO_2e, and then increased between 2012 and 2018 to 959,904 MT CO_2e. The majority of enteric fermentation emissions were from cattle, which generated 846,560 MT CO_2e in 2005 (97 percent of emissions), 837,813 MT CO_2e in 2012 (99 percent of emissions) and 949,522 MT CO_2e in 2018 (99 percent of emissions), with the remainder of emissions generated by sheep. Figure 4 details the breakdown of total emissions between sheep and cattle for each year.

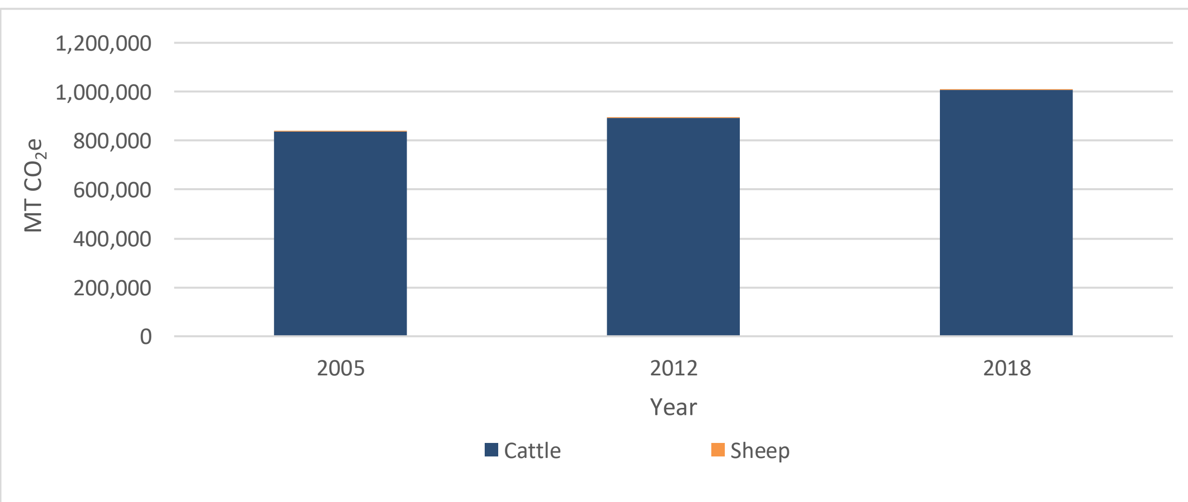
Figure 4 Enteric Fermentation Emissions



3.5 Livestock Manure Management Results

Livestock manure management increase between 2005 and 2018, with generated 841,958 MT CO_2e in 2005, 895,008 MT CO_2e in 2012 and 1,009,006 MT CO_2e in 2018. Emissions in this category were dominated by those generated by cattle, as shown in Figure 5. In 2005, 837,471 MT CO_2e were generated by cattle and 4,487 MT CO_2e by sheep. In 2012, 892,485 MT CO_2e were generated by cattle and 2,603 MT CO_2e by sheep. In 2018, 1,006,879 MT CO_2e were generated by cattle and 2,127 MT CO_2e by sheep.

Figure 5 Manure Management GHG Emissions



3.6 Conclusion

Agricultural activities are the largest generator of GHG emissions in the Imperial Valley. Compared to the GHG emissions generated by community activities (including on-road transportation, energy, water and waste), agriculture in Imperial Valley generated 170% more GHG emissions in 2018.[24] Agricultural emissions have also experienced a slight increase in total annual emissions since 2005, while community GHG emissions have seen a steady decline over the same time period. Even though economic activity is the primary driver for both agricultural and community GHG emissions, jurisdictions in Imperial Valley have much more influence over community GHG emission sources. For example, employment and population growth will increase energy consumption in a jurisdiction, but energy efficiency policies and updated building codes can help offset the increased consumption caused by this growth. Contrarily, large livestock operations with livestock populations that can be influenced by global commodity markets may generate emissions from processes that can vary year over year.

GHG emissions are intrinsic to agricultural operations and can be difficult to mitigate beyond complete changes to soil management or significant infrastructure installations for pumps and manure management. Many of these emission reduction practices may not be economically feasible in the near-term, and it even still may not be possible to completely eliminate GHG emissions from agricultural operations. Thus, carbon sequestration and identifying funding for reducing emissions from livestock operations will play an important role in achieving Imperial Valley's long-term GHG reduction goals.

[24] As part of the Community GHG Inventory, Imperial Valley generated approximately 1,325,800 MT CO_2e in 2018.

Appendix D

Calexico Ports of Entry Vehicle GHG Emissions Inventory

This report prepared on 50% recycled paper with 50% post-consumer content.

Table of Contents

Tables

Figures

1 Introduction

A high volume of both commercial and passenger vehicles through pass through the Calexico West Port of Entry (POE) and Calexico East POE as they enter the United States, traveling northward from Mexico. The Calexico West POE is the third largest land POE in California, processing nearly 4 million northbound vehicles each year.[1] The Calexico East POE processes both commercial and passenger vehicles, serving as a conduit for trade by truck from the Mexican State of Baja California to California and the rest of the United States.[2] The vehicles that utilize the Calexico land POEs generate both air quality pollutants and greenhouse gas (GHG) emissions, with congested conditions resulting in longer idling times and an increased number of engine starts that generate additional emissions.

The purpose of this Calexico POEs Vehicle GHG Emissions Inventory (Inventory) is to quantify the contribution of vehicles using the Calexico East and West Land POEs to regional GHG emissions. In addition to the GHG emissions, there has been considerable concern over air pollutants generated by vehicles waiting in queue for entry to the United States, as these pollutants are transported by air into the Imperial Valley, impacting residents. In 2015, the *Vehicle Idling Emissions Study at Calexico East and Calexico West Ports-of-Entry* was conducted by Imperial County Air Pollution Control District (ICAPCD) to quantify emissions of ozone precursor air pollutants and particulate matter based on real observations of border wait times, vehicle types, and vehicle origin and destinations.[3] This GHG Inventory utilizes the vehicle border crossing survey data obtained for the 2015 ICAPCD study to estimate the GHG emissions associated with northbound border traffic. Observations from the 2015 ICAPCD study were conducted in 2014; therefore, to maintain consistency GHG emissions are calculated for the year 2014.

[1] U.S. General Services Administration. 2020. Calexico West Land Port of Entry.https://www.gsa.gov/about-us/regions/welcome-to-the-pacific-rim-region-9/land-ports-of-entry/calexico-west-land-port-of-entry. Accessed June 20, 2020.

[2] Imperial County Transportation Commission. 2014. Calexico East Land Port of Entry County of Imperial, CA Fact Sheet: Expansion of Truck and Auto Inspection Lanes at Existing LPOE. http://www.imperialctc.org/media/managed/news/02_2014-Fact-Sheet-Calexico-East_revised5-21-14.pdf. Accessed June 20, 2020.

[3] Imperial County Air Pollution Control District. 2015. Vehicle Idling Emissions Study at Calexico East and Calexico West Ports-of-Entry. http://www.imperialctc.org/media/managed/pdf/Idling_Vehicle_Study_Calexico_PyOEs_Final_20151030_Stud_only.pdf

2 Calexico POE GHG Emissions Methodology

Vehicle emissions from the Calexico POE are calculated for passenger and commercial vehicles for the Calexico East POE and only for passenger vehicles for the Calexico West POE. Emissions were calculated by applying emission factors obtained from the California Air Resources Board's (CARB's) most recent EMission FACtors (EMFAC2017) model to the activity data provided in the 2015 ICAPCD *Vehicle Idling Emissions Study at Calexico East and Calexico West Ports-of-Entry*. Emissions are calculated for the various conditions that vehicles experience due to traffic volumes, including:

- Uncongested (traffic flows freely at less than 25 miles per hour),
- Creeping queue (traffic flows freely but at speeds less than 10 miles per hour),
- Stop-and-go (traffic flowing less than 5 miles per hour on average), and
- Idling.

Additional GHG emissions are generated during the warm-up periods when vehicle engines are restarted after the engine has been turned off for a period of time, categorized as Start-up emissions.

Calculation of GHG emissions includes emission of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) emitted from vehicle tailpipes. The appropriate 100-year global warming potentials (GWP) were applied to each of these gases in order to report emissions as their equivalent effect to carbon dioxide (CO_2e) , as recommended in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5).[4] AR5 GWPs are used in this analysis, as they reflect the most recent science behind the warming potential of individual GHGs. The GWPs used in the Calexico PEO GHG emission calculations are provided in Table 1.

Table 1 Summary of Greenhouse Gas Global Warming Potential

Greenhouse Gas	Formula	GWP (CO_2e)
Carbon Dioxide	CO_2	1
Methane	CH_4	28
Nitrous Oxide	N_2O	265

Source: Intergovernmental Panel on Climate Change (IPCC), Fifth Assessment Report AR5, 2014.
GWP = Global Warming Potential; CO_2e = Carbon Dioxide Equivalent

GHG emissions are generated at different rates depending on these various traffic conditions, and vehicle activity data is aggregated into traffic condition bins account for the varied emission factors. Uncongested, free-flowing traffic generates the least amount of emissions per mile traveled, while stop-and-go generates more emissions per mile traveled. Idling vehicle emissions are evaluated on the basis of gallons of fuel consumed per amount of time idling. The start-up associated emissions are accounted for as emissions generated per vehicle start, after the vehicle has been turned off for

[4] Intergovernmental Panel on Climate Change (IPCC), Fifth Assessment Report AR5, 2014.

thirty-minutes. These start-up emissions are the additional emissions generated, on top of driving or idling emissions that a vehicle generates during its warm-up period. The activity data and emission factors used for GHG emission calculations are described in the following sections.

2.1 Vehicle Crossing Activity Data

This GHG Inventory uses northbound vehicle traffic data at both Calexico POEs which was obtained for the Spring, Summer and Winter seasons of 2014 through direct observation of traffic conditions, as part of the 2015 ICAPCD *Vehicle Idling Emissions Study at Calexico East and Calexico West Ports-of-Entry*. The 2015 study referenced here provides data for the various traffic conditions mentioned previously, which are provided for each type of border crossing lane. Vehicle crossing activity data from the 2015 ICAPCD study is aggregated in the current GHG inventory for all border crossing lanes at each POE to provide daily average activity based on traffic conditions for commercial and passenger vehicles for the Spring, Summer, and Winter seasons, as provided in Table 2. Observations as part of the 2015 ICAPCD study were not conducted in the Fall season. These values are obtained by summing the baseline activity data for each traffic condition provided in Tables 10 through 18 of the 2015 ICAPCD study,. The average of the activity data for the three seasons is used for emissions calculations, provided in Table 3. Engine restarts and creeping queue conditions were not identified for commercial vehicles at the Calexico East POE.

Table 2 Average Daily POE Vehicle Activity Data by Season

Vehicle Category	Start up (vehicles/day)	Idle (hours/day)	Stop-and-go <5 mph (VMT /day)	Creeping Queue 5-10 mph (VMT/day)	Uncongested <25 mph (VMT/day)
Spring					
Calexico West Passenger	581.0	224.5	803.5	3,964.9	18,496.0
Calexico East Passenger	531.4	132.2	306.2	2,676.0	18,843.9
Calexico East Commercial	-	294.7	337.9	-	3,895.1
Summer					
Calexico West Passenger	529.0	217.3	369.9	1,640.9	19,256.9
Calexico East Passenger	521.4	129.8	298.7	1,724.5	19,410.6
Calexico East Commercial	-	278.6	183.2	-	3,821.5
Winter					
Calexico West Passenger	621.0	221.1	1,538.6	3,073.2	20,389.4
Calexico East Passenger	569.0	128.7	310.9	2,471.5	20,679.4
Calexico East Commercial	-	284.6	226.9	-	3,862.0

Notes: VMT = Vehicle Miles Traveled; mph = miles per hour

Table 3 Average Daily POE Vehicle Activity Data

Vehicle Category	Start up (vehicles/day)	Idle (hours/day)	Stop-and-go <5 mph (VMT /day)	Creeping Queue 5-10 mph (VMT/day)	Uncongested <25 mph (VMT/day)
Calexico West Passenger	577.0	221.0	904.0	2,893.0	19,380.8
Calexico East Passenger	540.6	130.2	305.3	2,290.7	19,644.6
Calexico East Commercial	-	286.0	249.3	-	3,859.5

Notes: VMT = Vehicle Miles Traveled; mph = miles per hour

2.2 Vehicle Emissions Factors

Vehicle emission factors were obtained from the CARB EMFAC2017 version 1.0.2 vehicle emissions model and applied to activity data based on vehicle class (commercial and passenger) and traffic conditions. Two EMFAC2017 model outputs were used to generate emission factors. A Project-Level Assessment run type was used to obtain emission rates for the uncongested, creeping queue, stop-and-go and start-up emissions for both commercial and passenger vehicles, as well as idling emissions for commercial vehicles. An Emissions Inventory run type was also performed in order to obtain fuel efficiencies for each vehicle type, which were used to calculate N_2O emissions for diesel vehicles. These EMFAC2017 model runs were performed for the Imperial County region, for the year 2014, using the annual average temperature and relative humidity in Calexico of 70 degrees Fahrenheit and 40%, respectively.[5]

The traffic condition categories analyzed in the 2015 ICAPCD study are separated due to their varied emission rates. Generally, as the speed of a vehicle's travel decreases, and traffic conditions require more slowing or stopping, fuel efficiency decreases, and emission rates increase.[6] Categorizing traffic conditions into speed bins allows a more accurate attribution of emissions to the various traffic conditions experienced at the POEs. Accordingly, emission factors were derived for each of activity data categories for CO_2, CH_4 and N_2O, and converted to CO_2e. The EMFAC2017 model provides emission factors by vehicle class. These emission factors were aggregated into commercial or passenger vehicle categories by weighting the vehicle population distribution. The EMFAC2017 vehicle class categories and the associated populations are provided in Table 4. The vehicle population used in this study assumes that the vehicles using the Calexico POEs have the same technology group distribution as vehicles in Imperial County. As provided in the EMFAC2017 *Technical Documentation*, this assumption is appropriate as approximately 85% of Mexican vehicles are former US vehicles, and Baja has instituted a smog check program to enforce vehicle emission standards.[7]

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[5] The annual average temperature and humidity was obtained by request from the National Oceanic and Atmospheric Administration's National Centers for Environmental Information Local Climatological Data tool. The average temperature and humidity were obtained from hourly measurements between the period of 2009 and 2019 at the Imperial County Airport (KIPL). https://www.ncdc.noaa.gov/cdo-web/datatools/lcd

[6] Barth, Matthew and Boriboonsomsin, Kanok. 2008. Real-World Carbon Dioxide Impacts of Traffic Congestion. Transportation Research Record: Journal of the Transportation Research Board. Volume: 2058 issue: 1, page(s): 163-171. Article first published online: January 1, 2008; Issue published: January 1, 2008. First Published January 1, 2008 Research Article. https://doi.org/10.3141/2058-20

[7] CARB. 2017. EMFAC2017 Volume III: Technical Documentation. pp. 131. https://ww3.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf

Table 4 Vehicle Class Attribution from EMFAC2017 Model Output

Inventory Vehicle Class	Model Output Category (Abbreviation)	Vehicle Fuel Type	Vehicle Population	Percentage of Inventory Vehicle Class
Passenger Vehicle	Passenger Cars (LDA)	Gas	118,587	50.4%
		Diesel	741	0.3%
	Light-Duty Trucks 1 (LDT1)	Gas	14,923	6.3%
		Diesel	31	0.0%
	Light-Duty Trucks 2 (LDT2)	Gas	47,318	20.1%
		Diesel	50	0.0%
	Medium Duty Vehicles (MDV)	Gas	44,795	19.0%
		Diesel	250	0.1%
	Light-Heavy Duty Trucks 1 (LHDT1)	Gas	4,648	2.0%
		Diesel	3,935	1.7%
Commercial Vehicles	Light-Heavy Duty Trucks 2 (LHDT2)	Gas	736	8.8%
		Diesel	1,088	13.1%
	Medium-Heavy-Duty Trucks (MHDT)	Gas	604	7.3%
		Diesel	1,769	21.3%
	Heavy-Heavy Duty Trucks (HHDT)	Gas	35	0.4%
		Diesel	3,816	45.9%
	Other Buses (OBUS)	Gas	170	2.0%
		Diesel	100	1.2%

Emission factors were obtained directly from the EMFAC2017 model for the uncongested, creeping queue and stop-and-go conditions, modeled as vehicle travel under 25 miles per hour (mph), 10 mph and 5 mph, respectively. The modeled emission factors were obtained in grams per mile for CH_4 and CO_2. N_2O emission factors are not provided directly in the EMFAC2017 Project-Level Assessment run type. As recommended in the EMFAC2017 *Technical Documentation*, per mile N_2O emissions can be dervied from the oxides of nitrogen (NO_x) emission factors for gasoline fueled vehicles and emissions per gallon of fuel combusted can be derived for diesel fueled vehicles from fuel consumption rates.[8] Accordingly, off-model calculations were performed using NO_x emission rates from the EMFAC2017 Project-Level Assessment for gasoline fueled vehicles and converted to N_2O using the recommended equation, and diesel vehicle fuel efficiencies were derived from the

[8] California Air Resources Board. 2018. EMFAC2017 Volume III – Technical Documentation. Table 3.1-2. Page 32. https://ww3.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf

Emissions Inventory run type for each EMFAC2017 vehicle class category by dividing the total vehicle population vehicle miles traveled (VMT) by the total population fuel consumption.

Idling emissions factors for passenger vehicles were derived from estimated idling fuel consumption values and fuel specific emission factors on a per gallon basis to obtain GHG emissions per hour of idling. Idling emission factors are only provided for commercial class vehicles in the EMFAC2017 Project-Level Assessment run type. Based on the information provided in the U.S. Department of Energy's Office of Efficiency and Renewable Energy *Idle Fuel Consumption for Selected Gasoline and Diesel Vehicles* factsheet[9], the consumption of fuel for light duty vehicles during idling was converted into an emission factor of GHGs per hour of idling using the CARB *Documentation of California's Greenhouse Gas Inventory*.[10] An emission factor applied to the entire passenger vehicles fleet was obtained by weighting the derived idling emission factors by the vehicle populations, as provided in Table 4. Table 5 provides the standard emissions factors for diesel and gasoline combustion, while the estimated idling fuel consumption and the calculated GHG emissions per hour idling emission factors are provided in Table 6.

Table 5 Annual Average Daily POE Vehicle Activity Data

Fuel Type	CO_2 emissions per gallon of fuel combusted (g/gallon)	CH_4 emissions per gallon of fuel combusted (g/gallon)	N_2O emissions per gallon of fuel combusted (g/gallon)
Unleaded Gasoline	8,917	0.413	0.317
No.2 Distillate Fuel Oil (Diesel)	10,206	0.0642	1.6

Notes: g = Grams
Data Source: CARB. 2019. Documentation of California's Greenhouse Gas Inventory. Sector: Transportation : On Road : Light-duty Vehicles : Passenger Cars. https://ww3.arb.ca.gov/cc/inventory/doc/doc_index.php. Accessed February 16th, 2020.

[9] U.S. Department of Energy, Office of Efficiency and Renewable Energy. 2015. Fact #861 February 23, 2015 Idle Fuel Consumption for Selected Gasoline and Diesel Vehicles. https://www.energy.gov/eere/vehicles/fact-861-february-23-2015-idle-fuel-consumption-selected-gasoline-and-diesel-vehicles. Accessed February 16th, 2020.

[10] CARB. 2019. Documentation of California's Greenhouse Gas Inventory. Sector: Transportation : On Road : Light-duty Vehicles : Passenger Cars. https://ww3.arb.ca.gov/cc/inventory/doc/doc_index.php. Accessed February 16th, 2020.

Table 6 Passenger Vehicle Idling Emission Factors

Model Output Category (Abbreviation)	Vehicle Fuel Type	Idling Fuel Consumption (gallons/hour)	CO_2 Emission Factor (Grams of CO_2/hour idling)	CH_4 Emission Factor (Grams of CH_4/hour idling)	N_2O Emission Factor (Grams of N_2O /hour idling)
Passenger Cars (LDA)	Gas	0.17	2,452.18	0.12	0.09
	Diesel	0.28	1,735.02	0.01	0.27
Light-Duty Trucks 1 (LDT1)	Gas	0.31	3,477.63	0.17	0.12
	Diesel	0.39	3,112.83	0.02	0.49
Light-Duty Trucks 2 (LDT2)	Gas	0.31	3,477.63	0.17	0.12
	Diesel	0.39	3,112.83	0.02	0.49
Medium Duty Vehicles (MDV)	Gas	0.31	3,477.63	0.17	0.12
	Diesel	0.39	3,112.83	0.02	0.49
Light-Heavy Duty Trucks 1 (LHDT1)	Gas	0.44	4,776.33	2.52	0.09
	Diesel	0.84	4,095.32	0.15	0.70
Weighted Passenger Vehicle Total	**Aggregated**	**N/A**	**2,990.75**	**0.19**	**0.12**

Notes: N/A = Not Applicable; CO_2 = Carbon Dioxide; CH_4 = Methane; N_2O = Nitrous Oxide

Data Source: U.S. Department of Energy, Office of Efficiency and Renewable Energy. 2015. Fact #861 February 23, 2015 Idle Fuel Consumption for Selected Gasoline and Diesel Vehicles. https://www.energy.gov/eere/vehicles/fact-861-february-23-2015-idle-fuel-consumption-selected-gasoline-and-diesel-vehicles. Accessed February 16th, 2020.

The resulting passenger and commercial fleet emission factors used to calculate GHG emissions for each of the traffic condition categories at both the Calexico East and West POEs are provided in Table 7.

Table 7 POE Vehicle GHG Emission Factor Summary

GHG	Start-up Emissions (g/start)[1]	Idling Emissions (g/gallon)	Stop-and-go <5mph (g/mile)	Creeping Queue 5-10 mph (g/mile)[1]	Uncongested <25 mph (g/mile)
Passenger					
CO_2	20.33	2,990.75	905.97	736.17	426.11
CH_4	0.06	0.19	0.07	0.05	0.02
N_2O	0.04	0.12	0.04	0.04	0.03
Commercial					
CO_2	-	7,242.19	3,057.96	-	1,578.70
CH_4	-	0.61	605.79	-	0.04
N_2O	-	0.97	0.20	-	0.19

Notes: g = Grams; GHG = Greenhouse Gas; CO_2 = Carbon Dioxide; CH_4 = Methane; N_2O = Nitrous Oxide

1. Commercial vehicle Start-up and Creeping Queue activity data is not included in this GHG inventory, and therefore, the emission factors are not calculated.

2.3 Emission Calculations

Vehicle emission were calculated by multiplying the emission factors in Table 7 by the activity data in Table 3, to obtain emissions in grams per day. These emissions were then multiplied by 365 days per year and converted from grams to metric tons (MT) to obtain emissions in MT per year of each GHG. Each GHG was then multiplied by its associated GWP to obtain emissions in metric tons of carbon dioxide equivalent (CO_2e). The GHG emissions results for each vehicle class at both the Calexico East and West POEs are provided in Table 8.

Table 8 2014 Annual POE Vehicle GHG Emissions

GHG	Start-up Emissions (MT)[1]	Idling Emissions (MT)	Stop-and-go <5mph (MT)	Creeping Queue 5-10 mph (MT)[1]	Uncongested <25 mph (MT)
Calexico West Passenger Vehicles					
CO_2	4.1	229.3	284.2	739.0	2,865.7
CH_4	0.0125	0.0145	0.0231	0.0509	0.1594
N_2O	0.0072	0.0088	0.0111	0.0354	0.1754
CO_2e[2]	**6**	**232**	**288**	**750**	**2,917**
Calexico East Passenger Vehicles					
CO_2	3.8	135.2	96.0	585.2	2,904.7
CH_4	0.0117	0.0085	0.0078	0.0403	0.1616
N_2O	0.0067	0.0052	0.0037	0.0280	0.1778
CO_2e[2]	**6**	**137**	**97**	**594**	**2,956**
Calexico East Commercial Vehicles					
CO_2	-	718.6	264.6	-	2,114.3
CH_4	-	0.0608	52.4119	-	0.0493
N_2O	-	0.0963	0.0171	-	0.2593
CO_2e[2]	**-**	**746**	**1,737**	**-**	**2,184**

Notes: MT = Metric Tons; GHG = Greenhouse Gas; CO_2 = Carbon Dioxide; CH_4 = Methane; N_2O = Nitrous Oxide; CO_2e = Carbon Dioxide Equivalent

Values may not add up due to rounding

1. Commercial vehicle Start-up and Creeping Queue activity data is not included in this GHG inventory.

2. Emissions in CO_2e are the sum of the CO_2, CH_4, and N_2O emissions with the appropriate global warming potentials (GWPs) applied to convert to CO_2e. (GWPs: 1 MT CO_2 = 1 MT CO_2e; 1 MT CH_4 = 28 MT CO_2e; 1 MT N_2O = 265 MT CO_2e)

3 Calexico POE Vehicle GHG Emissions Results

The estimated annual GHG emissions in 2014 from vehicles using the Calexico East and West land POEs are provided in Table 9 with the total annual emissions resulting from the various traffic conditions. The majority of GHG emissions are generated by commercial vehicles at the Calexico East POE, which were approximately 4,667 MT CO_2e, or 37% of annual emissions from northbound traffic at both POEs. While both the East and West POEs generate a similar magnitude of GHG emissions from passenger vehicles, 3,790 MT CO_2e and 4,667 MT CO_2e, respectively, the total emissions at Calexico East are largest due to the contribution of commercial vehicles. Uncongested flow conditions also generates the most GHG emissions, comparatively, as these conditions are associated with the longer distances of driving as vehicles approach the POEs. Idling emissions contribute 1,115 MT CO_2e annually, which is about 9% of the annual emissions. The contribution of emissions from each of the traffic conditions, in MT CO_2e, are shown in Figure 1 and the total emission contribution from each traffic condition at each POE is shown in Figure 2.

Table 9 Calexico Ports of Entry Vehicle GHG Emissions

Emission Source	Start-up Emissions (MT CO_2e)	Idle Emissions (MT CO_2e)	Stop-and-go Emissions (MT CO_2e)	Creeping Que Emissions (MT CO_2e)	Uncongested Emissions (MT CO_2e)	Total Emissions (MT CO_2e)
Calexico West						**4,193**
Passenger Vehicles	6	232	288	750	2,917	4,193
Calexico East						**8,457**
Passenger Vehicles	6	137	97	594	2,956	3,790
Commercial Vehicles	-	746	1,737	-	2,184	4,667
Total (East and West)	**12**	**1,115**	**2,122**	**1,344**	**8,057**	**12,649**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent
Totals may not add up to 100% due to rounding
Detailed results are provided in Appendix D

Figure 1 2014 GHG Emissions Summary by Traffic Conditions

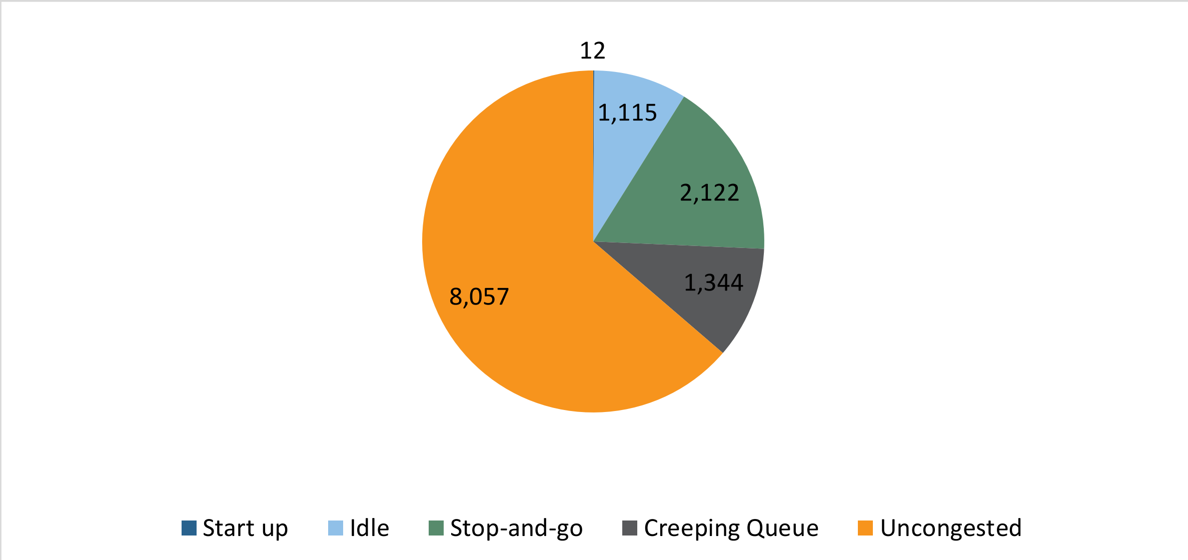
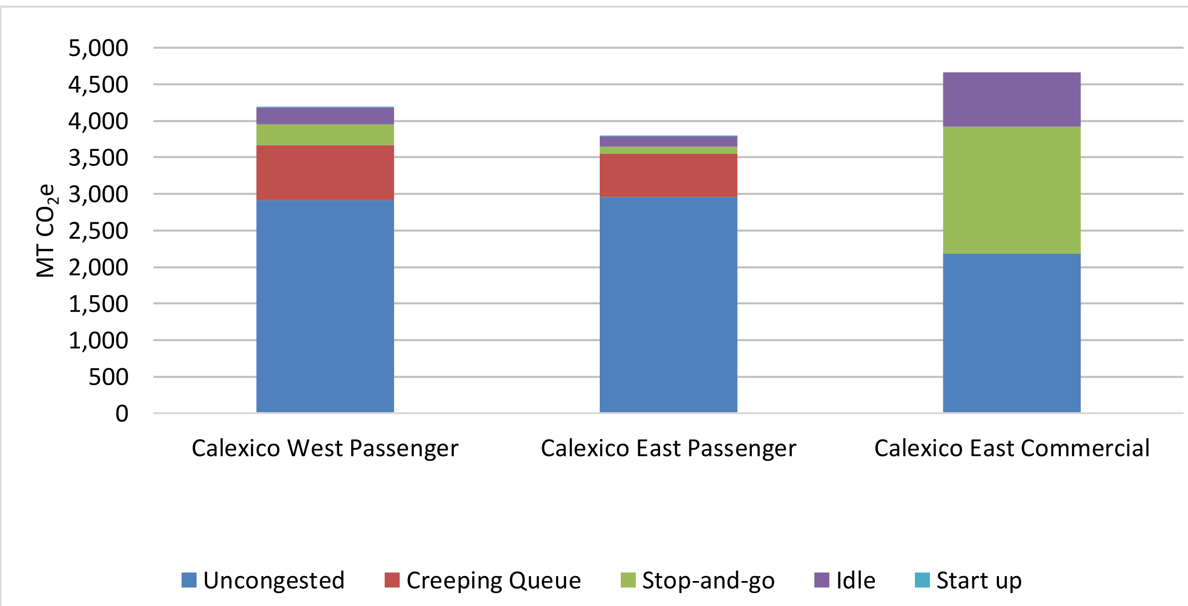


Figure 2 2014 GHG Emissions Summary by Vehicle Class and POE



Appendix B
Greenhouse Gas Emissions Forecast and Reduction Targets

Appendix B1

GHG Emissions Forecast Methodology

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Table of Contents

Tables

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1 Community GHG Emission Forecast Methodology Overview

Calculation methodologies are detailed in the following section for the greenhouse gas (GHG) emissions forecast, including the *business-as-usual* (*BAU*) *scenario* forecast and *legislative adjusted* (*adjusted*) *scenario* forecast. The *BAU scenario* provides an estimate of how GHG emissions would change in the forecast years if consumption trends continue as in 2018, absent any new regulations or actions which would reduce local GHG emissions. This provides a baseline for setting future emission reduction targets and establishing the *adjusted scenario.* The *adjusted scenario* forecast includes the quantification of GHG emission reductions that can be expected from currently adopted state and federal legislation, to provide a more accurate depiction of future emissions growth and the responsibility of each jurisdiction The jurisdictions included in the GHG emissions forecast methodology are:

- The City of Brawley,
- The City of Calexico,
- The City of Calipatria,
- The City of El Centro,
- The City of Holtville,
- The City of Imperial,
- The City of Westmorland, and
- All unincorporated communities and areas under the jurisdiction of Imperial County (Unincorporated County).

The GHG emissions forecast calculation methodology provides a transparent description of the forecasting metrics, growth projections, and assumptions used to estimate GHG emissions in 2020, 2030, 2040 and 2050. The forecast presented here is based on the guidance of the 2012 Association of Environmental Professionals (AEP) Whitepaper, *Forecasting Community-Wide Greenhouse Gas Emissions and Setting Reduction Targets*.[1] It is important to note that GHG emission forecast calculation methodologies can evolve over time, so transparency in methodology is essential for consistency in future updates to the Imperial Valley Regional Climate Action Plan (RCAP).

[1] Association of Environmental Professionals (AEP). 2012. Forecasting Community-Wide Greenhouse Gas Emissions and Setting Reduction Targets. https://califaep.org/docs/Forecasting_and_Target_Setting.pdf.

2 Business-as-Usual Scenario GHG Emissions Forecast

The *BAU scenario* GHG emissons forecast uses demographic projections and modeled tranportation emissions to estimate future GHG emissions without the influence of any GHG reduction legilsation or policies. The *BAU scenario* GHG emission projections were calculated by muliplying projected activty data with the sector GHG emission factors, established by the 2018 Community GHG Emissions Inventory. Several indicator growth factors were developed from community specific 2018 activity data for various emissions sectors, which were applied to community demographic projections to estimate future year emissions. On-road transportation and off-road equipment GHG emissions were projected using modeled activity data and emissions. Emission factors for the *BAU scenario* remain constant for all forecast years, derived from the 2018 Community GHG Emissions Inventory.

2.1 Business-as-Usual Scenario Growth Factors

BAU Scenario growth factors were developed for each GHG emissions source included in the 2018 Community GHG Emissions Inventories. Growth factors are calculated by dividing the 2018 activity data for a given emission source by the appropriate growth metric (population, employment, or service population). Growth metrics are used as indicators for how specific sectors are expected to change in the future, so sectors such as residential energy use will change with population and commercial energy use will change with the number of jobs. A description of the growth factors and associated demographics used to project activity data are provided in Table 1 for each for the GHG emission sources in the 2018 Community GHG Emissions Inventories. Jurisdiction specific growth factors are provided in

Table 2. On-road transportation and off-road equipment data was obtained from the Southern California Association of Governments (SCAG) traffic models which are discussed further in *On-Road Transportation Projections* and *Off-Road Transportation Projections*.

Table 1 Summary of GHG Emission Sources and Growth Factors for BAU Scenario Forecast

GHG Emissions Source	Demographic Projection Metric	Growth Factor
Energy		
Residential Natural Gas Consumption	Population	Natural Gas Consumption per Resident
Non-residential Natural Gas Consumption	Employment	Natural Gas Consumption per Employment
Residential Propane Consumption	Population	Propane Consumption per Resident
Non-residential Propane Consumption	Employment	Propane Consumption per Employment
Residential Electricity Consumption	Population	Electricity Consumption per Resident
Non-residential Electricity Consumption	Employment	Electricity Consumption per Employment
Transmission and Distribution Losses (T&D Losses)	NA	T&D Losses Factor (9.2%) applied to sum of Residential and Non-residential Electricity Consumption
Transportation		
On-Road Transportation	NA	Annual Vehicle Miles Traveled within Jurisdiction, obtained from the Southern California Association of Governments (SCAG) 2016 Regional Travel Demand Model.[1]
Off-Road Equipment	NA	MT of CO_2e as obtained from CARB's OFFROAD2007 and OFFROAD2017 off-road transportation emissions model
Water		
Potable Water Supply Electricity Consumption	Service Population	Potable Water Supply Electricity Consumption per Service Person
Wastewater Collection and Treatment Electricity Consumption	Service Population	Wastewater Collection and Treatment Electricity Consumption per Service Person
Wastewater Process and Fugitive Emissions	Service Population	Wastewater Process and Fugitive Emissions per Service Person
Waste		
Solid Waste Disposal	Service Population	Solid Waste Disposed per Service Person

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent;

[1] Senate Bill 375 Regional Targets Advisory Committee (SB 375 RTAC) Methodology utilizes the origin-destination method allowing for better allocation of vehicle miles traveled (VMT) across jurisdictions by accounting for all internal VMT with the jurisdiction, half of the VMT that crosses jurisdiction boundaries, and discounting pass-through traffic with no trip endpoint within the jurisdiction.

Table 2 Jurisdiction Specific Business-as-Usual Scenario Growth Factors

Emission Sector Growth Factor	Brawley	Calexico	Calipatria	El Centro	Holtville	Imperial	Westmorland	Unincorp. County
Residential Electricity per Resident (kWh/capita)	3,687	2,724	2,278	2,798	5,255	3,788	6,868	2,620
Non-residential Electricity per Employment (kWh/employment)	13,129	11,306	17,440	9,882	18,897	13,808	26,264	9,849
Residential Natural Gas per Resident (therm/capita)	51.64	42.81	20.50	42.26	29.34	48.82	47.60	20.09
Non-residential Natural Gas per Employment (therm/employment)	36.09	38.57	2.84	62.39	17.70	16.39	0.00	37.46
Residential Propane per Resident (gallons/capita)	1.88	1.61	0.87	1.89	1.86	1.83	1.75	1.78
Non-residential Propane per Employment (gallons/employment)	39.34	39.34	39.34	39.34	39.34	39.34	39.34	39.34
Waste per Service Person (tons/SP)	0.63	0.49	0.19	0.44	0.32	0.55	0.56	0.87
Wastewater Process GHG Emissions Per Service Person (MT CO_2e/SP)	0.12	0.13	0.13	0.10	0.12	0.13	0.14	0.16

Notes: **kWh** = kilowatt-hour; **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; **SP** = Service Population

Vehicle Miles Traveled (VMT) is not included in this table, because activity data was forecasted separately using the Southern California Association of Governments (SCAG) 2016 Regional Travel Demand Model. On-road transportation forecasted activity data is provided below, in *On-Road Transportation Projections.*

2.2 Demographic Projections

Future activity data used to calculate GHG emissions in the *BAU scenario* is estimated by multiplying a growth factor activity by the appropraite demographic projection. Demographic projections were obtained from the the SCAG *Connect SoCal 2020 Regional Transportation Plan/Sustainable*

Communities Strategy (2020 RTP/SCS) future demographic forecasts.[2] Demographic projections were applied to the growth factors provided in the following discusson. The population, employment and service population for each of the eight jurisdicitons are provided in Table 3.

[2] Southern California Association of Governments (SCAG) 2020. Connect SoCal 2020 Regional Transportation Plan/Sustainable Communities Strategy (2020 RTP/SCS). Demographics and Growth Forecasts. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579.

Table 3 Demographic Projections used for BAU Scenario Forecast

Jurisdiction	Growth Sector	2020	2030	2040	2050
City of Brawley	Population	28,431	33,498	38,566	43,634
	Employment	9,544	11,166	12,789	14,411
	Service Population	37,974	44,664	51,355	58,045
City of Calexico	Population	43,147	52,888	62,629	72,371
	Employment	12,750	15,970	19,190	22,410
	Service Population	55,897	68,858	81,819	94,781
City of Calipatria	Population	7,652	8,471	9,290	10,110
	Employment	1,976	2,386	2,795	3,205
	Service Population	9,628	10,857	12,086	13,314
City of El Centro	Population	47,240	51,864	56,488	61,112
	Employment	28,042	36,065	44,088	52,112
	Service Population	75,281	87,929	100,576	113,224
City of Holtville	Population	6,595	7,065	7,535	8,005
	Employment	2,044	2,347	2,649	2,951
	Service Population	8,639	9,412	10,184	10,956
City of Imperial	Population	19,996	23,118	26,239	29,361
	Employment	5,783	8,110	10,437	12,763
	Service Population	25,780	31,228	36,676	42,124
City of Westmorland	Population	2,331	2,358	2,386	2,414
	Employment	341	324	308	292
	Service Population	2,671	2,683	2,694	2,706
Unincorporated County[1]	Population	41,947	51,648	61,349	71,051
	Employment	19,659	23,756	27,852	31,948
	Service Population	61,606	75,404	89,201	102,999

Data Source: Southern California Association of Governments (SCAG) 2020. Connect SoCal 2020 Regional Transportation Plan/Sustainable Communities Strategy (2020 RTP/SCS). Demographics and Growth Forecasts. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579.

2.3 On-Road Transportation Projections

On-road transportation vehicle miles traveled (VMT) activity data was obtained through analysis performed by SCAG transportation modelers, which attributes VMT to each jurisdiction based on the origin and destination of vehicle trips. The analysis utilized the SCAG Trip Based Regional Travel Demand Model developed for the 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), which utilizes socio-economic data (i.e. population, employment, households, workers, school enrollment, etc.) and Traffic Analysis Zones (TAZs) to model regional traffic demand. The model output for each year attributes a traffic volume to a trip length that corresponds to the distance between two TAZs within the SCAG planning area. The traffic volume multiplied by trip length provides a daily VMT value which is used to obtain an annual VMT between two TAZs, which is then multiplied by 347 days per year to obtain annual VMT.[3] VMT was attributed to each jurisdiction utilizing the California Air Resources Board (CARB) recommended SB 375 Regional Targets Advisory Committee (RTAC) methodology.[4] Projected on-road transportation activity data is provided in Table 4 for passenger and commercial vehicles. Values provided are annual VMT projections aggregated according to SB 375 RTAC Methodology.

[3] Annual VMT is obtained by multiplying the daily VMT by 347 days per year. CARB https://members.e2.org/ext/doc/AB32%20Scoping%20Plan%20Economic%20Analysis.pdf. page 14

[4] The SB 375 RTAC methodology provides a framework for attributing VMT to a jurisdiction based on the origin and destination of a vehicle trip. Trips that begin and end in a TAZ within a specific jurisdiction are considered Internal-Internal (I-I), and all of the trip's VMT is fully attributed to the jurisdiction. Trips that begin or end in a TAZ within a specific jurisdiction but terminate or originate in a TAZ outside of the jurisdiction and considered Internal-External (I-X) or External-Internal (X-I), and half of the trip's VMT is attributed to the jurisdiction. Trips that begin and end in TAZs outside of a specific jurisdiction and only "pass-through" the jurisdiction are considered External-External (X-X), and no VMT is attributed to the jurisdiction.

Table 4 Projected Annual VMT

Jurisdiction	Vehicle Class	2020 VMT	2030 VMT	2040 VMT	2050 VMT
City of Brawley	Passenger	143,207,031	155,914,182	188,120,365	220,326,548
	Commercial	19,662,185	22,750,201	25,993,102	29,236,003
City of Calexico	Passenger	153,980,169	172,183,288	185,935,252	199,687,216
	Commercial	23,754,200	29,116,110	32,129,370	35,142,630
City of Calipatria	Passenger	54,724,616	56,295,470	42,385,535	28,475,600
	Commercial	3,536,024	4,386,528	5,135,229	5,883,930
City of El Centro	Passenger	225,934,924	244,093,749	244,997,439	245,901,129
	Commercial	26,144,417	30,233,085	34,195,028	38,156,971
City of Holtville	Passenger	34,644,143	37,182,629	34,234,241	31,285,853
	Commercial	4,466,992	5,300,896	5,973,721	6,646,546
City of Imperial	Passenger	78,235,655	84,834,821	86,507,223	88,179,625
	Commercial	10,978,860	12,905,205	15,155,342	17,405,479
City of Westmorland	Passenger	19,215,062	19,957,121	17,056,685	14,156,249
	Commercial	1,860,912	2,007,085	2,135,963	2,264,841
Unincorporated County[1]	Passenger	618,751,239	682,016,321	686,515,851	691,015,381
	Commercial	92,248,097	104,352,100	118,254,149	132,156,197

Notes: **VMT** = Vehicle Miles Traveled

Data Source: SCAG Trip Based Regional Travel Demand Model developed for the 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS)

2.4 Off-Road Transportation Projections

Off-road equipment GHG emissions for the *BAU scenario* forecast were obtained directly from CARB's OFFROAD2007 and OFFROAD2017 models. These models provide GHG emissions for different activity categories, such as recreational vehicles or commercial equipment, based on the expected existence of the activities in the region. Projected GHG emissions were obtained for the model output for the entire Imperial County for the years 2030 and 2040. Emissions for 2020 were estimated by interpolation between 2018 GHG emissions totals and 2030 emission totals, while 2050 emissions were estimated by projecting the change in emissions between 2030 and 2040 out to 2050. The total emissions for the entire Imperial County region were calculated from the model outputs, which were then attributed to each of the eight jurisdictions. The 2018 Community GHG Inventory provides a detailed description of the metrics used to attribute emission to each jurisdiction. The emission totals for each jurisdiction are provided for the forecast years in Table 5.

Table 5 Projected Off-road Equipment GHG Emissions

Jurisdiction	2020 Emissions (MT CO_2e)	2030 Emissions (MT CO_2e)	2040 Emissions (MT CO_2e)	2050 Emissions (MT CO_2e)
City of Brawley	10,423	12,345	14,729	17,113
City of Calexico	13,755	16,307	19,481	22,656
City of Calipatria	2,129	2,525	3,019	3,512
City of El Centro	28,780	33,948	40,291	46,634
City of Holtville	2,262	2,682	3,204	3,726
City of Imperial	6,126	7,271	8,698	10,125
City of Westmorland	431	516	624	732
Unincorporated County[1]	40,636	50,252	64,090	77,928
Total	104,544	125,845	154,135	182,425

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

Data Source: California Air Resources Board's (CARB's) OFFROAD2007 and OFFROAD2017 models.

2.5 Business-as-Usual Scenario Results

A summary of the *BAU scenario* results for each jurisdiction is provided in Appendix A.

3 Legislative Adjusted Scenario GHG Emissions Forecast

Several federal and state regulations have been enacted that reduce Imperial Valley's GHG emissions in 2020, 2030, 2040, and 2050. The impact of these regulations were quantified and incorporated into an *adjusted scenario* forecast to provide a more accurate depiction of future GHG emissions growth and the responsibility of each jurisdiciton once established state regulations have been implemented. A description of the methodology used to calculate GHG emissions reductionthat can be expected from the below regulations is provided in this section.

3.1 Transportation Legislation

Major regulations incorporated into the CARB's 2017 transportation modeling include Advanced Clean Car Standards (LEV III, ZEV program, etc.), Senate Bill 1, and Phase 2 Federal GHG Standards. The most recent action by the state to influence transportation related GHG emissions is Executive Order (EO) N-79-20, which moves to require all vehicles sold in California to be zero-emission by 2030. The reach of executive orders is limited to state agencies, and are not considered to have the same regulatory requirements as adopted legislation. Therefore, EO N-79-20 is not considered in the transportation legislation GHG emission reductions; however, the influence will be addressed GHG reduction measures specific to zero-emission vehicles.

Reductions in GHG emissions from the above referenced standards were calculated using CARB's EMFAC2017 model for Imperial County. The EMFAC2017 model integrates the estimated reductions from state and federal transportaion legislation into the mobile source emissions portion of the model.[5] The degree to which GHG emissions from on-road transportation in Imperial Valley will be reduced can be calcualted from the change in emission factors, as provided by EMFAC2017, between the baseline GHG inventory year (2018) and the forecast years. Emission factors are calculated for the two vehicle classes (passenger and commercial) were obtained by taking the average EMFAC2017 emission factors for all of the vehicle types under these classes, weighted by the EMFAC2017 modeled VMT, aggregated by fuel type.[6] The percentage change in emission factor from the baseline inventory year (2018) to the forecast year, as provided in Table 6, represents the percentage that state and federal legislation will reduce GHG emissions below the *BAU scenario*

[5] Additional details are provided in CARB's EMFAC2017 Technical Documentation, July 2018. (https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf). Note that the Low Carbon Fuel Standard (LCFS) regulation is excluded from EMFAC2017 because most of the emissions benefits due to the LCFS come from the production cycle (upstream emissions) of the fuel rather than the combustion cycle (tailpipe). As a result, LCFS is assumed to not have a significant impact on CO_2 emissions from EMFAC's tailpipe emission estimates.

[6] Emission factors for CO_2, CH_4, and N_2O were combined to calculate a carbon dioxide equivalent (CO_2e) factor using the appropriate global warming potentials. IPCC 5th Assessment Report Global Warming Potentials used for GHG emission calculations (1 kg CO2 = 1 kg CO2e; 1 kg CH4 = 21 kg CO2e; 1 kg N2O = 265 kg CO2e).

emissions in commercial and passenger on-road transportation for the respective forecast year. The GHG emissions reduction from legslation is calculated as the reduction in emissions below the *BAU scenario* forecast for commercial and passenger on-road transportation GHG emissions. The emissions reduction impact of transportation legislation for each jurisdiction is detailed in Appendix A.

Table 6 GHG Emission Reduction Impact of Transportation Legislation

Sector	2018 (Baseline)	2020	2030	2040	2050
Passenger Vehicles		-	-	-	-
Emission Factor (g CO_2e/VMT)	362	339	247	215	209
Reduction below *BAU Scenario*	0%	6%	32%	41%	42%
Commercial Vehicles					
Emission Factor (g CO_2e/VMT)	1,260	1,240	1,025	924	911
Reduction below *BAU Scenario*	0%	2%	19%	27%	28%

Notes: **g CO_2e** = Grams of Carbon Dioxide Equivalent; **VMT** = Vehicle Miles Traveled

3.2 Title 24

The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption, which in turn reduces fossil fuel consumption and associated GHG emissions. The standards are updated triennially to allow consideration and possible incorporation of new energy-efficient technologies and methods. For projects implemented after January 1, 2020, the California Energy Commission (CEC) estimates that the 2019 standards will reduce electricity and fuel consumption by 53 percent and 7 percent, respectively, for residential buildings and 30 percent for commercial buildings, relative to the 2016 standards.[7]

The calculations and GHG emissions forecast assume that all growth in the residential and non-resdiential sectors is from new construction. Accordingly, Title 24 GHG emission reductions for natural gas, propane and electricty are calculated as a percentage of the projected increase in energy consumption above the 2018 GHG inventory baseline, under the *BAU scenario* forecast, as provided in Table 7. The emissions reduction impact of Title 24 for each jurisdiction is detailed in Appendix A. While both Title 24 and SB 100 inlfuence GHG emission reductions in the electricity sector, double counting of these emission reductions is avoided by accounting for Title 24 reductions first, and then accounting for reductions from SB 100.

[7] California Energy Commission. 2018. 2019 Building Energy Efficiency Standards *Frequently Asked Questions*. https://www.energy.ca.gov/sites/default/files/2020-03/Title_24_2019_Building_Standards_FAQ_ada.pdf.

Table 7 Energy Consumption Reduction Impact of Title 24

	Reduction in Energy Consumption Growth Above 2018 baseline	
Sector	Residential	Commercial
Electricity	53%	30%
Natural Gas	7%	30%
Propane	7%	30%

Data Source: California Energy Commission. 2018. 2019 Building Energy Efficiency Standards Frequently Asked Questions. https://www.energy.ca.gov/sites/default/files/2020-03/Title_24_2019_Building_Standards_FAQ_ada.pdf.

3.3 Renewables Portfolio Standard & SB 100

Established in 2002 under Senate Bill 1078, enhanced in 2015 by Senate Bill 350, and accelerated in 2018 under Senate Bill 100, California's Renewables Portfolio Standard (RPS) is one of the most ambitious renewable energy standards in the country. The RPS program requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026 and 60 percent of total procurement by 2030. The RPS program further requires these entities to increase procurement from GHG-free sources to 100 percent of total procurement by 2045.

Imperial Irrigation District (IID) currently provides electricity in Imperial County and is subject to RPS requirements. IID emissions factors that included compliance with RPS were used to project emissions through 2050. GHG emissions from electricty consumption are largly dicated by the emission factor associated with the supplied electricity. As the percentage of GHG-free sources of energy increases, the electricty emission factor will decrease, thereby decreasing overall GHG emissions. Legislative GHG emission reductions for RPS and SB 100 is calculated as the difference between GHG emissions under the *BAU scenario*, where electricty emissions were calculated in each forecast year using the baseline (2018) emission factor, and GHG emissions calculated using the adjusted GHG emission factor for a given forecast year. The RPS percentage and associated emission factor used to determine the *adjusted scenario* forecast electricity emissions are provided in Table 8. The emissions reduction impact of the RPS and SB 100 for each jurisdiction is detailed in Appendix A.

Table 8 Imperial Irrigation District Forecasted RPS and Electricity Emission Factor

Sector	2018 (Baseline)	2020	2030	2040	2050
Renewable Portfolio Standard Percentage	35%	49%	60%	87%	100%
Adjusted Electricity Emission Factor (MT CO_2e/MWh)	0.2713	0.2137	0.1670	0.0557	0.0000

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; **MWh** = Megawatt-Hour

3.4 Legislative Adjusted Scenario Forecast Results

A summary of the emission reductions from each of the above regulations for each jurisdiction is provided in Appendix A.

4 Agricultural GHG Emissions Forecast

Agricultral emission forecasts are based on projecting forward current trends in agricultural activites. This includes the number of livestock and crop production acreage as provided in recent *Imperial County Crop and Livestock Reports*. The previous ten years of reported data were used to develop growth factors for the emission forcast, as shown in Table 9. While the years 2008 to 2012 show a slight downward trend in crop production, annual values remain fairly constant there after. Additionally, livestock numbers show no evidence of trend over the 10 year period between 2008 and 2018. A linear best-fit was performed with the livestock and crop acreage data, revealing little to no correlation for interannual trends. Accordingly, livestock population and crop acreage are assumed to remaing constant through the emissions forecast period.

Table 9 Agricultural Forecast Growth Factors

Year	Livestock Head	Crop Area Harvested (acres)
2008	525,403	599,040
2009	513,866	536,209
2010	428,196	529,334
2011	439,637	531,547
2012	426,181	565,372
2013	444,010	529,928
2014	407,181	509,442
2015	436,870	534,788
2016	399,286	542,064
2017	404,937	539,272
2018	439,129	537,193
Linear Best-fit Slope (Units/year)[2]	**-8,894**	**-2,802**
R squared value[3]	**0.511**	**0.160**

Notes:

1. in 2018, the *Imperial County Crop and Livestock Report* stopped reporting the number of sheep in the County; therefore, the number of sheep in 2018 is assumed to be equivalent to 2017, as shown in the 2018 report.

2. The linear best-fit slope is the result of applying a linear equation that best represents trends in the data. The slope in this case represents the change per year of the associated metric, head of livestock or crops acres harvested.

3. The R squared value ranges from 0 to 1, providing a metric to determine the accuracy of a linear best fit equation as applied to a specific set of data. A high R squared value provides evidence that there is little variation from the observed trend, and a low R squared value provides that the observed trendline has high variation and does not provide an accurate fit to a data set.

Data Source: Imperial County Agricultural Commissioner. Imperial County Crop Reports. https://www.co.imperial.ca.us/ag/?page=iccr. Accessed April 6, 2020.

Since no trend was found in livestock populations and crop area harvest, which would be used to forecast GHG emissions, and a detailed economic analysis of agricultural production in Imperial Valley is outside of the scope of this analysis, it is assumed that emissions in most agricultural sectors will remain constant from 2018 onward. One exception is for the off-road equipment sector, for which future emissions estimated can be obtained from the CARB OFROAD2017 model.

4.1.1.1 Off-Road Equipment Forecast Calculations

Agricultural off-road equipment emissions were calculated using the CARB OFFROAD2017 model for calculating emissions inventories from off-road equipment.[8] Forecasted fuel consumption totals for agricultural equipment for all Imperial County was obtained for each forecast year. The fuel consumption totals were then multiplied by the appropriate emission factors and global warming potentials to obtain emissions in carbon dioxide equivalent. The OFFROAD2017 model provides emissions forecasts out to 2040, with emissions for 2050 estimated by extrapolating the change in emissions between 2030 and 2040. Table 10 provides the fuel consumption, emission factors and emissions for agricultural equipment, and the extrapolated emissions for 2050.

[8] CARB. 2007. OFFROAD2007. Mobile Source Emissions Inventory Program. http://www.arb.ca.gov/msei/msei.htm

Table 10 Agricultural Off-road Equipment GHG Emissions Forecast

Data Type	2020	2030	2040	2050
Diesel Fuel				
Fuel Consumption (gallons)	6,031,010	5,939,904	5,839,869	5,739,835
CO_2 Emission Factor (kg CO_2/gallon)	10.21			
CH_4 Emission Factor (g CH_4/gallon)	0.28			
N_2O Emission Factor (g N_2O/gallon)	0.49			
Diesel GHG Emissions (MT CO_2e)	**61,577**	**60,646**	**59,625**	**58,604**
Gasoline Fuel				
Fuel Consumption (gallons)	189,709	197,330	208,926	220,522
CO_2 Emission Factor (kg CO_2/gallon)	8.78			
CH_4 Emission Factor (g CH_4/gallon)	12.96			
N_2O Emission Factor (g N_2O/gallon)	0.21			
Gasoline GHG Emissions (MT CO_2e)	**1,666**	**1,733**	**1,834**	**1,936**
Total Emissions (MT CO_2e)	**63,242**	**62,379**	**61,459**	**60,540**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent; **kg** = kilograms; **CO_2** = Carbon Dioxide; **CH_4** = Methane; **N_2O** = Nitrous Oxide.
IPCC 5th Assessment Report Global Warming Potentials used for GHG emission calculations (1 kg CO_2 = 1 kg CO_2e; 1 kg CH_4 = 21 kg CO_2e; 1 kg N_2O = 265 kg CO_2e).
GHG Emission Factors obtained from Environmental Protection Agency 2018 Emission Factors for Greenhouse Gas Inventories. CO_2 values were obtained from Table 4 and CH_4 and N_2O values were obtained from the average of the appropriate equipment class in Table 5. https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf.

Data Sources: CARB. 2017. OFFROAD2017 - ORION. Mobile Source Emissions Inventory Program. https://www.arb.ca.gov/orion/.

4.2 Agricultural GHG Emissions Forecast Results

A summary of the agricultural GHG emissions forecast results is provided in Table 11.

Table 11 Agricultural GHG Emissions Forecast Results

Emission Sector	2020 Emissions ($MT\ CO_2e$)	2030 Emissions ($MT\ CO_2e$)	2040 Emissions ($MT\ CO_2e$)	2050 Emissions ($MT\ CO_2e$)
Agricultural Off-road Equipment	63,242	62,379	61,459	60,540
Diesel Irrigation Pumps	9,546	9,546	9,546	9,546
Residue Burning	2,115	2,115	2,115	2,115
Nitrogen Fertilizer Application	274,796	274,796	274,796	274,796
Liming	34,299	34,299	34,299	34,299
Enteric Fermentation	959,904	959,904	959,904	959,904
Manure Management	1,009,006	1,009,006	1,009,006	1,009,006
Total	**2,352,909**	**2,352,045**	**2,351,126**	**2,350,206**

Notes: **$MT\ CO_2e$** = Metric Tons of Carbon Dioxide Equivalent

5 GHG Reduction Target Setting

The following provides the methodology used calculate GHG emission reduction targets based on mass emissions. The GHG reduction targets are established in alignment with SB 32 and EO-S-3-05, which use 1990 GHG emission levels as their baseline. The GHG reduction targets set for each jurisdiction use the 2005 GHG inventory as the baseline for comparing emissions to 1990 levels, and emission reduction targets are established based on this 2005 GHG inventory. Mass emissions are converted to emission per-capita by dividing the total emissions in a given forecast year by the expected population.

The following GHG emissions reduction target years and their corresponding legislation are used to set GHG emission reduction targets for each jurisdiction:

- Reduce GHG emissions to 40% below 1990 levels by 2030 (SB 32 target year),
- Reduce GHG emissions to 60% below 1990 levels by 2040 (interim year), and
- Reduce GHG emissions to 80% below 1990 levels by 2050 (EO S-3-05 target year).

While the above mentioned GHG reductions targets established by the state are provided in reference to 1990 emission levels, it is assumed that 1990 levels are 15% below 2005 levels, based upon the guidance of the Governor's Office of Planning and Research *General Plan Guidelines*.[9] As such, the emission reduction targets are recalculated to use the 2005 Community GHG Inventory as the baseline, which means first that 2005 emissions are reduced by 15% and then reduced by the state legislations target percentage. From this, an effective percent reduction can be calculated based off the 2005 baseline. A summary of these calculation is provided in Table 12, which demonstrates the percent reduction in GHG emissions that each jurisdiction will need to meet to align with state goals.

Table 12 Effective GHG Emission Reduction Target Calculation

Year	Target Description	Effective Reduction Target Calculation	Effective Reduction Below Baseline
1990	15% reduction below Baseline	Baseline x (1- 0.15)	15% reduction below Baseline
2005	Baseline	Baseline	Baseline
2030	40% reduction below 1990	Baseline x (1 - 0.15) x (1 - 0.40)	49% reduction below Baseline
2040	60% reduction below 1990	Baseline x (1 - 0.15) x (1 - 0.60)	66% reduction below Baseline
2050	80% reduction below 1990	Baseline x (1 - 0.15) x (1 - 0.80)	83% reduction below Baseline

[9] Governor's Office of Planning and Research (OPR). 2017. General Plan Guidelines. Ch 8 Climate Change. p. 228. https://opr.ca.gov/docs/OPR_C8_final.pdf.

Appendix B2

GHG Emissions Forecast and Targets Summary by Jurisdiction

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Table of Contents

Tables

Figures

1 Greenhouse Gas Emissions Forecast Summary by Jurisdiction

Provided in this appendix is a summary of the Community Greenhouse gas (GHG) Emissions Forecasts and Reduction Targets for each of the jurisdictions covered by the Imperial Valley Regional Climate Action Plan (RCAP). The GHG emissions forecasts build upon the GHG inventories that were prepared for the Imperial Valley jurisdictions for the years 2005, 2012 and 2018. The purpose of this section is to provide detailed information specific to each jurisdiction that can inform local policy makers on the expected change in future GHG emissions, and the reductions necessary to achieve the identified GHG reduction targets for their jurisdictions.

Included here is a detailed assessment of the impact of anticipated population and economic changes would have on future emissions in each incorporated city and the unincorporated areas and communities of Imperial County through 2050 in a *Business-as-Usual* (*BAU) scenario*, and a quantification of the reduction impact that State regulations will have on the *BAU scenario* emissions, presented in an *legislative adjusted (adjusted) scenario* forecast. The *adjusted scenario* incorporates the impact of State regulations which would reduce the future Imperial County GHG emissions to provide a more accurate picture of future emissions growth and the responsibility of the County of Imperial and the incorporated cities for GHG reductions. The methodology for the GHG emission forecast calculations can be found in Appendix B.

2 City of Brawley

The City of Brawley (Brawley) is an incorporated city of Imperial Valley which had adopted its own Climate action Plan (CAP) in 2015. The 2015 CAP includes strategies to reduce GHG emissions to 15% below 2005 baseline emission levels by 2020, and a further 30% reduction of emissions by 2030. 2020 was the sunsetting year for the GHG reduction goals established by Assembly Bill (AB) 32 and an updated GHG reductions goal of 40% below the states 1990 baseline has more recently been established with the adoption of Senate Bill (SB) 32. Therefore, it is recommended that the City of Brawley update its GHG reduction targets to align with the 2030 targets established by SB 32 and establish a long-term aspirational target. Included here is an updated GHG emissions forecast based on the updated GHG inventories for 2005, 2012 and 2018, as well as recommended GHG reduction targets that align with recent State legislation.

2.1 City of Brawley Business-as-Usual Scenario GHG Emissions Forecast

The *BAU scenario* forecast for Brawley estimates that all GHG emission sectors will experience growth in alignment with population and employment projections. An increase from 190,742 metric tons of carbon dioxide equivalent (MT CO_2e) in 2018 to 298,745 MT CO_2e in 2050 would be expected if no action to reduce GHG emissions were to take place. Because of established climate legislation by the State, it is not expected that GHG emissions will reach these levels in Brawley; however, the *BAU scenario* forecast provided here does serve as a baseline for determining expected future GHG emissions after the impacts of state legislation. Brawley demographics and GHG emissions for each emission sources are provided in Table 1 for previous GHG inventory years and the *BAU scenario* forecast.

Table 1 City of Brawley BAU Scenario Forecast and Previous Inventories

Emission Sector	2005	2012	2018	2020	2030	2040	2050
Demographics							
Population	22,909	25,465	27,417	28,431	33,498	38,566	43,634
Employment	6,907	8,031	9,219	9,544	11,166	12,789	14,411
Energy (MT CO_2e)	**155,426**	**124,006**	**77,478**	**80,272**	**94,243**	**108,213**	**122,183**
Natural Gas	10,349	9,505	9,289	9,629	11,330	13,032	14,733
Residential Propane	157	235	295	306	361	416	470
Non-residential Propane	1,559	1,813	2,081	2,155	2,521	2,887	3,253
Residential Electricity	61,917	50,090	27,429	28,443	33,512	38,582	43,652
Non-residential Electricity	69,367	52,889	32,839	33,995	39,775	45,555	51,335
Electricity T&D Losses	12,078	9,474	5,545	5,744	6,742	7,741	8,739
Transportation (MT CO_2e)	**71,858**	**75,409**	**86,201**	**86,986**	**97,394**	**115,510**	**133,627**
Passenger On-road Vehicles	46,619	48,403	53,151	51,784	56,379	68,025	79,671
Commercial On-road Vehicles	17,189	19,486	23,011	24,778	28,669	32,756	36,843
Off-road Equipment	8,050	7,520	10,039	10,423	12,345	14,729	17,113
Water (MT CO_2e)[1]	**3,754**	**4,172**	**4,492**	**4,656**	**5,477**	**6,297**	**7,117**
Waste (MT CO_2e)[2]	**20,534**	**15,902**	**22,607**	**23,433**	**27,561**	**31,690**	**35,818**
Total Emissions (MT CO_2e)	**251,571**	**219,489**	**190,778**	**195,347**	**224,674**	**261,710**	**298,745**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Water sector emissions include only process and fugitive emissions from wastewater treatment. Emissions from the electricty consumed in the supply of potable water and wastewater treatment are included in the non-residential electricity sector.

2. Waste sector emissions include methane from waste decomposition and landfill process emissions.

2.2 City of Brawley Legislative Adjusted GHG Emissions Forecast

The *adjusted scenario* GHG emissions forecast provides an assessment of how currently adopted State legislation is expected to contribute to GHG emissions reduction in Brawley. Legislation accounted for in the *adjusted scenario* forecast includes Title 24 building standards, SB 100, and various pieces of transportation legislation, including Advanced Clean Car Standards, SB 1, and Phase 2 Federal GHG Standards. A summary of the GHG emissions reductions expected from legislation are provided in Table 2.

Table 2 City of Brawley Legislative Reductions and Adjusted Scenario Forecast

Emission Sector	2020 (MT CO_2e)	2030 (MT CO_2e)	2040 (MT CO_2e)	2050 (MT CO_2e)
Transportation Legislation[1]	**3,584**	**23,285**	**29,466**	**43,945**
Passenger On-road	3,181	17,925	22,498	33,731
Commercial On-road	403	5,360	6,968	10,215
Title 24[2]	**527**	**5,792**	**11,058**	**16,323**
Residential Natural Gas	10	107	204	302
Non-residential Natural Gas	31	342	653	964
Residential Propane	0	4	8	12
Non-residential Propane	3	28	54	79
Residential Electricity	269	2,956	5,643	8,330
Non-residential Electricity	173	1,907	3,641	5,375
Transmission and Distribution Losses	41	447	854	1,261
Senate Bill 100[3]	**14,373**	**28,738**	**64,973**	**88,760**
Residential Electricity	5,982	11,753	26,183	35,322
Non-residential Electricity	7,181	14,565	33,316	45,960
Transmission and Distribution Losses	1,211	2,421	5,474	7,478
Total Legislative Reductions	**18,484**	**57,816**	**105,496**	**149,029**
Resulting *Adjusted Scenario* Forecast[4]	**176,863**	**166,859**	**149,360**	**149,716**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Transportation legislation includes the expected emission reduction from major regulations incorporated into the California Air Resources Board's 2017 transportation modeling include Advanced Clean Car Standards (LEV III, ZEV program, etc.), Senate Bill 1, and Phase 2 Federal GHG Standards.

2. The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings result in reduced energy consumption in new construction under the 2019 code cycle, as compared to existing buildings.

3. The RPS program under Senate Bill 100 requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026, 60 percent of total procurement by 2030, and 100 percent of total procurement by 2045.

4. The Resulting *adjusted scenario* forecast is calculated by subtracting the Total Legislative Reductions from the *BAU scenario* forecast results.

2.3 City of Brawley GHG Emission Reduction Targets

Brawley's GHG emission reduction targets are established in alignment with the reduction goals of SB 32 (2030) and Executive Order (EO) S-3-05 (2050), based on the 2005 GHG inventory, with an interim target for 2040.[1] The GHG emission reductions that will need to be accomplished with policies in the RCAP can be determined from the gap remaining between the *adjusted scenario* forecast and the reduction targets. GHG reduction targets can be established as mass emissions, looking at the total emissions generated by the community, or on a per-capita basis. Table 3 and Figure 1 provide a summary of the GHG emissions forecast and GHG reduction targets. In order to meet the 2030 target established by SB 32, Brawley will need to establish policies that are supported by substantial evidence to reduce GHG emissions by 38,557 MT CO_2e in 2030 and 106,949 MT CO_2e by 2050.

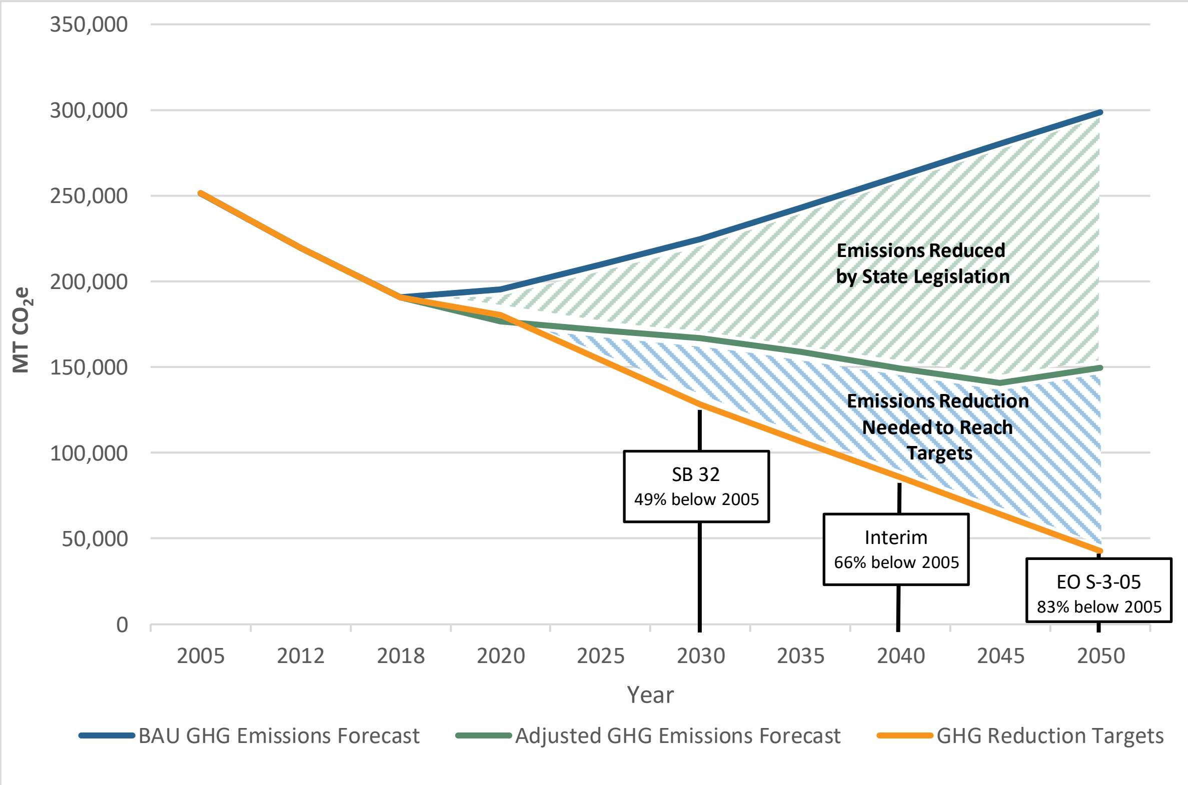
Table 3 City of Brawley GHG Emissions Reduction Target and Gap Analysis

Scenario	2020 (MT CO_2e)[3]	2030 (MT CO_2e)[4]	2040 (MT CO_2e)[5]	2050 (MT CO_2e)[6]
Mass Emissions Targets and Gap				
Absolute Emissions Adjusted Forecast (MT CO_2e)	176,863	166,859	149,360	149,716
Absolute Emissions Targets (MT CO_2e)[2]	180,365	128,301	85,534	42,767
Remaining Emissions Gap (MT CO_2e)	**-3,502**	**38,557**	**63,826**	**106,949**
Per-Capita Targets and Gap				
Population[1]	28,431	33,498	38,566	43,634
Per Capita Adjusted Forecast (MT CO_2e per capita)	6.2	5.0	3.9	3.4
Per Capita Targets (MT CO_2e per capita)[2]	6.3	3.8	2.2	1.0
Remaining Per Capita Emissions Gap (MT CO_2e per capita)	**-0.1**	**1.2**	**1.7**	**2.4**

Notes: MT CO_2e = metric tons of carbon dioxide equivalent
Emissions have been rounded to the nearest whole number and therefore sums may not match.
1. Population estimates are from the Southern California Association of Governments (SCAG) Connect SoCal 2020 - Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) Growth Forecast. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579.
2. These provisional targets are consistent with both SB 32 and a trajectory set forth to achieve EO S-3-05 targets set by the state.
3. Specific targets for 2020 are not established, but are instead provided to show the trajectory between the 2018 GHG inventory and the 2030 forecast year.
4. SB 32 requires the CARB to ensure that statewide GHG emissions are reduced to 40 percent below the 1990 level by 2030.
5. Recommended interim target year.
6. EO-S-3-05 sets a target of reducing statewide GHG emissions to 80% below 1990 levels by 2050.

[1] Executive Order S-3-05 (2005), signed by former Governor Schwarzenegger in 2005, establishes statewide GHG emissions reduction goals to achieve long-term climate stabilization as follows: by 2020, reduce GHG emissions to 1990 levels and by 2050, reduce GHG emissions to 80 percent below 1990 levels.

Figure 1 City of Brawley GHG Emissions Forecast and Targets



3 City of Calexico

The City of Calexico (Calexico) is an incorporated city of Imperial Valley which had adopted its own CAP in 2015. The 2015 CAP includes strategies to reduce GHG emissions to 15% below 2005 baseline emission levels by 2020, and a further 30% reduction of emissions by 2030. 2020 was the sunsetting year for the GHG reduction goals established by AB 32 and an updated GHG reductions goal of 40% below the states 1990 baseline has more recently been established with the adoption of SB 32. Therefore, it is recommended that the City of Calexico update its GHG reduction targets to align with the 2030 targets established by SB 32 and establish a long-term aspirational target. Included here is an updated GHG emissions forecast based on the updated GHG inventories for 2005, 2012 and 2018, as well as recommended GHG reduction targets that align with recent State legislation.

3.1 City of Calexico Business-as-Usual Scenario GHG Emissions Forecast

The *BAU scenario* forecast for Calexico estimates that all GHG emission sectors will experience growth in alignment with population and employment projections. An increase from 217,473 MT CO_2e in 2018 to 356,723 MT CO_2e in 2050 would be expected if no action to reduce GHG emissions were to take place. Because of established climate legislation by the State, it is not expected that GHG emissions will reach these levels in Calexico; however, the *BAU scenario* forecast provided here does serve as a baseline for determining expected future GHG emissions after the impacts of state legislation. Calexico demographics and GHG emissions for each emission sources are provided in Table 4 for previous GHG inventory years and the *BAU scenario* forecast.

Table 4 City of Calexico BAU Scenario Forecast and Previous Inventories

Emission Sector	2005	2012	2018	2020	2030	2040	2050
Demographics							
Population	34,492	29,533	41,199	43,147	52,888	62,629	72,371
Employment	8,555	8,256	12,106	12,750	15,970	19,190	22,410
Energy (MT CO_2e)	**163,290**	**122,163**	**88,774**	**93,242**	**115,584**	**137,926**	**160,268**
Natural Gas	12,974	11,793	11,850	12,426	15,301	18,176	21,051
Residential Propane	200	311	381	399	489	579	669
Non-residential Propane	1,931	1,864	2,733	2,878	3,605	4,332	5,059
Residential Electricity	65,064	54,380	30,455	31,895	39,096	46,297	53,497
Non-residential Electricity	70,635	44,700	37,136	39,112	48,989	58,867	68,745
Electricity T&D Losses	12,484	9,115	6,218	6,533	8,104	9,675	11,246
Transportation (MT CO_2e)	**97,757**	**81,409**	**96,471**	**99,370**	**115,261**	**127,205**	**139,150**
Passenger On-road Vehicles	63,874	51,084	54,377	55,680	62,262	67,235	72,208
Commercial On-road Vehicles	23,826	22,419	28,849	29,935	36,692	40,489	44,286
Off-road Equipment	10,056	7,906	13,245	13,755	16,307	19,481	22,656
Water (MT CO_2e)[1]	**5,651**	**4,839**	**6,750**	**7,079**	**8,720**	**10,361**	**12,003**
Waste (MT CO_2e)[2]	**24,474**	**14,388**	**25,479**	**26,718**	**32,913**	**39,108**	**45,303**
Total Emissions (MT CO_2e)	**291,173**	**222,799**	**217,473**	**226,408**	**272,477**	**314,600**	**356,723**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Water sector emissions include only process and fugitive emissions from wastewater treatment. Emissions from the electricty consumed in the supply of potable water and wastewater treatment are included in the non-residential electricity sector.
2. Waste sector emissions include methane from waste decomposition and landfill process emissions.

3.2 City of Calexico Legislative Adjusted GHG Emissions Forecast

The *adjusted scenario* GHG emissions forecast provides an assessment of how currently adopted State legislation is expected to contribute to GHG emissions reduction in Calexico. Legislation accounted for in the *adjusted scenario* forecast includes Title 24 building standards, SB 100, and various pieces of transportation legislation, including Advanced Clean Car Standards, SB 1, and Phase 2 Federal GHG Standards. A summary of the GHG emissions reductions expected from legislation are provided in Table 5.

Table 5 City of Calexico Legislative Reductions and Adjusted Scenario Forecast

Emission Sector	2020 (MT CO_2e)	2030 (MT CO_2e)	2040 (MT CO_2e)	2050 (MT CO_2e)
Transportation Legislation[1]	**3,907**	**26,655**	**32,174**	**42,849**
Passenger On-road	3,420	19,795	23,419	30,571
Commercial On-road	487	6,860	8,755	12,278
Title 24[2]	**828**	**9,103**	**17,379**	**25,654**
Residential Natural Gas	16	171	326	481
Non-residential Natural Gas	66	726	1,386	2,046
Residential Propane	1	7	13	20
Non-residential Propane	5	56	107	158
Residential Electricity	382	4,198	8,014	11,831
Non-residential Electricity	296	3,260	6,223	9,186
Transmission and Distribution Losses	62	686	1,310	1,934
Senate Bill 100[3]	**16,305**	**33,864**	**78,924**	**110,538**
Residential Electricity	6,691	13,422	30,429	41,667
Non-residential Electricity	8,241	17,588	41,845	59,558
Transmission and Distribution Losses	1,374	2,853	6,649	9,313
Total Legislative Reductions	**21,040**	**69,622**	**128,476**	**179,041**
Resulting *Adjusted Scenario* Forecast[4]	**205,369**	**202,855**	**180,236**	**177,682**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Transportation legislation includes the expected emission reduction from major regulations incorporated into the California Air Resources Board's 2017 transportation modeling include Advanced Clean Car Standards (LEV III, ZEV program, etc.), Senate Bill 1, and Phase 2 Federal GHG Standards.

2. The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings result in reduced energy consumption in new construction under the 2019 code cycle, as compared to existing buildings.

3. The RPS program under Senate Bill 100 requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026, 60 percent of total procurement by 2030, and 100 percent of total procurement by 2045.

4. The Resulting *adjusted scenario* forecast is calculated by subtracting the Total Legislative Reductions from the *BAU scenario* forecast results.

3.3 City of Calexico GHG Emission Reduction Targets

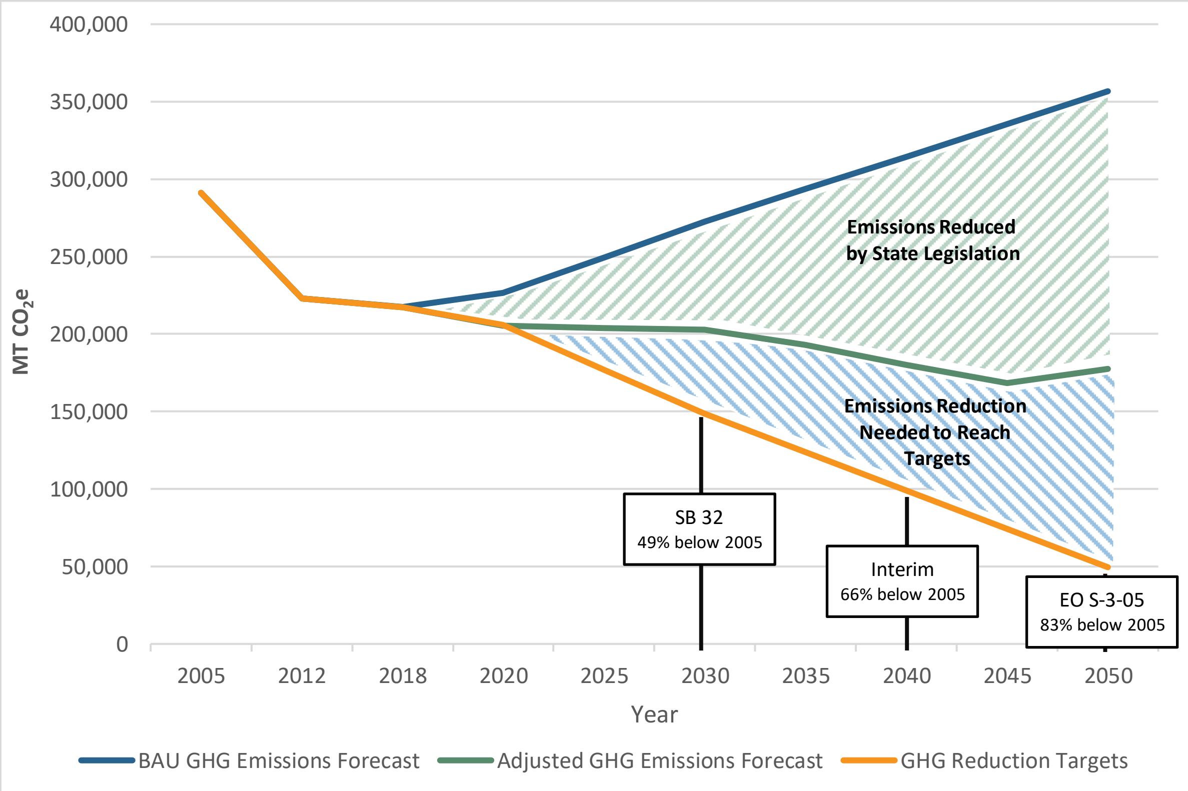
Calexico's GHG emission reduction targets are established in alignment with SB 32 and EO S-3-05, based on the 2005 GHG inventory, with an interim target for 2040. The GHG emissions reduction that will need to be accomplished with policies in the RCAP can be determined from the gap remaining between the *adjusted scenario* forecast and the reduction targets. GHG reduction targets can be established as mass emissions, looking at the total emissions generated by the community, or on a per-capita basis. Table 6 and Figure 2 provide a summary of the GHG emissions forecast and GHG reduction targets. In order to meet the 2030 target established by SB 32, Calexico will need to establish policies that are supported by substantial evidence to reduce GHG emissions by 54,358 MT CO_2e in 2030 and 128,182 MT CO_2e by 2050.

Table 6 City of Calexico GHG Emissions Reduction Target and Gap Analysis

Scenario	2020 (MT CO_2e)[3]	2030 (MT CO_2e)[4]	2040 (MT CO_2e)[5]	2050 (MT CO_2e)[6]
Mass Emissions Targets and Gap				
Absolute Emissions Adjusted Forecast (MT CO_2e)	205,369	202,855	180,236	177,682
Absolute Emissions Targets (MT CO_2e)[2]	205,978	148,498	98,999	49,499
Remaining Emissions Gap (MT CO_2e)	**-609**	**54,358**	**81,237**	**128,182**
Per-Capita Targets and Gap				
Population[1]	43,147	52,888	62,629	72,371
Per Capita Adjusted Forecast (MT CO_2e per capita)	4.8	3.8	2.9	2.5
Per Capita Targets (MT CO_2e per capita)[2]	4.8	2.8	1.6	0.7
Remaining Per Capita Emissions Gap (MT CO_2e per capita)	**0.0**	**1.0**	**1.3**	**1.8**

Notes: MT CO_2e = metric tons of carbon dioxide equivalent
Emissions have been rounded to the nearest whole number and therefore sums may not match.
1. Population estimates are from the Southern California Association of Governments (SCAG) Connect SoCal 2020 - Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) Growth Forecast. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579.
2. These provisional targets are consistent with both SB 32 and a trajectory set forth to achieve EO S-3-05 targets set by the state.
3. Specific targets for 2020 are not established, but are instead provided to show the trajectory between the 2018 GHG inventory and the 2030 forecast year.
4. SB 32 requires the CARB to ensure that statewide GHG emissions are reduced to 40 percent below the 1990 level by 2030.
5. Recommended interim target year.
6. EO-S-3-05 sets a target of reducing statewide GHG emissions to 80% below 1990 levels by 2050.

Figure 2 City of Calexico GHG Emissions Forecast and Targets



4 City of Calipatria

The City of Calipatria (Calipatria) is an incorporated city of Imperial Valley which has not previously adopted a CAP, completed a GHG inventory, or established GHG reduction targets. Calipatria generally covers a smaller land area and has experienced slower growth than other Imperial Valley jurisdictions. Calipatria has also seen a steep decrease in GHG emissions between 2005 and 2018, which is likely attributed to losses of jobs in Calipatria during the economic downturn of the late 2000's. Included here is a GHG emissions forecast based on the GHG inventories for 2005, 2012 and 2018, as well as recommended GHG reduction targets that align with recent State legislation.

4.1 City of Calipatria Business-as-Usual Scenario GHG Emissions Forecast

The *BAU scenario* forecast for Calipatria estimates that most GHG emission sectors will experience growth in alignment with population and employment projections, except for on-road passenger vehicles, which are expected to experience a decline in overall vehicle miles traveled after 2030 due to increased infill development. An overall increase from 38,726 MT CO_2e in 2018 to 51,449 MT CO_2e in 2050 would be expected if no action to reduce GHG emissions were to take place. It is not expected that GHG emissions will reach these levels in Calipatria; however, the *BAU scenario* forecast provided here serves as a baseline for determining expected future GHG emissions after the impacts of state legislation and setting GHG reduction targets. Calipatria demographics and GHG emissions for each emission source are provided in Table 7 for previous GHG inventory years and the *BAU scenario* forecast.

Table 7 City of Calipatria BAU Scenario Forecast and Previous Inventories

Emission Sector	2005	2012	2018	2020	2030	2040	2050
Demographics							
Population	7,554	7,980	7,488	7,652	8,471	9,290	10,110
Employment	2,239	1,257	1,894	1,976	2,386	2,795	3,205
Energy (MT CO_2e)	**56,836**	**27,641**	**16,150**	**16,722**	**19,584**	**22,446**	**25,307**
Natural Gas	1,015	874	844	863	959	1,054	1,149
Residential Propane	22	31	38	38	42	47	51
Non-residential Propane	505	284	428	446	539	631	724
Residential Electricity	13,909	10,703	4,628	4,729	5,236	5,742	6,248
Non-residential Electricity	36,727	13,521	8,963	9,350	11,289	13,227	15,165
Electricity T&D Losses	4,658	2,229	1,250	1,295	1,520	1,745	1,970
Transportation (MT CO_2e)	**24,343**	**20,162**	**19,590**	**26,374**	**28,409**	**24,817**	**21,224**
Passenger On-road Vehicles	15,948	15,736	13,464	19,789	20,357	15,327	10,297
Commercial On-road Vehicles	5,859	3,207	4,075	4,456	5,528	6,471	7,415
Off-road Equipment	2,536	1,219	2,050	2,129	2,525	3,019	3,512
Water (MT CO_2e)[1]	**1,238**	**1,308**	**1,227**	**1,259**	**1,420**	**1,580**	**1,741**
Waste (MT CO_2e)[2]	**3,186**	**1,730**	**1,759**	**1,805**	**2,036**	**2,266**	**2,497**
Total Emissions (MT CO_2e)	**85,603**	**50,840**	**38,726**	**46,161**	**51,449**	**51,109**	**50,769**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Water sector emissions include only process and fugitive emissions from wastewater treatment. Emissions from the electricty consumed in the supply of potable water and wastewater treatment are included in the non-residential electricity sector.

2. Waste sector emissions include methane from waste decomposition and landfill process emissions.

4.2 City of Calipatria Legislative Adjusted GHG Emissions Forecast

The *adjusted scenario* GHG emissions forecast provides an assessment of how currently adopted State legislation is expected to contribute to GHG emissions reduction in Calipatria. Legislation accounted for in the *adjusted scenario* forecast includes Title 24 building standards, SB 100, and various pieces of transportation legislation, including Advanced Clean Car Standards, SB 1, and Phase 2 Federal GHG Standards. A summary of the GHG emissions reductions expected from legislation are provided in Table 8.

Table 8 City of Calipatria Legislative Reductions and Adjusted Scenario Forecast

Emission Sector	2020 (MT CO_2e)	2030 (MT CO_2e)	2040 (MT CO_2e)	2050 (MT CO_2e)
Transportation Legislation[1]	**1,288**	**7,506**	**7,814**	**6,415**
Passenger On-road	1,215	6,472	6,453	4,359
Commercial On-road	73	1,034	1,361	2,056
Title 24[2]	**95**	**1,042**	**1,989**	**2,936**
Residential Natural Gas	1	7	13	19
Non-residential Natural Gas	1	7	13	19
Residential Propane	0	0	1	1
Non-residential Propane	1	7	14	20
Residential Electricity	27	295	564	832
Non-residential Electricity	58	640	1,221	1,803
Transmission and Distribution Losses	8	86	164	242
Senate Bill 100[3]	**3,244**	**6,548**	**14,916**	**20,507**
Residential Electricity	998	1,900	4,116	5,416
Non-residential Electricity	1,973	4,096	9,543	13,363
Transmission and Distribution Losses	273	552	1,257	1,728
Total Legislative Reductions	**4,627**	**15,095**	**24,719**	**29,858**
Resulting *Adjusted Scenario* Forecast[4]	**41,534**	**36,354**	**26,263**	**20,911**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Transportation legislation includes the expected emission reduction from major regulations incorporated into the California Air Resources Board's 2017 transportation modeling include Advanced Clean Car Standards (LEV III, ZEV program, etc.), Senate Bill 1, and Phase 2 Federal GHG Standards.

2. The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings result in reduced energy consumption in new construction under the 2019 code cycle, as compared to existing buildings.

3. The RPS program under Senate Bill 100 requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026, 60 percent of total procurement by 2030, and 100 percent of total procurement by 2045.

4. The Resulting *adjusted scenario* forecast is calculated by subtracting the Total Legislative Reductions from the *BAU scenario* forecast results.

4.3 City of Calipatria GHG Emission Reduction Targets

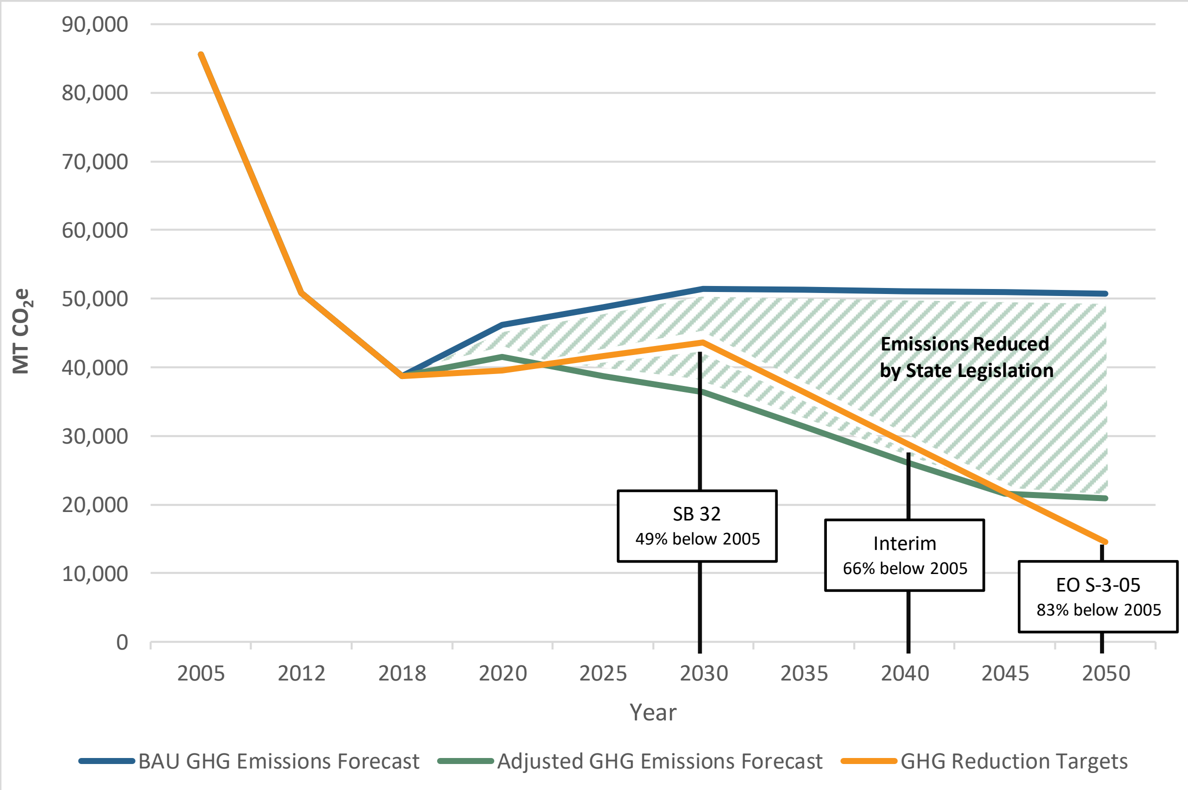
Calipatria's GHG emissions reduction targets are established in alignment with SB 32 and EO S-3-05, based on the 2005 GHG inventory, with an interim target for 2040. The GHG emission reductions that will need to be accomplished with policies in the RCAP can be determined from the gap remaining between the *adjusted scenario* forecast and the reduction targets. GHG reduction targets can be established as mass emissions, looking at the total emissions generated by the community, or on a per-capita basis. Table 9 and Figure 3 provide a summary of the GHG emissions forecast and GHG reduction targets. Due to the significant GHG emission reduction experienced in Calipatria since 2005, it is expected that the GHG emission reductions that will occur from state legislation alone will allow Calipatria to meet the SB 32 targets for 2030. This is primarily attributed to the limited growth potential in Calipatria, which is influenced by the small area of the jurisdictional boundary. This situation allows Calipatria to focus on maintaining the progress made thus far and looking towards longer-term deep-carbonization goals.

Table 9 City of Calipatria GHG Emissions Reduction Target and Gap Analysis

Scenario	2020 (MT CO_2e)[3]	2030 (MT CO_2e)[4]	2040 (MT CO_2e)[5]	2050 (MT CO_2e)[6]
Mass Emissions Targets and Gap				
Absolute Emissions Adjusted Forecast (MT CO_2e)	41,534	36,354	26,263	20,911
Absolute Emissions Targets (MT CO_2e)[2]	39,548	43,657	29,105	14,552
Remaining Emissions Gap (MT CO_2e)	**1,986**	**-7,303**	**-2,841**	**6,358**
Per-Capita Targets and Gap				
Population[1]	7,652	8,471	9,290	10,110
Per Capita Adjusted Forecast (MT CO_2e per capita)	5.4	4.3	2.8	2.1
Per Capita Targets (MT CO_2e per capita)[2]	5.2	5.2	3.1	1.4
Remaining Per Capita Emissions Gap (MT CO_2e per capita)	**0.2**	**-0.9**	**-0.3**	**0.6**

Notes: MT CO_2e = metric tons of carbon dioxide equivalent
Emissions have been rounded to the nearest whole number and therefore sums may not match.
1. Population estimates are from the Southern California Association of Governments (SCAG) Connect SoCal 2020 - Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) Growth Forecast. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579.
2. These provisional targets are consistent with both SB 32 and a trajectory set forth to achieve EO S-3-05 targets set by the state.
3. Specific targets for 2020 are not established, but are instead provided to show the trajectory between the 2018 GHG inventory and the 2030 forecast year.
4. SB 32 requires the CARB to ensure that statewide GHG emissions are reduced to 40 percent below the 1990 level by 2030.
5. Recommended interim target year.
6. EO-S-3-05 sets a target of reducing statewide GHG emissions to 80% below 1990 levels by 2050.

Figure 3 City of Calipatria GHG Emissions Forecast and Targets



5 City of El Centro

The City of El Centro (El Centro) is an incorporated city of Imperial Valley which has not previously adopted a CAP, completed a GHG inventory, or established GHG reduction targets. El Centro is Imperial Valley's population and employment center, and as such has experienced larger growth as compared to the smaller Imperial Valley jurisdictions. El Centro has also seen a steady decrease in GHG emissions between 2005 and 2018. Included here is a GHG emissions forecast based on the GHG inventories for 2005, 2012 and 2018, as well as recommended GHG reduction targets that align with recent State legislation.

5.1 City of El Centro Business-as-Usual Scenario GHG Emissions Forecast

The *BAU scenario* forecast for El Centro estimates that all GHG emission sectors will experience growth in alignment with population and employment growth projections. An overall increase from 315,556 MT CO_2e in 2018 to 491,047 MT CO_2e in 2050 would be expected if no action to reduce GHG emissions were to take place. It is not expected that GHG emissions will reach these levels in El Centro; however, the *BAU scenario* forecast provided here serves as a baseline for determining expected future GHG emissions after the impacts of state legislation and setting GHG emissions reduction targets. El Centro demographics and GHG emissions for each emission source are provided in Table 10 for previous GHG inventory years and the *BAU scenario* forecast.

Table 10 City of El Centro BAU Scenario Forecast and Previous Inventories

Emission Sector	2005	2012	2018	2020	2030	2040	2050
Demographics							
Population	39,273	43,396	46,315	47,240	51,864	56,488	61,112
Employment	18,002	20,315	26,437	28,042	36,065	44,088	52,112
Energy (MT CO_2e)	**291,031**	**226,324**	**141,428**	**148,004**	**180,887**	**213,771**	**246,654**
Natural Gas	21,310	18,853	19,161	19,901	23,599	27,296	30,994
Residential Propane	271	404	503	513	563	614	664
Non-residential Propane	4,064	4,586	5,968	6,331	8,142	9,953	11,765
Residential Electricity	90,456	72,520	35,158	35,860	39,370	42,880	46,390
Non-residential Electricity	152,571	112,901	70,881	75,184	96,696	118,207	139,719
Electricity T&D Losses	22,359	17,059	9,756	10,216	12,518	14,820	17,122
Transportation (MT CO_2e)	**122,627**	**125,495**	**135,090**	**143,427**	**160,313**	**171,975**	**183,638**
Passenger On-road Vehicles	78,631	81,156	76,697	81,699	88,266	88,592	88,919
Commercial On-road Vehicles	23,595	25,960	30,646	32,947	38,099	43,092	48,085
Off-road Equipment	20,401	18,379	27,747	28,780	33,948	40,291	46,634
Water (MT CO_2e)[1]	**6,435**	**7,110**	**7,589**	**7,852**	**9,172**	**10,491**	**11,810**
Waste (MT CO_2e)[2]	**54,623**	**32,313**	**31,450**	**32,543**	**38,011**	**43,478**	**48,945**
Total Emissions (MT CO_2e)	**474,715**	**391,242**	**315,556**	**331,827**	**388,383**	**439,715**	**491,047**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Water sector emissions include only process and fugitive emissions from wastewater treatment. Emissions from the electricty consumed in the supply of potable water and wastewater treatment are included in the non-residential electricity sector.

2. Waste sector emissions include methane from waste decomposition and landfill process emissions.

5.2 City of El Centro Legislative Adjusted GHG Emissions Forecast

The *adjusted scenario* GHG emissions forecast provides an assessment of how currently adopted State legislation is expected to contribute to GHG emissions reduction in El Centro. Legislation accounted for in the *adjusted scenario* forecast includes Title 24 building standards, SB 100, and various pieces of transportation legislation, including Advanced Clean Car Standards, SB 1, and Phase 2 Federal GHG Standards. A summary of the GHG emissions reductions expected from legislation are provided in Table 11.

Table 11 City of El Centro Legislative Reductions and Adjusted Scenario Forecast

Emission Sector	2020 (MT CO_2e)	2030 (MT CO_2e)	2040 (MT CO_2e)	2050 (MT CO_2e)
Transportation Legislation[1]	**5,554**	**35,186**	**41,194**	**50,978**
Passenger On-road	5,018	28,062	31,984	37,646
Commercial On-road	536	7,123	9,210	13,331
Title 24[2]	**1,194**	**13,135**	**25,077**	**37,018**
Residential Natural Gas	7	80	153	225
Non-residential Natural Gas	266	2,925	5,585	8,244
Residential Propane	0	4	7	11
Non-residential Propane	13	139	266	393
Residential Electricity	186	2,046	3,907	5,767
Non-residential Electricity	645	7,099	13,552	20,006
Transmission and Distribution Losses	76	841	1,606	2,371
Senate Bill 100[3]	**25,552**	**53,307**	**124,669**	**175,087**
Residential Electricity	7,574	14,355	30,979	40,623
Non-residential Electricity	15,825	34,460	83,187	119,713
Transmission and Distribution Losses	2,153	4,491	10,503	14,751
Total Legislative Reductions	**32,300**	**101,628**	**190,940**	**263,083**
Resulting *Adjusted Scenario* Forecast[4]	**299,526**	**286,755**	**242,554**	**227,964**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Transportation legislation includes the expected emission reduction from major regulations incorporated into the California Air Resources Board's 2017 transportation modeling include Advanced Clean Car Standards (LEV III, ZEV program, etc.), Senate Bill 1, and Phase 2 Federal GHG Standards.

2. The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings result in reduced energy consumption in new construction under the 2019 code cycle, as compared to existing buildings.

3. The RPS program under Senate Bill 100 requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026, 60 percent of total procurement by 2030, and 100 percent of total procurement by 2045.

4. The Resulting *adjusted scenario* forecast is calculated by subtracting the Total Legislative Reductions from the *BAU scenario* forecast results.

5.3 City of El Centro GHG Emission Reduction Targets

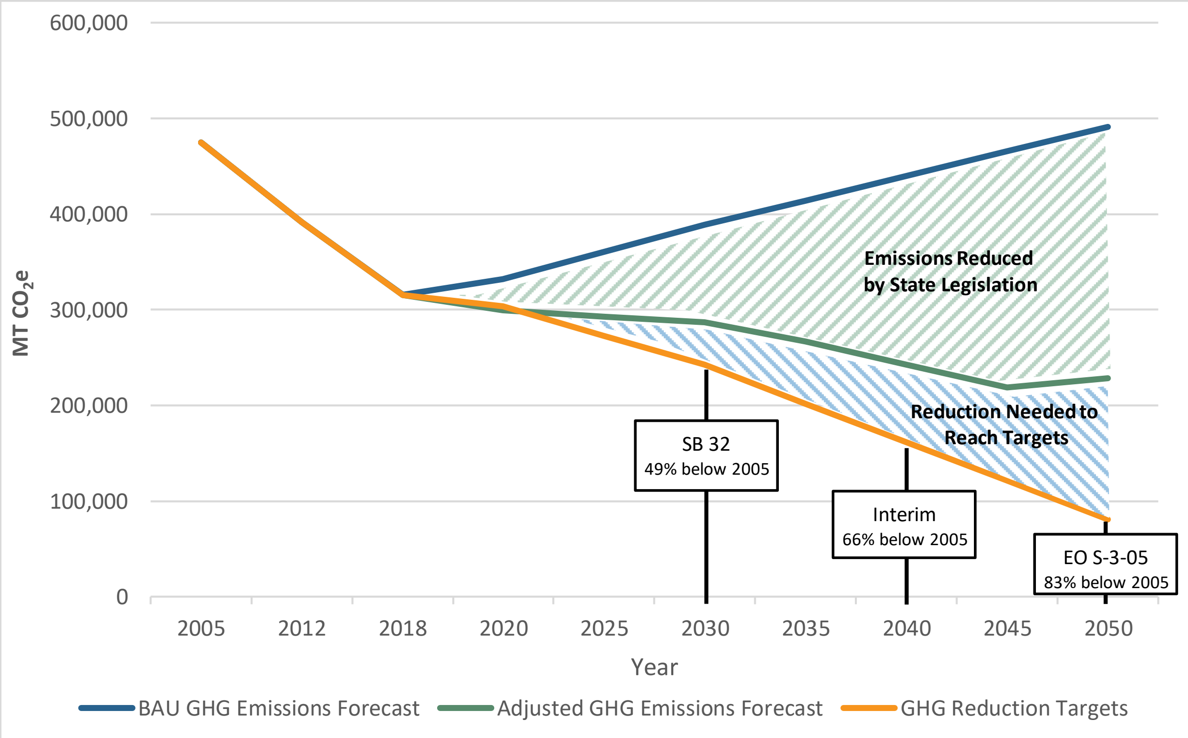
El Centro's GHG emission reduction targets are established in alignment with SB 32 and EO S-3-05, based on the 2005 GHG inventory, with an interim target for 2040. The GHG emissions reduction that will need to be accomplished with policies in the RCAP can be determined from the gap remaining between the *adjusted scenario* forecast and the reduction targets. GHG reduction targets can be established as mass emissions, looking at the total emissions generated by the community, or on a per-capita basis. Table 12 and Figure 4 provide a summary of the GHG emissions forecast and GHG reduction targets. In order to meet the 2030 target established by SB 32, El Centro will need to establish policies that are supported by substantial evidence to reduce GHG emissions by 44,650 MT CO_2e in 2030.

Table 12 City of El Centro GHG Emissions Reduction Target and Gap Analysis

Scenario	2020 (MT CO_2e)[3]	2030 (MT CO_2e)[4]	2040 (MT CO_2e)[5]	2050 (MT CO_2e)[6]
Mass Emissions Targets and Gap				
Absolute Emissions Adjusted Forecast (MT CO_2e)	299,526	286,755	242,554	227,964
Absolute Emissions Targets (MT CO_2e)[2]	303,315	242,105	161,403	80,702
Remaining Emissions Gap (MT CO_2e)	**-3,788**	**44,650**	**81,150**	**147,263**
Per-Capita Targets and Gap				
Population[1]	47,240	51,864	56,488	61,112
Per Capita Adjusted Forecast (MT CO_2e per capita)	6.3	5.5	4.3	3.7
Per Capita Targets (MT CO_2e per capita)[2]	6.4	4.7	2.9	1.3
Remaining Per Capita Emissions Gap (MT CO_2e per capita)	**-0.1**	**0.8**	**1.4**	**2.4**

Notes: MT CO_2e = metric tons of carbon dioxide equivalent
Emissions have been rounded to the nearest whole number and therefore sums may not match.
1. Population estimates are from the Southern California Association of Governments (SCAG) Connect SoCal 2020 - Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) Growth Forecast. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579.
2. These provisional targets are consistent with both SB 32 and a trajectory set forth to achieve EO S-3-05 targets set by the state.
3. Specific targets for 2020 are not established, but are instead provided to show the trajectory between the 2018 GHG inventory and the 2030 forecast year.
4. SB 32 requires the CARB to ensure that statewide GHG emissions are reduced to 40 percent below the 1990 level by 2030.
5. Recommended interim target year.
6. EO-S-3-05 sets a target of reducing statewide GHG emissions to 80% below 1990 levels by 2050.

Figure 4 City of El Centro GHG Emissions Forecast and Targets



6 City of Holtville

The City of Holtville (Holtville) is an incorporated city of Imperial Valley which has not previously adopted a CAP, completed a GHG inventory, or established GHG reduction targets. Holtville covers a smaller land area and has experienced slower growth than other Imperial Valley jurisdictions. Holtville has also seen a steep decrease in GHG emissions between 2005 and 2018. Included here is a GHG emissions forecast based on the GHG inventories for 2005, 2012 and 2018, as well as recommended GHG reduction targets that align with recent State legislation.

6.1 City of Holtville Business-as-Usual Scenario GHG Emissions Forecast

The *BAU scenario* forecast for Holtville estimates that most GHG emission sectors will experience growth in alignment with population and employment projections, except for on-road passenger vehicles, which are expected to decline in overall vehicle miles traveled after 2030 due to increased infill development. An overall increase from 45,614 MT CO_2e in 2018 to 59,393 MT CO_2e in 2050 would be expected if no action to reduce GHG emissions were to take place. It is not expected that GHG emissions will reach these levels in Holtville; however, the *BAU scenario* forecast provided here serves as a baseline for determining expected future GHG emissions after the impacts of state legislation and setting GHG reduction targets. Holtville demographics and GHG emissions for each emission sources are provided in Table 13 for previous GHG inventory years and the *BAU scenario* forecast.

Table 13 City of Holtville BAU Scenario Forecast and Previous Inventories

Emission Sector	2005	2012	2018	2020	2030	2040	2050
Demographics							
Population	5,408	6,049	6,501	6,595	7,065	7,535	8,005
Employment	1,202	1,041	1,984	2,044	2,347	2,649	2,951
Energy (MT CO_2e)	**48,136**	**34,478**	**22,948**	**23,468**	**26,067**	**28,666**	**31,265**
Natural Gas	1,248	1,138	1,200	1,220	1,322	1,423	1,525
Residential Propane	36	55	69	70	75	80	85
Non-residential Propane	271	235	448	462	530	598	666
Residential Electricity	22,927	19,062	9,270	9,404	10,074	10,745	11,415
Non-residential Electricity	19,729	11,204	10,173	10,482	12,032	13,582	15,131
Electricity T&D Losses	3,924	2,784	1,789	1,830	2,034	2,238	2,442
Transportation (MT CO_2e)	**19,925**	**19,278**	**19,015**	**20,419**	**22,808**	**23,111**	**23,415**
Passenger On-road Vehicles	13,029	13,612	11,202	12,528	13,445	12,379	11,313
Commercial On-road Vehicles	5,458	4,609	5,634	5,629	6,680	7,528	8,376
Off-road Equipment	1,438	1,057	2,179	2,262	2,682	3,204	3,726
Water (MT CO_2e)[1]	**886**	**991**	**983**	**1,001**	**1,091**	**1,180**	**1,270**
Waste (MT CO_2e)[2]	**5,523**	**2,988**	**2,667**	**2,716**	**2,958**	**3,201**	**3,444**
Total Emissions (MT CO_2e)	**74,470**	**57,736**	**45,614**	**47,604**	**52,924**	**56,159**	**59,393**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Water sector emissions include only process and fugitive emissions from wastewater treatment. Emissions from the electricty consumed in the supply of potable water and wastewater treatment are included in the non-residential electricity sector.

2. Waste sector emissions include methane from waste decomposition and landfill process emissions.

6.2 City of Holtville Legislative Adjusted GHG Emissions Forecast

The *adjusted scenario* GHG emissions forecast provides an assessment of how currently adopted State legislation is expected to contribute to GHG emissions reduction in Holtville. Legislation accounted for in the *adjusted scenario* forecast includes Title 24 building standards, SB 100, and various pieces of transportation legislation, including Advanced Clean Car Standards, SB 1, and Phase 2 Federal GHG Standards. A summary of the GHG emissions reductions expected from legislation are provided in Table 14.

Table 14 City of Holtville Legislative Reductions and Adjusted Scenario Forecast

Emission Sector	2020 (MT CO_2e)	2030 (MT CO_2e)	2040 (MT CO_2e)	2050 (MT CO_2e)
Transportation Legislation[1]	**861**	**5,524**	**6,282**	**7,112**
Passenger On-road	769	4,275	4,670	4,790
Commercial On-road	92	1,249	1,612	2,322
Title 24[2]	**93**	**1,028**	**1,962**	**2,896**
Residential Natural Gas	1	6	11	16
Non-residential Natural Gas	3	31	60	88
Residential Propane	0	0	1	1
Non-residential Propane	0	5	10	15
Residential Electricity	36	391	746	1,101
Non-residential Electricity	46	511	976	1,441
Transmission and Distribution Losses	8	83	158	234
Senate Bill 100[3]	**4,592**	**8,906**	**19,620**	**26,212**
Residential Electricity	1,989	3,724	7,948	10,314
Non-residential Electricity	2,216	4,431	10,020	13,690
Transmission and Distribution Losses	387	750	1,653	2,208
Total Legislative Reductions	**5,546**	**15,457**	**27,864**	**36,220**
Resulting *Adjusted Scenario* Forecast[4]	**42,058**	**37,467**	**27,549**	**23,173**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Transportation legislation includes the expected emission reduction from major regulations incorporated into the California Air Resources Board's 2017 transportation modeling include Advanced Clean Car Standards (LEV III, ZEV program, etc.), Senate Bill 1, and Phase 2 Federal GHG Standards.

2. The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings result in reduced energy consumption in new construction under the 2019 code cycle, as compared to existing buildings.

3. The RPS program under Senate Bill 100 requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026, 60 percent of total procurement by 2030, and 100 percent of total procurement by 2045.

4. The Resulting *adjusted scenario* forecast is calculated by subtracting the Total Legislative Reductions from the *BAU scenario* forecast results.

6.3 City of Holtville GHG Emission Reduction Targets

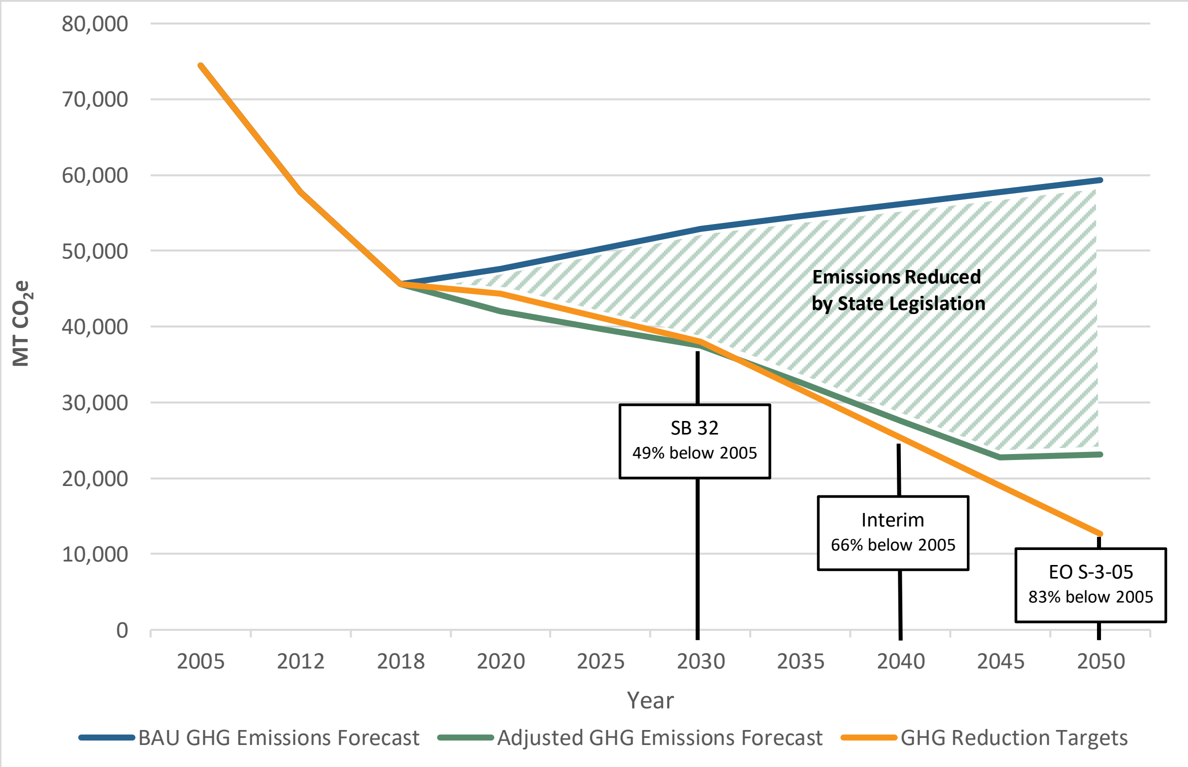
Holtville's GHG emissions reduction targets are established in alignment with SB 32 and EO S-3-05, based on the 2005 GHG inventory, with an interim target for 2040. The GHG emissions reduction that will need to be accomplished with policies in the RCAP can be determined from the gap remaining between the *adjusted scenario* forecast and the reduction targets. GHG reduction targets can be established as mass emissions, looking at the total emissions generated by the community, or on a per-capita basis. Table 9 and Figure 3 provide a summary of the GHG emissions forecast and GHG reduction targets. Due to the significant GHG emission reduction experienced in Holtville since 2005, it is expected that the GHG emission reductions that will occur from state legislation alone will allow Holtville to meet the SB 32 targets for 2030. This is primarily attributed to the limited growth potential in Holtville, which is influenced by the small area of the jurisdictional boundary. This situation allows Holtville to focus on maintaining the progress made thus far and looking towards longer-term deep-carbonization goals.

Table 15 City of Holtville GHG Emissions Reduction Target and Gap Analysis

Scenario	2020 (MT CO_2e)[3]	2030 (MT CO_2e)[4]	2040 (MT CO_2e)[5]	2050 (MT CO_2e)[6]
Mass Emissions Targets and Gap				
Absolute Emissions Adjusted Forecast (MT CO_2e)	42,058	37,467	27,549	23,173
Absolute Emissions Targets (MT CO_2e)[2]	44,341	37,980	25,320	12,660
Remaining Emissions Gap (MT CO_2e)	**-2,283**	**-513**	**2,229**	**10,513**
Per-Capita Targets and Gap				
Population[1]	6,595	7,065	7,535	8,005
Per Capita Adjusted Forecast (MT CO_2e per capita)	6.4	5.3	3.7	2.9
Per Capita Targets (MT CO_2e per capita)[2]	6.7	5.4	3.4	1.6
Remaining Per Capita Emissions Gap (MT CO_2e per capita)	**-0.3**	**-0.1**	**0.3**	**1.3**

Notes: MT CO_2e = metric tons of carbon dioxide equivalent
Emissions have been rounded to the nearest whole number and therefore sums may not match.
1. Population estimates are from the Southern California Association of Governments (SCAG) Connect SoCal 2020 - Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) Growth Forecast. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579.
2. These provisional targets are consistent with both SB 32 and a trajectory set forth to achieve EO S-3-05 targets set by the state.
3. Specific targets for 2020 are not established, but are instead provided to show the trajectory between the 2018 GHG inventory and the 2030 forecast year.
4. SB 32 requires the CARB to ensure that statewide GHG emissions are reduced to 40 percent below the 1990 level by 2030.
5. Recommended interim target year.
6. EO-S-3-05 sets a target of reducing statewide GHG emissions to 80% below 1990 levels by 2050.

Figure 5 City of Holtville GHG Emissions Forecast and Targets



7 City of Imperial

The City of Imperial (Imperial) is an incorporated city of Imperial Valley which has not previously adopted a CAP, completed a GHG inventory, or established GHG reduction targets. Imperial is one of Imperial Valley's population and employment centers and has experienced the largest growth of any of the other Imperial Valley jurisdiction. Imperial's community GHG emissions between 2005 and 2018 have remained nearly constant, with efficiencies in energy end-uses and vehicle fuel consumption being outweighed by growth. Included here is a GHG emissions forecast based on the GHG inventories for 2005, 2012 and 2018, as well as recommended GHG reduction targets that align with recent State legislation.

7.1 City of Imperial Business-as-Usual Scenario GHG Emissions Forecast

The *BAU scenario* forecast for Imperial estimates that all GHG emission sectors will experience growth in alignment with population and employment projections. An overall increase from 111,231 MT CO_2e in 2018 to 189,131 MT CO_2e in 2050 would be expected if no action to reduce GHG emissions were to take place. It is not expected that GHG emissions will reach these levels in Imperial; however, the *BAU scenario* forecast provided here serves as a baseline for determining expected future GHG emissions after the impacts of state legislation and setting GHG reduction targets. Imperial demographics and GHG emissions for each emission source are provided in Table 16 for previous GHG inventory years and the *BAU scenario* forecast.

Table 16 City of Imperial BAU Scenario Forecast and Previous Inventories

Emission Sector	2005	2012	2018	2020	2030	2040	2050
Demographics							
Population	10,289	15,353	19,372	19,996	23,118	26,239	29,361
Employment	2,738	3,445	5,318	5,783	8,110	10,437	12,763
Energy (MT CO_2e)	**68,087**	**65,765**	**50,392**	**53,310**	**67,903**	**82,495**	**97,088**
Natural Gas	3,919	4,715	5,487	5,689	6,702	7,714	8,726
Residential Propane	70	139	204	210	243	276	309
Non-residential Propane	618	778	1,201	1,306	1,831	2,356	2,881
Residential Electricity	29,133	31,142	19,912	20,554	23,762	26,971	30,179
Non-residential Electricity	28,999	23,926	19,923	21,667	30,383	39,100	47,816
Electricity T&D Losses	5,348	5,066	3,665	3,884	4,981	6,079	7,176
Transportation (MT CO_2e)	**29,950**	**39,199**	**44,370**	**48,252**	**54,210**	**59,078**	**63,945**
Passenger On-road Vehicles	18,302	25,509	25,727	28,290	30,677	31,282	31,886
Commercial On-road Vehicles	8,424	10,334	12,745	13,835	16,263	19,098	21,934
Off-road Equipment	3,224	3,356	5,897	6,126	7,271	8,698	10,125
Water (MT CO_2e)[1]	**1,686**	**2,516**	**3,174**	**3,314**	**4,015**	**4,715**	**5,415**
Waste (MT CO_2e)[2]	**10,464**	**9,196**	**13,295**	**13,882**	**16,815**	**19,749**	**22,683**
Total Emissions (MT CO_2e)	**110,187**	**116,676**	**111,231**	**118,758**	**142,943**	**166,037**	**189,131**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Water sector emissions include only process and fugitive emissions from wastewater treatment. Emissions from the electricty consumed in the supply of potable water and wastewater treatment are included in the non-residential electricity sector.

2. Waste sector emissions include methane from waste decomposition and landfill process emissions.

7.2 City of Imperial Legislative Adjusted GHG Emissions Forecast

The *adjusted scenario* GHG emissions forecast provides an assessment of how currently adopted State legislation is expected to contribute to GHG emissions reduction in Imperial. Legislation accounted for in the *adjusted scenario* forecast includes Title 24 building standards, SB 100, and various pieces of transportation legislation, including Advanced Clean Car Standards, SB 1, and Phase 2 Federal GHG Standards. A summary of the GHG emissions reductions expected from legislation are provided in Table 17.

Table 17 City of Imperial Legislative Reductions and Adjusted Scenario Forecast

Emission Sector	2020 (MT CO_2e)	2030 (MT CO_2e)	2040 (MT CO_2e)	2050 (MT CO_2e)
Transportation Legislation[1]	**1,963**	**12,794**	**15,216**	**19,581**
Passenger On-road	1,738	9,753	11,205	13,500
Commercial On-road	225	3,041	4,011	6,081
Title 24[2]	**501**	**5,512**	**10,523**	**15,534**
Residential Natural Gas	6	62	119	176
Non-residential Natural Gas	20	223	425	628
Residential Propane	0	3	5	7
Non-residential Propane	4	40	77	114
Residential Electricity	170	1,871	3,571	5,272
Non-residential Electricity	261	2,876	5,491	8,106
Transmission and Distribution Losses	40	437	834	1,231
Senate Bill 100[3]	**9,688**	**20,747**	**49,483**	**70,563**
Residential Electricity	4,328	8,420	18,600	24,908
Non-residential Electricity	4,544	10,580	26,714	39,710
Transmission and Distribution Losses	816	1,748	4,169	5,945
Total Legislative Reductions	**12,152**	**39,053**	**75,222**	**105,677**
Resulting *Adjusted Scenario* Forecast[4]	**106,606**	**103,890**	**88,253**	**83,453**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Transportation legislation includes the expected emission reduction from major regulations incorporated into the California Air Resources Board's 2017 transportation modeling include Advanced Clean Car Standards (LEV III, ZEV program, etc.), Senate Bill 1, and Phase 2 Federal GHG Standards.

2. The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings result in reduced energy consumption in new construction under the 2019 code cycle, as compared to existing buildings.

3. The RPS program under Senate Bill 100 requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026, 60 percent of total procurement by 2030, and 100 percent of total procurement by 2045.

4. The Resulting *adjusted scenario* forecast is calculated by subtracting the Total Legislative Reductions from the *BAU scenario* forecast results.

7.3 City of Imperial GHG Emission Reduction Targets

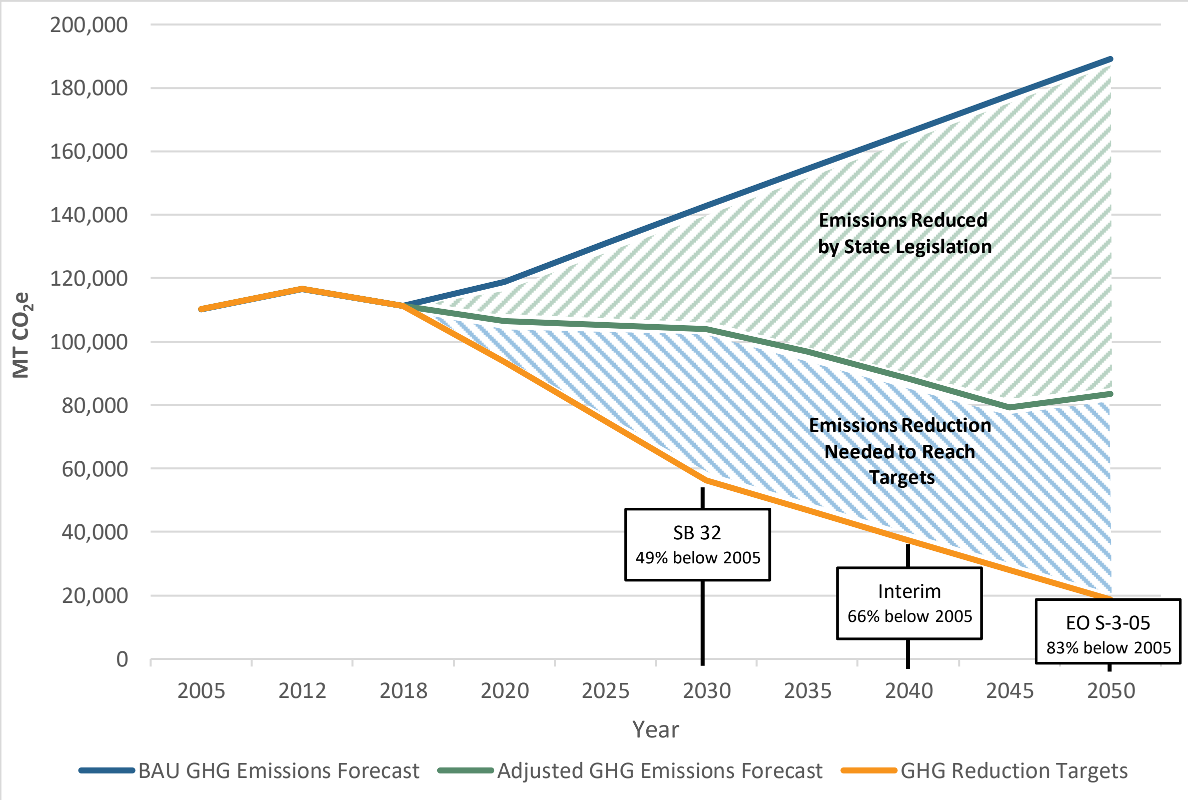
Imperial's GHG emission reduction targets are established in alignment with SB 32 and EO S-3-05, based on the 2005 GHG inventory, with an interim target for 2040. The GHG emission reductions that will need to be accomplished with policies in the RCAP can be determined from the gap remaining between the *adjusted scenario* forecast and the reduction targets. GHG reduction targets can be established as mass emissions, looking at the total emissions generated by the community, or on a per-capita basis. Table 18 and Figure 6 provide a summary of the GHG emissions forecast and GHG reduction targets. In order to meet the 2030 target established by SB 32, Imperial will need to establish policies that are supported by substantial evidence to reduce GHG emissions by 47,695 MT CO_2e in 2030.

Table 18 City of Imperial GHG Emissions Reduction Target and Gap Analysis

Scenario	2020 (MT CO_2e)[3]	2030 (MT CO_2e)[4]	2040 (MT CO_2e)[5]	2050 (MT CO_2e)[6]
Mass Emissions Targets and Gap				
Absolute Emissions Adjusted Forecast (MT CO_2e)	106,606	103,890	88,253	83,453
Absolute Emissions Targets (MT CO_2e)[2]	93,659	56,195	37,464	18,732
Remaining Emissions Gap (MT CO_2e)	**12,947**	**47,695**	**50,790**	**64,722**
Per-Capita Targets and Gap				
Population[1]	19,996	23,118	26,239	29,361
Per Capita Adjusted Forecast (MT CO_2e per capita)	5.3	4.5	3.4	2.8
Per Capita Targets (MT CO_2e per capita)[2]	4.7	2.4	1.4	0.6
Remaining Per Capita Emissions Gap (MT CO_2e per capita)	**0.6**	**2.1**	**2.0**	**2.2**

Notes: MT CO_2e = metric tons of carbon dioxide equivalent
Emissions have been rounded to the nearest whole number and therefore sums may not match.
1. Population estimates are from the Southern California Association of Governments (SCAG) Connect SoCal 2020 - Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) Growth Forecast. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579.
2. These provisional targets are consistent with both SB 32 and a trajectory set forth to achieve EO S-3-05 targets set by the state.
3. Specific targets for 2020 are not established, but are instead provided to show the trajectory between the 2018 GHG inventory and the 2030 forecast year.
4. SB 32 requires the CARB to ensure that statewide GHG emissions are reduced to 40 percent below the 1990 level by 2030.
5. Recommended interim target year.
6. EO-S-3-05 sets a target of reducing statewide GHG emissions to 80% below 1990 levels by 2050.

Figure 6 City of Imperial GHG Emissions Forecast and Targets



8 City of Westmorland

The City of Westmorland (Westmorland) is an incorporated city of Imperial Valley which has not previously adopted a CAP, completed a GHG inventory, or established GHG reduction targets. Westmorland covers a smaller land area and has experienced slower growth than other Imperial Valley jurisdictions. Westmorland has also seen a steep decrease in GHG emissions between 2005 and 2018. Included here is a GHG emissions forecast based on the GHG inventories for 2005, 2012 and 2018, as well as recommended GHG reduction targets that align with recent State legislation.

8.1 City of Westmorland Business-as-Usual Scenario GHG Emissions Forecast

The *BAU scenario* forecast for Westmorland estimates that most GHG emissions sectors will experience growth until 2030, and then a decline from 2030 to 2050 which can be attributed to limited growth and increased infill development. Virtually no change in GHG emissions would be expected between 2018 and 2050, from 18,167 MT CO_2e in 2018 to 18,440 MT CO_2e in 2050, if no action to reduce GHG emissions were to take place. It is not expected that GHG emissions will reach these levels in Westmorland; however, the *BAU scenario* forecast provided here serves as a baseline for determining expected future GHG emissions after the impacts of state and federal legislation and setting GHG reduction targets. Westmorland demographics and GHG emissions for each emission sources are provided in Table 19 for previous GHG inventory years and the *BAU scenario* forecast.

Table 19 City of Westmorland BAU Scenario Forecast and Previous Inventories

Emission Sector	2005	2012	2018	2020	2030	2040	2050
Demographics							
Population	2,184	2,270	2,325	2,331	2,358	2,386	2,414
Employment	589	325	344	341	324	308	292
Energy (MT CO_2e)	**20,024**	**11,023**	**8,097**	**8,084**	**8,017**	**7,951**	**7,884**
Natural Gas	737	616	588	589	596	603	610
Residential Propane	14	19	23	23	24	24	24
Non-residential Propane	133	73	78	77	73	70	66
Residential Electricity	8,559	6,201	4,333	4,343	4,395	4,447	4,498
Non-residential Electricity	8,969	3,245	2,451	2,428	2,312	2,196	2,080
Electricity T&D Losses	1,613	869	624	623	617	611	605
Transportation (MT CO_2e)	**12,137**	**9,589**	**8,244**	**9,724**	**10,262**	**9,483**	**8,705**
Passenger On-road Vehicles	7,145	6,937	5,547	6,948	7,217	6,168	5,119
Commercial On-road Vehicles	4,300	2,313	2,283	2,345	2,529	2,692	2,854
Off-road Equipment	691	339	414	431	516	624	732
Water (MT CO_2e)[1]	**358**	**372**	**381**	**381**	**383**	**385**	**386**
Waste (MT CO_2e)[2]	**1,461**	**1,007**	**1,446**	**1,447**	**1,453**	**1,459**	**1,466**
Total Emissions (MT CO_2e)	**33,979**	**21,991**	**18,167**	**19,636**	**20,115**	**19,278**	**18,440**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Water sector emissions include only process and fugitive emissions from wastewater treatment. Emissions from the electricty consumed in the supply of potable water and wastewater treatment are included in the non-residential electricity sector.

2. Waste sector emissions include methane from waste decomposition and landfill process emissions.

8.2 City of Westmorland Legislative Adjusted GHG Emissions Forecast

The *adjusted scenario* GHG emissions forecast provides an assessment of how currently adopted State legislation is expected to contribute to GHG emissions reduction in Westmorland. Legislation accounted for in the *adjusted scenario* forecast includes Title 24 building standards, SB 100, and various pieces of transportation legislation, including Advanced Clean Car Standards, SB 1, and Phase 2 Federal GHG Standards. A summary of the GHG emissions reductions expected from legislation are provided in Table 20.

Table 20 City of Westmorland Legislative Reductions and Adjusted Scenario Forecast

Emission Sector	2020 (MT CO_2e)	2030 (MT CO_2e)	2040 (MT CO_2e)	2050 (MT CO_2e)
Transportation Legislation[1]	**465**	**2,767**	**3,013**	**2,959**
Passenger On-road	427	2,294	2,420	2,167
Commercial On-road	38	473	592	791
Title 24[2]	**3**	**30**	**59**	**87**
Residential Natural Gas	0	1	1	2
Non-residential Natural Gas	0	0	0	0
Residential Propane	0	0	0	0
Non-residential Propane	0	0	0	0
Residential Electricity	3	30	58	85
Non-residential Electricity	0	0	0	0
Transmission and Distribution Losses	0	0	0	0
Senate Bill 100[3]	**1,570**	**2,820**	**5,779**	**7,208**
Residential Electricity	921	1,679	3,489	4,413
Non-residential Electricity	516	904	1,804	2,188
Transmission and Distribution Losses	132	238	487	607
Total Legislative Reductions	**2,038**	**5,618**	**8,851**	**10,254**
Resulting *Adjusted Scenario* Forecast[4]	**17,602**	**14,536**	**10,296**	**8,298**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Transportation legislation includes the expected emission reduction from major regulations incorporated into the California Air Resources Board's 2017 transportation modeling include Advanced Clean Car Standards (LEV III, ZEV program, etc.), Senate Bill 1, and Phase 2 Federal GHG Standards.

2. The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings result in reduced energy consumption in new construction under the 2019 code cycle, as compared to existing buildings.

3. The RPS program under Senate Bill 100 requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026, 60 percent of total procurement by 2030, and 100 percent of total procurement by 2045.

4. The Resulting *adjusted scenario* forecast is calculated by subtracting the Total Legislative Reductions from the *BAU scenario* forecast results.

8.3 City of Westmorland GHG Emission Reduction Targets

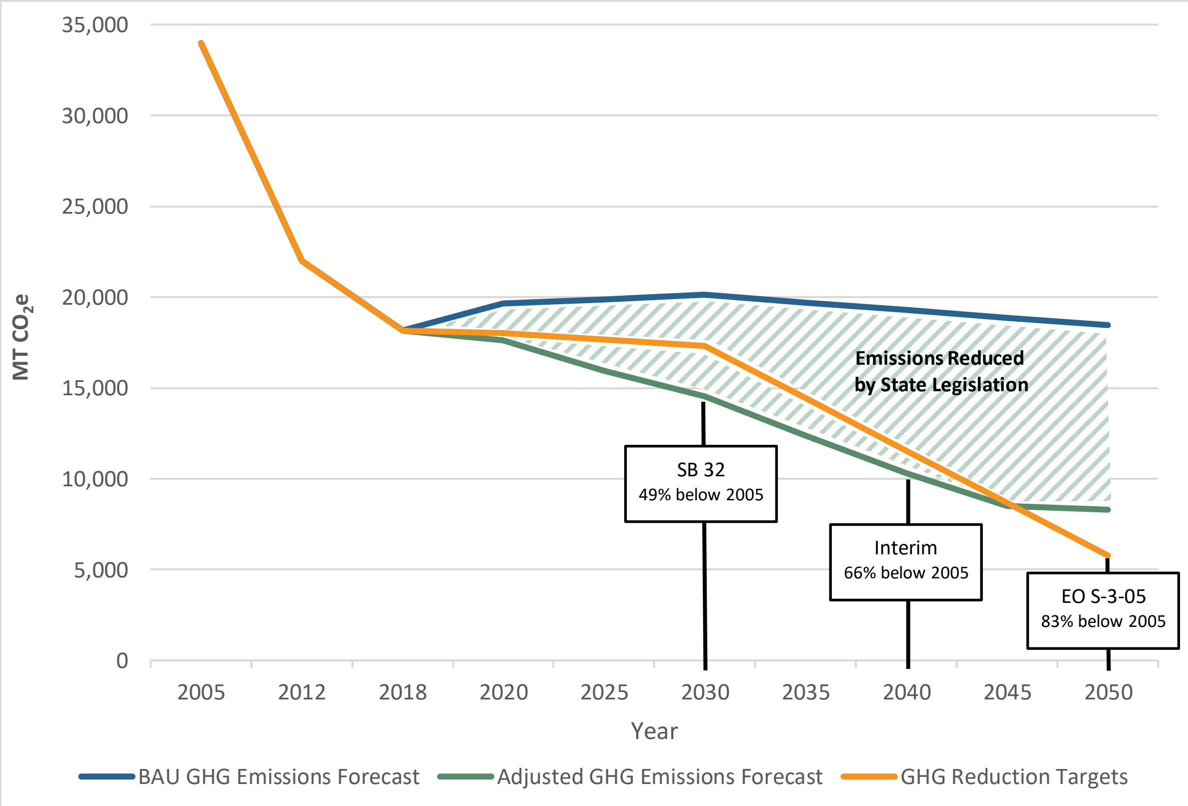
Westmorland's GHG emission reduction targets are established in alignment with SB 32 and EO S-3-05, based on the 2005 GHG inventory, with an interim target for 2040. The GHG emissions reduction that will need to be accomplished with policies in the RCAP can be determined from the gap remaining between the *adjusted scenario* forecast and the reduction targets. GHG reduction targets can be established as mass emissions, looking at the total emissions generated by the community, or on a per-capita basis. Table 21 and Figure 7 provide a summary of the GHG emissions forecast and GHG reduction targets. Due to the significant GHG emission reduction experienced in Westmorland since 2005 and limited future growth, it is expected that the GHG emission reductions that will occur from state legislation alone will allow Westmorland to meet the SB 32 targets for 2030. This is primarily attributed to the limited growth potential in Westmorland, which is influenced by the small area of the jurisdictional boundary. This situation allows Westmorland to focus on maintaining the progress made thus far and looking towards longer-term deep-carbonization goals.

Table 21 City of Westmorland GHG Emissions Reduction Target and Gap Analysis

Scenario	2020 (MT CO_2e)[3]	2030 (MT CO_2e)[4]	2040 (MT CO_2e)[5]	2050 (MT CO_2e)[6]
Mass Emissions Targets and Gap				
Absolute Emissions Adjusted Forecast (MT CO_2e)	17,602	14,536	10,296	8,298
Absolute Emissions Targets (MT CO_2e)[2]	18,028	17,329	11,553	5,776
Remaining Emissions Gap (MT CO_2e)	**-426**	**-2,794**	**-1,257**	**2,521**
Per-Capita Targets and Gap				
Population[1]	2,331	2,358	2,386	2,414
Per Capita Adjusted Forecast (MT CO_2e per capita)	7.6	6.2	4.3	3.4
Per Capita Targets (MT CO_2e per capita)[2]	7.7	7.3	4.8	2.4
Remaining Per Capita Emissions Gap (MT CO_2e per capita)	**-0.1**	**-1.1**	**-0.5**	**1.0**

Notes: MT CO_2e = metric tons of carbon dioxide equivalent
Emissions have been rounded to the nearest whole number and therefore sums may not match.
1. Population estimates are from the Southern California Association of Governments (SCAG) Connect SoCal 2020 - Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) Growth Forecast. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579.
2. These provisional targets are consistent with both SB 32 and a trajectory set forth to achieve EO S-3-05 targets set by the state.
3. Specific targets for 2020 are not established, but are instead provided to show the trajectory between the 2018 GHG inventory and the 2030 forecast year.
4. SB 32 requires the CARB to ensure that statewide GHG emissions are reduced to 40 percent below the 1990 level by 2030.
5. Recommended interim target year.
6. EO-S-3-05 sets a target of reducing statewide GHG emissions to 80% below 1990 levels by 2050.

Figure 7 City of Westmorland GHG Emissions Forecast and Targets



9 Unincorporated Imperial County

The unincorporated areas and communities of Imperial County (Unincorporated County) represents a number of small jurisdictions and a large area of agricultural land spread throughout Imperial Valley. The Unincorporated County has not previously adopted a CAP, completed a GHG inventory, or established GHG reduction targets, and this section provide a GHG emissions forecast and GHG reduction targets that align with State legislation. The unincorporated communities that comprise the Unincorporated County will provide the opportunity to work the GHG reduction measure that come from this RCAP into their respective community plans. The Unincorporated County's community GHG emissions have decreased steadily between 2005 and 2018. Included here is a GHG emissions forecast based on the GHG inventories for 2005, 2012 and 2018, as well as recommended GHG reduction targets that align with recent State legislation.

9.1 Unincorporated County Business-as-Usual Scenario GHG Emissions Forecast

The *BAU scenario* forecast for the Unincorporated County estimates that all GHG emission sectors will experience growth in alignment with population and employment projections. An overall increase from 497,169 MT CO_2e in 2018 to 768,436 MT CO_2e in 2050 would be expected if no action to reduce GHG emissions were to take place. It is not expected that GHG emissions will reach these levels in the Unincorporated County; however, the *BAU scenario* forecast provided here serves as a baseline for determining expected future GHG emissions after the impacts of state and federal legislation and setting GHG reduction targets. Unincorporated County demographics and GHG emissions for each emission sources are provided in Table 22 for previous GHG inventory years and the *BAU scenario* forecast.

Table 22 Unincorporated County BAU Scenario Forecast and Previous Inventories

Emission Sector	2005	2012	2018	2020	2030	2040	2050
Demographics							
Population	34,147	37,395	40,007	41,947	51,648	61,349	71,051
Employment	16,097	16,396	18,840	19,659	23,756	27,852	31,948
Energy (MT CO_2e)	**217,854**	**160,494**	**98,708**	**103,179**	**125,536**	**147,893**	**170,250**
Natural Gas	9,794	8,349	8,019	8,389	10,239	12,090	13,940
Residential Propane	211	328	408	428	527	626	725
Non-residential Propane	3,634	3,702	4,253	4,438	5,363	6,288	7,213
Residential Electricity	63,610	53,215	28,435	29,814	36,709	43,604	50,499
Non-residential Electricity	123,400	82,422	50,345	52,534	63,480	74,426	85,373
Electricity T&D Losses	17,205	12,479	7,248	7,576	9,217	10,859	12,500
Transportation (MT CO_2e)	**278,059**	**280,188**	**339,132**	**380,629**	**428,375**	**461,359**	**494,343**
Passenger On-road Vehicles	165,452	169,241	195,747	223,744	246,621	248,248	249,875
Commercial On-road Vehicles	80,323	79,769	104,672	116,249	131,502	149,021	166,541
Off-road Equipment	32,284	31,178	38,713	40,636	50,252	64,090	77,928
Water (MT CO_2e)[1]	**8,106**	**8,850**	**9,694**	**10,149**	**12,422**	**14,695**	**16,967**
Waste (MT CO_2e)[2]	**98,583**	**55,249**	**49,635**	**51,962**	**63,600**	**75,238**	**86,875**
Total Emissions (MT CO_2e)	**602,603**	**504,780**	**497,169**	**545,919**	**629,933**	**699,185**	**768,436**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Water sector emissions include only process and fugitive emissions from wastewater treatment. Emissions from the electricty consumed in the supply of potable water and wastewater treatment are included in the non-residential electricity sector.

2. Waste sector emissions include methane from waste decomposition and landfill process emissions.

9.2 Unincorporated County Legislative Adjusted GHG Emissions Forecast

The *adjusted scenario* GHG emissions forecast provides an assessment of how currently adopted State legislation is expected to contribute to GHG emissions reduction in Unincorporated County. Legislation accounted for in the *adjusted scenario* forecast includes Title 24 building standards, SB 100, and various pieces of transportation legislation, including Advanced Clean Car Standards, SB 1, and Phase 2 Federal GHG Standards. A summary of the GHG emissions reductions expected from legislation are provided in Table 23.

Table 23 Unincorporated County Legislative Reductions and Adjusted Scenario Forecast

Emission Sector	2020 (MT CO_2e)	2030 (MT CO_2e)	2040 (MT CO_2e)	2050 (MT CO_2e)
Transportation Legislation[1]	**15,635**	**102,995**	**121,315**	**151,964**
Passenger On-road	13,743	78,408	89,494	105,791
Commercial On-road	1,892	24,587	31,822	46,173
Title 24[2]	**854**	**9,390**	**17,926**	**26,462**
Residential Natural Gas	7	80	152	225
Non-residential Natural Gas	82	897	1,712	2,527
Residential Propane	1	8	15	21
Non-residential Propane	6	71	136	201
Residential Electricity	365	4,020	7,674	11,329
Non-residential Electricity	328	3,612	6,896	10,180
Transmission and Distribution Losses	64	702	1,340	1,979
Senate Bill 100[3]	**18,931**	**38,874**	**89,804**	**124,885**
Residential Electricity	6,252	12,573	28,560	39,171
Non-residential Electricity	11,084	23,026	53,678	75,193
Transmission and Distribution Losses	1,595	3,275	7,566	10,521
Total Legislative Reductions	**35,419**	**151,259**	**229,045**	**303,311**
Resulting *Adjusted Scenario* Forecast[4]	**510,500**	**478,675**	**451,049**	**465,126**

Notes: **MT CO_2e** = Metric Tons of Carbon Dioxide Equivalent

1. Transportation legislation includes the expected emission reduction from major regulations incorporated into the California Air Resources Board's 2017 transportation modeling include Advanced Clean Car Standards (LEV III, ZEV program, etc.), Senate Bill 1, and Phase 2 Federal GHG Standards.

2. The California Code of Regulations Title 24, Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings result in reduced energy consumption in new construction under the 2019 code cycle, as compared to existing buildings.

3. The RPS program under Senate Bill 100 requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026, 60 percent of total procurement by 2030, and 100 percent of total procurement by 2045.

4. The Resulting *adjusted scenario* forecast is calculated by subtracting the Total Legislative Reductions from the *BAU scenario* forecast results.

9.3 Unincorporated County GHG Emission Reduction Targets

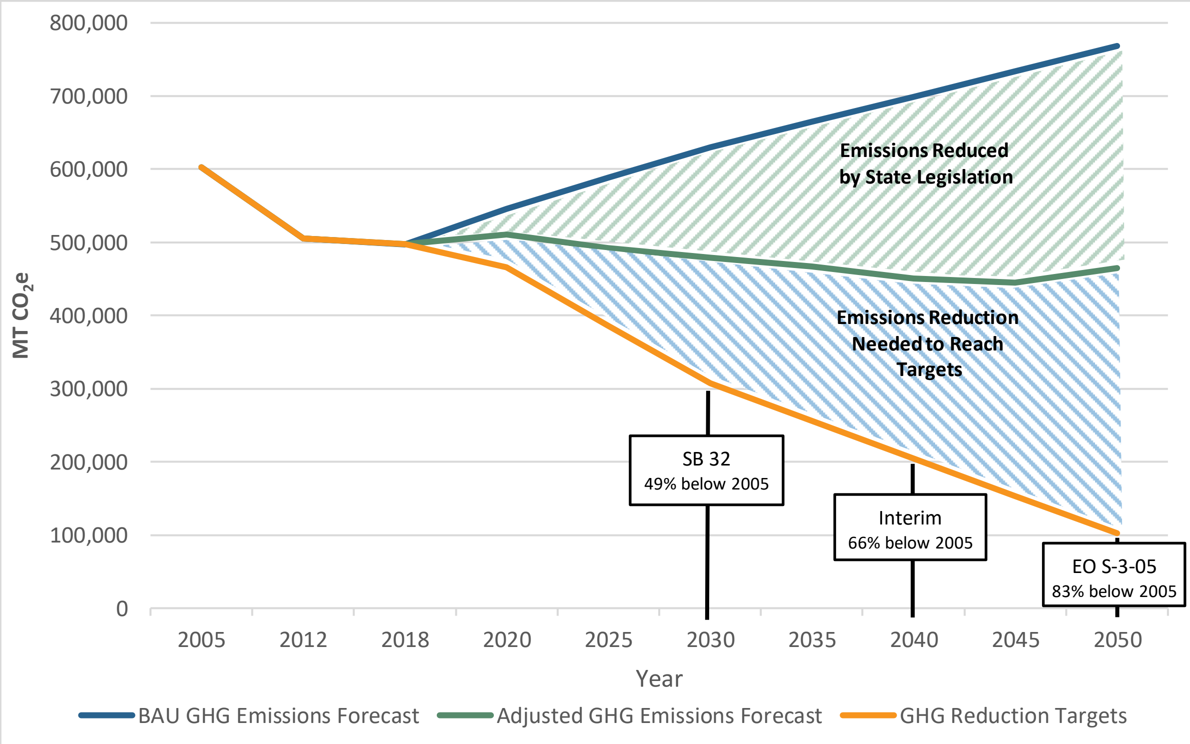
The Unincorporated County's GHG emission reduction targets are established in alignment with SB 32 and EO S-3-05, based on the 2005 GHG inventory, with an interim target for 2040. The GHG emission reductions that will need to be accomplished with policies in the RCAP can be determined from the gap remaining between the *adjusted scenario* forecast and the reduction targets. GHG reduction targets can be established as mass emissions, looking at the total emissions generated by the community, or on a per-capita basis. Table 24 and Figure 8 provide a summary of the GHG emissions forecast and GHG reduction targets. In order to meet the 2030 target established by SB 32, the Unincorporated County will need to establish policies that are supported by substantial evidence to reduce GHG emissions by 171,347 MT CO_2e in 2030.

Table 24 Unincorporated County GHG Emissions Reduction Target and Gap Analysis

Scenario	2020 (MT CO_2e)[3]	2030 (MT CO_2e)[4]	2040 (MT CO_2e)[5]	2050 (MT CO_2e)[6]
Mass Emissions Targets and Gap				
Absolute Emissions Adjusted Forecast (MT CO_2e)	510,500	478,675	451,049	465,126
Absolute Emissions Targets (MT CO_2e)[2]	465,529	307,327	204,885	102,442
Remaining Emissions Gap (MT CO_2e)	**44,971**	**171,347**	**246,164**	**362,683**
Per-Capita Targets and Gap				
Population[1]	41,947	51,648	61,349	71,051
Per Capita Adjusted Forecast (MT CO_2e per capita)	12.2	9.3	7.4	6.5
Per Capita Targets (MT CO_2e per capita)[2]	11.1	6.0	3.3	1.4
Remaining Per Capita Emissions Gap (MT CO_2e per capita)	**1.1**	**3.3**	**4.1**	**5.1**

Notes: MT CO_2e = metric tons of carbon dioxide equivalent
Emissions have been rounded to the nearest whole number and therefore sums may not match.
1. Population estimates are from the Southern California Association of Governments (SCAG) Connect SoCal 2020 - Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) Growth Forecast. https://scag.ca.gov/sites/main/files/file-attachments/0903fconnectsocal_demographics-and-growth-forecast.pdf?1606001579.
2. These provisional targets are consistent with both SB 32 and a trajectory set forth to achieve EO S-3-05 targets set by the state.
3. Specific targets for 2020 are not established, but are instead provided to show the trajectory between the 2018 GHG inventory and the 2030 forecast year.
4. SB 32 requires the CARB to ensure that statewide GHG emissions are reduced to 40 percent below the 1990 level by 2030.
5. Recommended interim target year.
6. EO-S-3-05 sets a target of reducing statewide GHG emissions to 80% below 1990 levels by 2050.

Figure 8 Unincorporated County GHG Emissions Forecast and Targets



Appendix C
Comments Received on Draft Regional Climate Action Plan

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AIR POLLUTION CONTROL DISTRICT

April 21, 2021

Virginia Mendoza
Senior Transportation Planner
Imperial County Transportation Commission
1503 North Imperial Avenue
El Centro, CA 92243

Re: IMPERIAL VALLEY REGIONAL CLIMATE ACTION PLAN DRAFT REVIEW

Dear Ms. Mendoza

The Imperial County Air Pollution Control District ("Air District") expresses its appreciation to the Imperial County Transportation Commission and Rincon Consultants, Inc. for the opportunity to review the *Greenhouse Gas Emissions Forecast and Reduction Targets-January 2021* (GGEFRT) and the *Greenhouse Gas Emissions Inventory-July 2020* (GGEI) that together form the Imperial Valley Regional Climate Action Plan (IVRCAP). The Air District acknowledges that documents of this scope are a substantial endeavor to produce. Staff reviewed the IVRCAP for consistency and completeness and found overall it serves as a sufficient guidance document. However, staff did identify areas for additional clarification and explanation as discussed below:

- The GGEI (pg. 4) states that "agricultural GHG emissions have increased by nearly 13% in Imperial Valley since 2005." Yet the GGEFRT (pg. 11) asserts that data between 2008 and 2018 "shows virtually no trend that indicates GHG emissions have been increasing or decreasing over time." This appears contradictory. Further, the area harvested in Imperial Valley can fluctuate as acreage is left fallow. This was not discussed.

- The GGEI used activity data from the Imperial County Agricultural Commissioner and the United States Department of Agriculture, among other sources (pg. C-2). Yet, it also states that activity data was not available for all activities for years. What data activity was missing?

- Section 2.5.1—Livestock Manure Management Activity Data (GGEI, pg. C-23) used proportions of livestock in each manure management system of the *California GHG Emissions Inventory* to calculate emissions as specific data for Imperial Valley was unavailable. Why was the specific data not available and how were the proportions determined?

- According to the *2000–2018 GHG Emissions Trends Report Data /* Greenhouse Gas Emissions Inventory Summary [2000-2018] query tool, total statewide agricultural/forestry GHG emissions were 32.57 million tonnes in 2018. That would mean the 2,354,168 MT CO2e GHG agricultural emissions attributed to Imperial Valley represent nearly approximately 7% of California's GHG emissions. This seems a disproportional amount.

- Table 3—Agricultural BAU GHG Emission Forecast Results (GGEFRT, pg. 11) shows 2018 baseline emissions consistent with Table 2—Imperial Valley Agricultural Emission Summary, except for omitting "liming" from Table 3 and the 2018 baseline value for "Off-road equipment" in Table 3 being nearly half of what it is in Table 2. The reason for this is unclear.

- Unlike communities, where the 2018 baseline provides some reference against legislated reductions, there is no adopted state level regulations to reduce agricultural GHG emissions (GGEFRT, pg. 11). Further, the forecast is only a guide due to the present imitations of technology and funding. This scenario offers no guidance to the Air District.

- Community GHG emission calculations are acknowledged to be based on assumptions due to the inconsistent reporting of some data over many years (GGEI, pg. B-7). While this is understandable, it leaves open to dispute the soundness of later decisions based on data that is incomplete. This lack of data for some years in employment (GGEI, pg. B-8), natural gas usage (GGEI, pg. B-10), electricity activity data (GGEI, pg. B-15), and the lack of a 2005 inventory year emission factor from IID (GGEI, pg. B-18).

- The combined documents (GGEFRT, pg. A-1 and GGEI, pg. A-1) discuss necessary GHG reductions but offer no guidance in actual forms of mitigation. Indeed, the GGEFRT, pg. C-38, acknowledges GHG emissions related to agricultural operations "can be difficult to mitigate..." A Climate Action Plan would be strengthened by outlining actual forms of mitigation.

- The IVRCAP excludes any forecast analysis for the Calexico Ports-of-Entry. This provides no guidance to the APCD or other agencies when considering the CEQA implications of a proposed project.

- A review of the IVRCAP would be facilitated if all of the data compiled for Imperial Valley was found in one Excel workbook.

Again, the Air District sincerely appreciates the efforts of everyone involved in producing the IVRCAP. We believe that as the points above are addressed and staff review it with input from a consultant, the IVRCAP will be a worthy guidance document.

Respectfully submitted,

Curtis Blondell

Curtis Blondell
APC Environmental Coordinator

Monica N. Soucier
APC Division Manager

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April 30, 2021

Monica Soucier, APC Division Manager
Imperial County Air Pollution Control District
150 South Ninth Street
El Centro, California 92243

Subject: Imperial Valley Regional Climate Action Plan Draft Review – Response to Comments

Dear Ms. Soucier:

This letter is to provide response to the comments provided on the Imperial Valley Regional Climate Action Plan (IVRCAP) Draft by the Imperial County Air Pollution Control District (Air District) on April 21st, 2021. The consultant team for the IVRCAP and the Imperial County Transportation Commission greatly appreciate the detailed review of the greenhouse gas (GHG) technical appendices. Below, please find the response to comments on *the Greenhouse Gas Emissions Forecast and Reduction Targets-January 2021* (GGEFRT) and the *Greenhouse Gas Emissions Inventory-July 2020* (GGEI).

ICAPCD Comment #1

The GGEI (pg. 4) states that "agricultural GHG emissions have increased by nearly 13% in Imperial Valley since 2005." Yet the GGEFRT (pg. 11) asserts that data between 2008 and 2018 "shows virtually no trend that indicates GHG emissions have been increasing or decreasing over time." This appears contradictory. Further, the area harvested in Imperial Valley can fluctuate as acreage is left fallow. This was not discussed.

Response

As noted in this report, there is not a specific agricultural protocol therefore this inventory was completed using data and emissions calculations similar to that used by the state. Similar to the states inventory, the calculations use data from a wide variety of inputs. Following the review of the data, the annual trends in the data used from the sources was reviewed for the purpose of producing a forecast of GHG emissions. As shown on page B-18 of the GGEFRT, crop area harvested data and livestock population data from Imperial County Crop Production Reports for the past ten years was used to perform a linear regression to determine if there is a trend in the activity used to calculate GHG emissions. The results showed that there was no trend and differences in totals were primarily caused by interannual variability. Although a trend of increasing emissions appears from the 2005 and 2018 data, this is only from two data points which cannot sufficiently identify a trend. As future GHG emission inventories are conducted, a further assessment of trends in emissions can be addressed.

Air District Comment #2

The GGEI used activity data from the Imperial County Agricultural Commissioner and the United States Department of Agriculture, among other sources (pg. C-2). Yet, it also states that activity data was not available for all activities for years. What data activity was missing?

Response

As detailed in the report, various data sources were missing; therefore interpolation and scaling of emissions from available data was used to estimate activity data for the inventory years assessed in the GHG inventory. The following provides the location in the report where this information can be found in the analysis.

- Diesel irrigation pump data for Stationary Fuel Combustion was only available for the year 2003, as discussed on page C-5. Due to this lack of data, the emissions were estimated from diesel usage in pumps by scaling the number of pumps to crop production data.
- Liming material application activity data was only available for the year 2018, as discussed on page C-18. Due to this lack of data, the emissions were estimated from liming by scaling the number of pumps to crop production data.
- Livestock head inventories were only available for the years 2002, 2007, 2012, and 2017, as discussed on page C-19. Due to this lack of data, a linear interpolation of the livestock head inventories between the available data years was used to estimate livestock populations in the 2005 and 2018 inventory years.

Air District Comment #3

Section 2.5.1—Livestock Manure Management Activity Data (GGEI, pg. C-23) used proportions of livestock in each manure management system of the California GHG Emissions Inventory to calculate emissions as specific data for Imperial Valley was unavailable. Why was the specific data not available and how were the proportions determined?

Response

A data request related to livestock and manure management was provided to the County of Imperial on December 3rd, 2019 and was subsequently followed up with a phone call. However, the requested data was not provided to the Climate Action Plan consultant team. Therefore, statewide averages for livestock population characteristics and the proportions of these livestock in different manure management systems were applied to the County, as this was identified as the most relevant available dataset at the time. This detail will be included in the report. Proportions of livestock type and manure management practices were pulled directly from the State GHG inventory Documentation Index, as referenced on page C-24, which were outputs of the United States Environmental Protection Agency's Cattle Enteric Fermentation Model that provide statewide totals for livestock population characterizations.

Air District Comment #4

According to the 2000-2018 GHG Emissions Trends Report Data / Greenhouse Gas Emissions Inventory Summary [2000-2018] query tool, total statewide agricultural/forestry GHG emissions were 32.57 million tonnes in 2018. That would mean the 2,354,168 MT C02e GHG agricultural emissions attributed to Imperial Valley represent nearly approximately 7% of California's GHG emissions. This seems a disproportional amount.

Response

As part of our data evaluation and validation of the GHG inventory, we compared the emissions totals of the County to those of the state using the referenced data source. Imperial County is a large producer of cattle. Cattle contributes the largest proportion to the total agricultural GHG emissions, which is consistent with state estimates of agricultural GHG emission sources.

According to the 2017 NASS Census of Agriculture Imperial County had 376,513 heads of cattle, which is approximately 8% of the 5,185,531 heads of cattle in the state. (https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_2_County_Level/California/st06_2_0011_0011.pdf)

Air District Comment #5

Table 3—Agricultural BAU GHG Emission Forecast Results (GGEFRT, pg. 11) shows 2018 baseline emissions consistent with Table 2—Imperial Valley Agricultural Emission Summary, except for omitting "liming" from Table 3 and the 2018 baseline value for "Offroad equipment" in Table 3 being nearly half of what it is in Table 2. The reason for this is unclear.

Response

We have noted this discrepancy in the emissions tables which will be corrected. Thank you for noting this discrepancy.

Air District Comment #6

Unlike communities where the 2018 baseline provides some reference against legislated reductions, there is no adopted state level regulations to reduce agricultural GHG emissions (GGEFRT, pg. 11). Further, the forecast is only a guide due to the present imitations of technology and funding. This scenario offers no guidance to the Air District.

Response

The comment is noted. As there are no comparable adopted state level regulations to reduce agricultural GHG emissions, this analysis is intended to provide information about the scale of agricultural GHG emissions in the County.

Air District Comment #7

Community GHG emission calculations are acknowledged to be based on assumptions due to the inconsistent reporting of some data over many years (GGEI, pg. B-7). While this is understandable, it leaves open to dispute the soundness of later decisions based on data that is incomplete. This lack of data for some years in employment (GGEI, pg. B-8), natural gas usage (GGEI, pg. B-10), electricity activity data (GGEI, pg. B-15), and the lack of a 2005 inventory year emission factor from IID (GGEI, pg. B-18).

Response

Data limitations in the field of GHG accounting and reporting is quite common. It is important to acknowledge that there are assumptions made due to lack of available data for the 2005 GHG inventory year. Data used for the 2018 GHG inventory year was complete and accurate to the highest degree possible within the guidance provided by the protocols used for GHG emissions calculations. As discussed in the Governor's Office of Planning and Research General Plan Guidelines, (http://opr.ca.gov/docs/OPR_C8_final.pdf) reasonable assumptions must be made to estimate 2005 GHG emissions for greenhouse gas reduction planning and setting of GHG reduction targets.

Air District Comment #8

The combined documents (GGEFRT, pg. A-1 and GGEI, pg. A-1) discuss necessary GHG reductions but offer no guidance in actual forms of mitigation. Indeed, the GGEFRT, pg. C-38, acknowledges GHG emissions related to agricultural operations "can be difficult to mitigate…" A Climate Action Plan would be strengthened by outlining actual forms of mitigation.

Response

This comment is noted; however there are agricultural GHG emission mitigation measures included in the IVRCAP. Please refer to section 3.6 *Regional GHG Reduction Measures* of the IVRCAP document for reference to these measures.

Air District Comment #9

The IVRCAP excludes any forecast analysis for the Calexico Ports-of-Entry. This provides no guidance to the APCD or other agencies when considering the CEQA implications of a proposed project

Response

Performing a GHG analysis for discretionary projects at the Calexico Ports-of-Entry is outside of the scope of the IVRCAP. The GHG analysis for the Calexico Ports-of-Entry was intended to quantify the GHG emissions contribution of idling cars the border crossing as compared to total regional GHG emissions.

Air District Comment #10

Review of the IVRCAP would be facilitated if all of the data compiled for Imperial Valley was found in one Excel workbook.

Response

The calculations were completed in a robust Excel workbook. The workbooks can be provided to the Air District at their request.

Sincerely,
Rincon Consultants, Inc.

Andrew Beecher
Sustainability Planner

Erik Feldman, MS, LEED AP
Principal

May 10, 2021

Imperial County Transportation Commission
1503 N. Imperial Ave., Suite 104
El Centro, CA 92243

RE: Imperial Valley Regional Climate Action Plan

Executive Director Mark Baza and Members of the Transportation Commission:

As you know, California has set an ambitious goal of carbon neutrality by 2045 and as the Draft Imperial Valley Regional Climate Action Plan (CAP) accurately declares, "State programs and legislation are essential to reduce both statewide and local greenhouse gas (GHG) emissions, but regionally- and locally-specific actions are also necessary to meet long-term GHG emissions reduction goals."[1] We agree that it is prudent for local municipalities to identify strategies that mitigate the impacts of climate change and to plan for extreme weather events and disasters that are specific to their communities and residents.

SoCalGas' vision is to be the cleanest gas utility in North America, and we are committed to being a partner in helping the communities we serve achieve their energy and environmental goals. As a trusted long-term energy provider, SoCalGas is proud to have served the residents of the Imperial Valley for over 100 years and recognizes the unique challenges presented in the Draft Regional CAP for targeted GHG reduction efforts. As such, SoCalGas provides the following comments for the purpose of highlighting areas of alignment and resources with respect to specific aspects of the recommendations proposed in the Draft Regional CAP.

I. Decarbonizing Molecules Delivered through the Gas Pipeline System Provides Options for Public Participation in GHG Reduction Efforts

The Draft Regional CAP states that, "the success of many measures will ultimately depend on public participation in the Regional CAP implementation process" and that "effective and long-term climate action and energy resilience in Imperial Valley can only be achieved through efforts that continue to change the way individuals interact with the environment.[2]" Renewable Natural Gas (RNG), can provide today's gas customers with a pathway to reduce GHG emissions without having to replace their gas appliances. Existing gas infrastructure can be a common carrier of clean fuels, including biomethane and green hydrogen. As such, the gas system can be leveraged as an additional solution to achieve GHG reductions required to address climate change. Furthermore, the gas grid supports the decarbonization of the electric grid by providing flexibility, storage, reliability, and resiliency.

Clean molecules are necessary to decarbonize the economy and to facilitate electrification as demand and renewable electricity capacity grow. RNG can be an important renewable energy tool because it is available anytime consumers need it. Wind and solar are intermittent energy sources – meaning the energy isn't available when the sun isn't shining, and the wind isn't blowing, whereas RNG can be deployed when and where it is needed through the pipeline network.

[1] Draft Regional CAP at p.12
[2] Draft Regional CAP at p.119

Decarbonizing the gas already being delivered to customers ensures that local governments, residents, and businesses can contribute to GHG reduction efforts without modifications to their existing service. Moreover, research conducted in 2018 by Navigant Consulting shows RNG in buildings can be two to three times less expensive than any all-electric building requirements and does not require families or businesses to purchase new appliances or take on costly construction projects.[3]

II. <u>Targeted Emission Reductions for Sectors Critical to the Imperial Valley</u>

Since the California legislature enacted AB 32, the Global Warming Solutions Act of 2016, SoCalGas has been investing in early decarbonization efforts, diversification through expanded fuel options, and increased business efficiency and effectiveness with implementation of digital solutions. More recently we announced our ASPIRE 2045 sustainability strategy, which includes a bold commitment to achieve net zero GHG emissions in our operations and delivery of energy by 2045.[4] Under ASPIRE 2045, SoCalGas will accelerate the shift to cleaner fuels, complementing wind and solar energy, and add clean fuels, such as hydrogen, to the energy mix. We have committed to replacing twenty percent (20%) of our core service with RNG by 2030. Through these and other efforts, we will help our customers mitigate GHG emissions through providing increasingly decarbonized gas. Further, the reliability and resiliency of our gas grid is critical to enabling higher percentages of renewable electricity.

Biomethane is already being delivered to customers through SoCalGas' pipeline system and experts agree it is needed to help the state achieve carbon neutrality. Biomethane from certain feedstocks, such as animal manure, is currently the only fuel certified by the California Air Resources Board (ARB) to have a negative carbon intensity value -- meaning the greenhouse gases generated by its use are less than the GHG removed by its production. Negative carbon fuels that reduce Short Lived Climate Pollutants (SLCP) will be critical to reaching carbon neutrality. The most effective way to meet long term climate goals is a mix of early action to reduce both carbon and SLCPs. Early action to reduce SLCPs, which includes methane emitted directly to the atmosphere from organic sources such as agriculture, landfills, and wastewater treatment facilities, is essential if we are to avoid the most extreme and irreversible impacts of climate change.

A. Agriculture

The Draft Regional CAP Report identifies Agriculture as the largest source of GHG emitter in the county, representing 62 percent of GHG emissions in 2018.[5] Additionally, the Draft Regional CAP Report identifies that while overall, ARB anticipates a 29 percent reduction between 1990 and 2030, communities that have a greater percentage of agriculture emissions, like the Imperial Valley will see lower GHG reductions. Capturing this gas and putting it to beneficial use as a renewable fuel significantly reduces greenhouse gas emissions from these waste sources. "In California, about half of methane emissions come from dairy and livestock manure or organic waste streams that are landfilled. These resources could be put to valuable use as sources of renewable energy or fuel, soil amendments, and other products.[6]. RNG sourced from landfill-diverted food and green waste can provide a 125 percent reduction in greenhouse gas emissions, and RNG from dairy manure can result in a 400 percent reduction in greenhouse gas emissions when replacing traditional vehicle fuels.[7]

B. Transportation

SoCalGas respectfully suggests that zero emission vehicle infrastructure investment include a diversified approach that in that maximizes the benefits of Fuel Cell Electric Vehicles (FCEV) and Compressed Natural Gas ("CNG") buses and trucks (including CNG buses and trucks fueled by RNG).

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[3] Navigant Consulting. *Analysis of the Role of Gas for a Low-Carbon California Future*. July 2018. Available at: https://www.socalgas.com/1443741887279/SoCalGas_Renewable_Gas_Final-Report.pdf
[4] ASPIRE 2045 – SoCalGas
[5] Draft Regional CAP Table 3-2.
[6] CARB. *Short-Lived Climate Pollutant Reduction Strategy.* March 2017. Available at: https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf
[7] California Air Resources Board, Low Carbon Fuel Standard Pathway Certified Carbon Intensities.

FCEVs do not have the same limitations as plug-in and battery technologies including range, weight and charging time. These limitations present operational challenges in certain high use and long-haul heavy-duty applications and without FCEV options, users will stick with the status quo of diesel trucks. Additionally, FCEVs are a viable zero emission option for many Californians who live in multi-unit dwellings with no access to onsite charging infrastructure, which is a particular obstacle for lower income customers.

C. Energy Efficiency

At SoCalGas, we offer a multitude of energy efficiency programs which can help the Imperial Valley reduce GHG emissions.[8] These include energy conservation, home weatherization, and energy efficiency incentive programs. SoCalGas offer multiple energy efficiency measures that are designed to minimize overall energy use, further supporting the region's GHG emission reduction efforts. According to a recent Energy Futures Initiative report,[9] energy efficiency is the most cost-effective tool for decarbonizing energy. Additionally, replacing about 20 percent of California's traditional natural gas supply with RNG would lower emissions equal to those achieved through retrofitting every building in the state to run solely on electricity and at a fraction of the cost.[10]

III. Resiliency and Reliability

Government leaders at all levels find themselves at a clear inflection point where sustainability planning must not only address emissions reductions to achieve carbon neutrality but must also account for critical climate resiliency concerns. California's electricity grid was pushed to the brink of failure this past summer by sustained heat waves and more frequent and intense wildfires. Unfortunately, what used to be considered unprecedented is now our new normal and, as a result, California is expected to see similar conditions in years to come. With recent and increasing wildfires, regional heatwaves, rolling blackouts and de-energization events (known as "Public Safety Power Shutoffs"), energy system vulnerability significantly impacts local resilience. The inherent resilience of the gas system to extreme weather events can support local and regional energy reliability. Communities with both natural gas and electric service are more resilient to extreme weather events and disasters.[11]

IV. Conclusion

We appreciate the Imperial County Transportation Commission's leadership and support the Commission's and County's overall effort to identify policies and programs that address climate change and improve air quality. Creating a clean, decarbonized, and sustainable future requires an inclusive technology strategy that does not limit current and future innovation. That means an integrated energy system of the future with decarbonized molecules and electrons working together to drive down emissions and offering "dual-fuel" options to safely and reliably meet customer energy needs for all Californians. SoCalGas' system complements and enables the use of intermittent renewables by providing reliability, resiliency and cost effective, long-duration storability. The importance of resiliency has been observed nationwide during a multitude of climate events, where redundant energy systems enabled critical municipal services and facilities, such as buses, hospitals, and emergency response facilities, to operate and support public health and safety during climate events.

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[8] ASPIRE 2045 – SoCalGas

[9] "Optionality, Flexibility and Innovation: Pathways for Deep Decarbonization in California," May 2019, available at https://energyfuturesinitiative.org/efi-reports

[10] Navigant Consulting. *Analysis of the Role of Gas for a Low-Carbon California Future*. July 2018. Available at: https://www.socalgas.com/1443741887279/SoCalGas_Renewable_Gas_Final-Report.pdf

[11] Lawrence Livermore National Laboratory. "Getting to Neutral," August 2020, available at https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf; see also ICF, "Case Studies of Natural Gas Sector Resilience," October 2019

We hope this information will be helpful as you develop plans to achieve the goals outlined in the Draft Regional CAP. Thank you for the opportunity to comment on this important policy issue.

Sincerely,

Deborah McGarrey

Deborah McGarrey
SoCalGas, Public Affairs Manager

Cc: Ezana Emmanuel, SoCalGas, Senior Public Policy Advisor
Tanya Peacock, SoCalGas, Public Policy and Planning Manager
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Imperial County Farm Bureau

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June 30, 2021

Virginia Mendoza
Imperial County Transportation Commission
1503 North Imperial Avenue
El Centro, CA 92243

Re: Imperial Regional Climate Action Plan

Dear Ms. Mendoza,

Imperial County Farm Bureau expresses its appreciation to the Imperial County Transportation Commission for the opportunity to provide input on the Regional Climate Action Plan. I would like to add that ICFB and the agriculture industry would appreciate the opportunity to have more extensive involvement in the development of future documents of this scope. Please find our comments below from our review of this plan. Please note that with the short timeline given to us for review, we are providing a more broad perspective on how there are many factors that contribute to agriculture's role in the climate change initiative as well as highlighting additional elements that should be considered. We look forward to continuing to work with you.

Agriculture

When looking at agriculture and agricultural emissions, the plan shows a constant increase in emission in that sector, yet the crops remain the same on the same foot print of land. The gas mileage of the vehicles driven by the worker and ag producer has increased 25% over the last 15 years. The size of tractors has increased and the relative efficiency of these tractors has increased with the use of DEF and improved motor emissions technology. The average size of tractors has increased, the number of tractors in the fleet has declined. This means fewer tractor drivers are accomplishing the same work. Fewer employees go to the fields. The parasitic load on the society for reduction of employees and number of tractors has been significant. The state increasing the minimum wage has reduced the number of employees and thus their carbon foot print. The increased carbon emissions have come in the form of sprinkler engines spurred on by a transfer of water to the cities. The engines that are generally used are more efficient engines than used in the past but there are more total engines. All engine use in the Imperial Valley, with the exception of sprinkler irrigation, have declined and are well below the 1970 levels. The increase in emissions are caused by the actions of state politicians to get water to the over growing cities. Should this legitimately be a charge against the farmers of the Imperial Valley? The agriculture population has declined, the non-water transfer efforts to supply society with food, seed, and fiber are being done so more efficiently. An answer instead of reduction in emissions is to increase sequestration of carbon by growing salt cedar forests using water underruns that would go to the cities.

Cattle in Imperial Valley

The type of cattle in the Imperial Valley are similar to the type generally found in the state of California, but the use is different. Outside the Imperial Valley, dairy is the largest use of cattle in California. In dairy, the cattle are fully grown and produce milk for three to five years depending on their production. In the Imperial Valley, with the exception of the two dairies, cattle are brought here at around 300 pounds from Central California and raised to 1,300 pounds in about 11 months, then are harvested. Therefore, the mean between import weight and final weight is much less than a herd that averages four years in age. The difference is calculated as is the difference in consumption and thus emissions. This plan's approach seems to take a percentage of California's dairy cattle and applies it to Imperial County resulting in inaccurate inventories. It is important that before making this a benchmark, local numbers and conditions are considered more-so over state averages considering the unique conditions in Imperial County. It appears that statewide livestock populations were used in calculating emissions.

Further, it is noted that belching constitutes 75% of emissions from cattle not exit gas. This ratio has been studied and the variation in type of gas versus other carbon emissions and its constituents are different from industrial emissions and flow through the atmosphere in a different cycle.

Electricity

This plan necessitates the vast increase in the delivery of electricity to the grid. This electricity will power non-emissive vehicles. The problem is the cost to society of the increased size in generation and delivery infrastructure. We have not seen any estimate in cost for this product of the proposed plan. In that, the same thing will be done but at greater cost and replacement of vast capital assets. Additionally, the idea to make covered parking mandatory will vastly increase the cost of commercial development. In an area where the city centers are dying this does not seem like a good idea.

Sequestration in Crop and Park Patterns

Fifty to seventy years ago, carbon emissions can be modeled and are believed to be at levels below 2005 or current. 2005 is not the best year to compare with, as the Quantitative Settlement Agreement (QSA) produced abnormal patterns in land use and crops. Transitioning from fallowing to conservation is the most obvious difference. If one looks to 1990, 1980, 1970 all these can be calculated in gross as adequate statistics have been taken. An interesting look could be at soil organic material. In the Imperial Valley 3-4% organic is high but even 1-2% makes up a large number of tons of carbon. The levels in various crops will be informative. Where we have seen a decline in alfalfa, grasses have increased. We believe that overall, the valley has been basically static for the time before warming was noticed and an effort to test this hypothesis should be taken. There is no reason to change carbon output by regulation where there is no problem created by current usage.

Climate Change Agenda of the State of California

The State sponsored increase in regulation of many types of activities is based on disputed science. While a majority may agree, a vocal minority disagree. They agree the scientists are incentivized to find the problem. The first thing the county, state, and federal government should do is take a skeptical view of Climate Change and the associated growth of government regulation.

A constant review and probing into the rationale of the various plans with the scientists who do make these projections needs to continually occur. The funding creates conflicts of interest and must be finding neutral. Economic impacts should be closely studied and considered before implementing plans such as this. Imperial County's economy relies heavily on the agriculture industry and the furthering of overregulation of ag will impact our region tremendously.

Additional Comments

If you take out the federal immigration employment, prisons, county and state government employment, growth is relatively flat. Agriculture has increased production with a smaller work force and more efficient usage of materials. More increases in efficiency are on the way. As new technologies are developed to improve production from existing lands and to bring into production from now nonproductive lands, the production of carbon sequestration will increase. The free flow of goods and services including the production of food will regulate where we need to go. The cost of implementing these plans and regulations should be a large part of the research and study process.

For a planning document of this nature and the implications it has for the future of Imperial County, we recommend the use of local/regional numbers as opposed to state averages. This will allow for a more accurate inventory and a better baseline for measuring realistic emission reduction targets.

Again, thank you for extending the opportunity for input. If you have any questions, please reach out to Rachel Magos at 760-352-3831 or rachel@icfb.net.

Sincerely,

Jeff Plourd
President