Climate Action Plan Monitoring and Reporting

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Prepared for the San Diego Association of Governments (SANDAG)

Prepared by the Energy Policy Initiatives Center (EPIC)

About EPIC

The Energy Policy Initiatives Center (EPIC) is a non-profit research center of the USD School of Law that studies energy policy issues affecting California and the San Diego region. EPIC's mission is to increase awareness and understanding of energy- and climate-related policy issues by conducting research and analysis to inform decision makers and educate law students.

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1 INTRODUCTION

This document is Appendix VI to the SANDAG Regional Climate Action Planning Framework (ReCAP). It presents considerations and a framework for monitoring Climate Action Plan (CAP) implementation. Section 1 provides the introduction, the purpose of monitoring and reporting, and related State guidance for monitoring and reporting. Section 2 deals with considerations that affect CAP monitoring, including data availability and the relationship to other plans. Section 3 introduces the framework for monitoring and focuses on needs and processes for monitoring various levels of CAP implementation and progress toward GHG reduction goals. Section 4 discusses monitoring other aspects of a CAP. Section 5 discusses methods to present and disseminate the monitoring data and results, and Section 6 provides a conclusion.

Monitoring CAPs is part of the climate action planning cycle (Figure 1), however, few jurisdictions have progressed into this phase. Monitoring uses methods and protocols from GHG inventories and GHG reduction measures calculations (see Technical Appendix 1 and 2, respectively). Monitoring also informs future CAP updates.
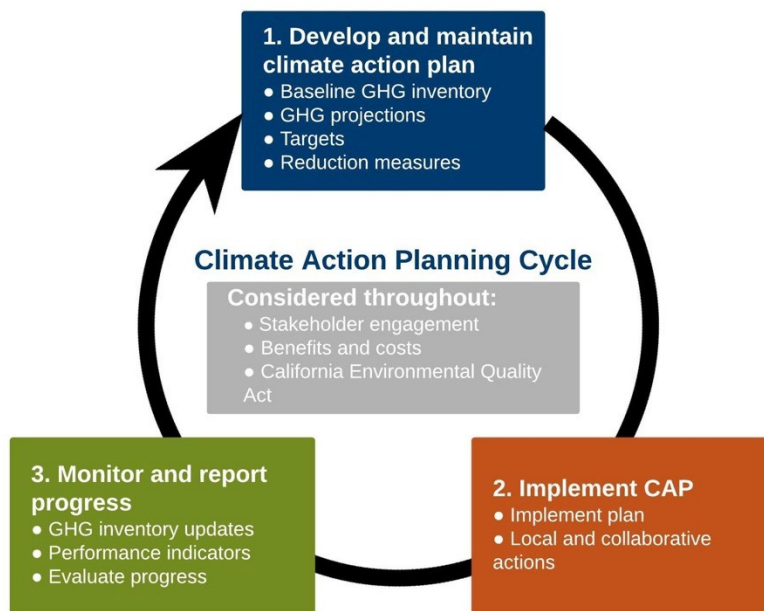
Figure 1 Climate Action Planning Cycle

Objectives for Monitoring and Reporting

Objectives for monitoring and reporting on CAP implementation may include, but are not limited to:

- Identify GHG reduction progress overall, categorized by inventory, by emissions inventory category, and by reduction measures and actions;
- Track consistency with the CAP implementation schedule and identify barriers to implementation;
- Determine if changes are needed to achieve the reduction targets by category and by measure;

- Provide feedback to local legislative bodies, as well as to stakeholders and the public, on the status of implementation of CAP measures and progress towards achieving the goals as described in the CAP;
- Report to outside entities, such as the International Council for Local Environmental Initiatives (ICLEI), the Carbon Disclosure Project (CDP), etc.;
- Identify opportunities to collaborate with other monitoring efforts and entities locally, regionally, and statewide.

Monitoring Framework Overview

The monitoring framework described in detail in this appendix considers two main aspects of CAP implementation: (1) whether community-wide GHG emissions are on track to meet reduction targets and the status and (2) progress in implementing the GHG reduction strategies, measures and actions in the CAP. These two aspects are used to inform the levels of monitoring described in Figure 2.

Figure 2 Levels of Climate Action Plan Monitoring

2 CONSIDERATIONS THAT AFFECT CAP MONITORING AND REPORTING

There are several considerations that play a role in the monitoring and reporting of CAP progress: the frequency of monitoring as specified in the CAP; the timing and availability of data; the relationship with the General Plan (GP), other planning documents, and/or CEQA monitoring; and staff resources. Each of these considerations is discussed below.

Frequency of Monitoring

The baseline data collected and identified in an adopted CAP serves as a baseline for monitoring CAP implementation and progress. This data includes the GHG inventory as well as activity data related to GHG reduction measures (e.g. number of electric vehicles, solar photovoltaics [PV] installed, etc.). Most CAPs identify a monitoring program that includes updating the GHG emissions inventory and providing updates on CAP implementation progress through a progress report or other method.

Table 1 summarizes the frequencies of inventory updates and CAP progress reporting as provided in the adopted CAPs in the San Diego region.

Table 1 Frequency of Monitoring identified in CAPs in the San Diego Region

Jurisdiction	Date of Recent CAP Adoption	Inventory Updates	Frequency of Monitoring and/or Reporting CAP Progress
Carlsbad	Sep-15	Every 3 years after 2014 (CAP page 5-15);	Annual monitoring and reporting of each action and performance target progress; present to Council at public meeting; CAP monitoring and reporting is to be consistent with CEQA Guidelines s 15183.5(b)(1)(D) and (E) (CAP page 5-14).
Chula Vista	Sep-17	Every 2-3 years as part of SANDAG Energy Roadmap Program (CAP page 23);	Every two years for CAP strategies and actions (CAP page 24) in a publicly available progress report.
Del Mar	Dec-15	Prior to 2020 through SANDAG Energy Roadmap Program schedule (CAP page 5-7)	Track CAP measures and report annually (or semi-annually or other intervals) to city council (CAP page 5-7)
Encinitas	Jan-18	Every two years from 2016 as part of SANDAG Energy Roadmap Program schedule (CAP page 4-8)	Annual monitoring and reporting of CAP measure progress through a dashboard open to the public; present to Environmental Commission and city council every two years (CAP page 4-8)
Escondido	Dec-13		Use screening tables for every project to continuously monitor progress of measures; implement a monitoring and reporting program; Year 1: progress of cost effective and voluntary efforts; 2017 review of first and second tier measures' progress; 2020 for post 2020 GHG reduction planning. Periodic updates to GHG emissions reductions. (CAP page 7-10)
La Mesa	March-18	Every 2 years (CAP page 133)	Evaluate regularly (unspecified interval, CAP page 134)

National City	May-11	Every 3 years (CAP page 5-9),	Continually monitor; review CAP as a whole every 3 years (CAP page 5-9)
San Diego	Dec-15	Annual (CAP page 42-43)	Annual to track progress of measures, third party verification of voluntary disclocure to Carbon Disclosure Project, and jobs (CAP page 42-43)
San Marcos	Sep-13	Every 5 years (CAP page 4-21 to 4-23.)	Annual progress report to city council for measure implementation, progress toward performance criteria, effectiveness of CAP measures, state implementaton of state measures, adjustments needed (CAP page 4-21 to 4-23.)
Solana Beach	May-17	Every 2 years under the SANDAG Energy Roadmap Program schedule 2016, 2018 etc (CAP page 5-4)	In Year 1, initial summary of progress, and annually thereafter; (CAP page 5-4)
Vista	Nov-12	From 2010, update inventory every 5 years and report to city council (CAP page 4-14).	Annual for measures and performance indicators progress and may be submitted to city council with General Plan status reports (CAP page 4-14).
Unincorporated County of San Diego	Jan-18	Every two years consistent with the SANDAG Energy Roadmap Program schedule (CAP page 5-6).;	From 2019, annual monitoring and reporting to staff, Sustainability Task Force, Board and public of status of CAP measures, metrics and progress towards targets (CAP page 5-6).

As shown in Table 1, there is a range of frequencies for monitoring and reporting, depending on whether it is for inventories and inventory categories, for individual measures within each category, or for performance indicators. For inventories, monitoring ranges from annually to every five years; for individual CAP measures and performance indicators the range is less, from annually to every three years. In addition, some monitoring programs will track actions taken by the jurisdiction to implement measures, the timeline for implementation, and barriers to implementation and/or schedule. CAPs may or may not provide timelines, but several provide implementation phases or timelines based on short, medium, and long-term actions.

SANDAG, through its Energy Roadmap Program, plans to update GHG inventories and prepare monitoring reports every two years for jurisdictions in the San Diego region. Jurisdictions can use the inventories and monitoring reports to report on CAP implementation and progress.

Data Needs, Availability and Sources

2.1.1 Overall GHG Emissions and Emissions by Category
Another consideration for monitoring progress is the availability and timing of the necessary data. Some data are available annually, while some are not, which can affect the monitoring process. Monitoring overall GHG emissions and emissions by category requires preparing an updated GHG inventory. Table 2 provides a high-level summary of the data needs, sources, retrieval method, and the frequency and time

of data availability for GHG emissions inventories. More detail on data needs for inventories and inventory categories are provided in Appendix 1.

Table 2 Frequency of Data Availability for Inventories and Inventory Categories

Data Needs	Data Source	Data Retrieval Method	Frequency and Dates of Data Updates
Electricity – Activity Data			
Consumption - SDG&E bundled customers	SDG&E	Request through SDG&E Privacy Greenlight https://energydata.sdge.com/showDataAccessAnd Release	March for previous calendar year
Consumption - SDG&E Direct Access customers	SDG&E	Request through SDG&E Privacy Greenlight https://energydata.sdge.com/showDataAccessAnd Release	March for previous calendar year
Consumption - Self Serve PV	California distributed generation Statistics	Web - https://www.californiasolarstatistics.ca.gov/data_downloads/	Updated quarterly
Consumption - Self Serve Non-PV	CPUC, CSE	Web - http://energycenter.org/sgip/statistics and http://energycenter.org/sgip/statistics	Update frequency unknown
Transmission and Distribution Losses	Fixed T&D loss factor, CEC	Web - http://www.energy.ca.gov/2011publications/CEC-200-2011-009/CEC-200-2011-009.pdf	Not applicable
Electricity – Emission Factor			
SDG&E bundled factor	SDG&E Electricity Procurement - CEC Power Disclosure Form	by request	Updated annually - summer for previous calendar year
	Emission Factors for SDG&E Electricity Procurement - EPA eGRID	Web - https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid	Update frequency unknown, last update - in 2017 for 2014 data
	Emission Factor for SDG&E Market and CAISO Purchases	Web - http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M144/K130/144130487.pdf	Update frequency unknown, current regulation effective on January 2015
Direct Access factor	CPUC Decision D.14-12-037	Web - http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M144/K130/144130487.pdf	Update frequency unknown, date of issuance December 2014
Natural Gas – Activity Data			
Consumption - SDG&E bundled customers	SDG&E	Request through SDG&E Privacy Greenlight https://energydata.sdge.com/showDataAccessAnd Release	March for previous calendar year

Data Needs	Data Source	Data Retrieval Method	Frequency and Dates of Data Updates
Consumption - SDG&E Direct Access customers	SDG&E	Request through SDG&E Privacy Greenlight https://energydata.sdge.com/showDataAccessAnd Release	March for previous calendar year
Natural Gas – Emission Factor			
All customers	ARB Statewide Inventory	Web - https://www.arb.ca.gov/cc/inventory/data/data.htm	Updated annually
Transportation – Activity Data			
Weekday Origin-Destination VMT provided, must be converted to annual	SANDAG	Request	SANDAG updates every four years
Transportation - Emission Factor			
Emission rate for each vehicle category in San Diego region	CARB - EMFAC	Web - https://www.arb.ca.gov/emfac/2014/	Update frequency unknown, Last update - 2015
Solid Waste – Activity Data			
Annual Waste Disposal	CalRecycle	Web http://www.calrecycle.ca.gov/DataCentral/Materials.htm	Updated annually usually by Fall
Solid Waste – Emission Factor			
Mixed Waste Emission Factor	EPA WARM Model	Web https://www.epa.gov/warm	Update frequency unknown, last update - Feb 2016
Water – Activity Data			
Annual water supply - surface water	Jurisdiction or water district	Request	N/A
Annual water supply - groundwater	Jurisdiction or water district	Request	N/A
Annual water supplied - recycled water	Jurisdiction or water district	Request	N/A
Water – Emission Factor			
Upstream supply and conveyance energy Intensity	California Energy Commission (CEC) or water district	Web - http://www.cpuc.ca.gov/general.aspx?id=4388	N/A, last update - 2006

Data Needs	Data Source	Data Retrieval Method	Frequency and Dates of Data Updates
Upstream supply and conveyance energy Intensity	San Diego County Water Authority (SDCWA) OR Metropolitan Water District (MWD)	Web or request - https://www.sdcwa.org/urban-water-management-plan	Urban Water Management Plan voluntary energy intensity reporting - update every 5 years
Water treatment and local distribution energy Intensity	City of San Diego or water district	Request	Upon request or in UWMP, last update - 2015 UWMP
Wastewater – Activity Data			
Annual wastewater generated	Jurisdiction or wastewater district	Request	Upon request
Wastewater – Emission Factor			
Wastewater treatment plant emission factor	Individual wastewater treatment facilities	Web or request by individual treatment facility	Upon request or annual reported emissions for facilities under MRR

If carried out using the same methodologies, annual emissions estimates for overall inventories and inventory categories can be compared and trends established. However, this type of monitoring does not indicate which measures within each category yield reductions.

2.1.2   GHG Reduction Measures and Actions

CAP GHG reduction measures consist of federal, state and local measures. Local GHG emissions are affected by a number of policies and activities across multiple levels of government (e.g., State, regional, local), as well as other social, technological, and economic factors. Monitoring performance metrics accounts for the combined impact of these factors since it is challenging, and in many cases impossible, to separate out the impact of different policies or actions.

Activity data to monitor GHG reduction strategies, measures or actions can be collected directly (e.g., megawatts [MW] of PV systems) from the local jurisdiction, local or state organizations that monitor data, or through surveys specifically performed by the jurisdictions for this purpose. The availability of activity data is continually evolving; however, the data needs and typical sources for several typical CAP measures have been identified as provided in Table 3. The potential data needs identified in Table 3 can be used to develop performance metrics.

Table 3 Potential Monitoring Data Needs and Data Sources by Typical CAP Measure

Measure	Data/Information Needs	Data Source
California Solar Programs and Policies	Actual (interconnected) capacity of the behind-the-meter PV systems in a jurisdiction	California Distributed Generation (DG) Statistics **https://www.californiadgstats.ca.gov/**
	Annual electricity generation from behind-the-meter PV systems in the SDG&E planning area	CEC energy demand forecasts (includes historical values). The 2018-2030 forecast including histo[...] use is available at http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-03/TN222287_20180120T141708_The_California_Energy_Demand_20182030_Revised_Forecast[...]
PV Installation Ordinance	Number of new housing units each year by type (single-family, multi-family, etc.)	Jurisdiction
	Square footage of new commercial space	Jurisdiction
	PV system capacity installed due to the ordinance	Jurisdiction
Effects of CA Energy Efficiency Program	Jurisdiction's net energy for load or gross generation, and natural gas use	SDG&E
	SDG&E service area's net energy for load or gross generation, and natural gas use	SDG&E, CEC energy demand forecast (includes historical values)
	SDG&E service area annual electricity and natural gas saving estimates under the State energy efficiency programs	CPUC California Energy Efficiency Statistics http://eestats.cpuc.ca.gov/ provides projected saving[...] by utility service area.
	Actual energy savings from SDG&E energy efficiency programs in the jurisdiction	SDG&E (by request) CPUC: Energy efficiency evaluation reports are verified savings but lag by several years, at http://www.cpuc.ca.gov/General.aspx?id=6391. The latest energy efficiency evaluation reports a[...] for 2010-2012.

Residential Energy Disclosure and Conservation Ordinance	Number of housing units or percentage of total housing units affected by the energy disclosure and conservation ordinance (number of building permits, housing units sold)	Jurisdiction; San Diego Association of Realtors monthly historical reports, at https://www.sdar.co
	Estimated energy savings from a residential energy retrofit	Jurisdiction
	Number of units that complete audits that perform energy retrofits	Jurisdiction
Require New Homes to Install Solar Water Heaters	Number of housing units affected by the measure (new housing units, number of building permits issued)	Jurisdiction
	Number of housing units affected by the measure by type (single-family, multi-family, etc.)	Jurisdiction
	Average annual energy savings upon replacing electric/natural gas water heater with solar water heater	California DG Statistics
Require EV charging stations at new constructions	Number of new housing units each year by type (single-family, multi-family, etc.)	Jurisdiction (for recent years)
	Square footage of new commercial space each year	Jurisdiction
	EV charging and EV parking requirements by type of housing unit and commercial space	Jurisdiction's municipal code parking standards; Center for Sustainable Energy statistics on EVs ar AFVs

Transition to a More Efficient Municipal Fleet	Amount (eg gallons) of fuel purchased by fuel type for municipal fleet	Jurisdiction
	Number of gasoline, diesel, biofuel etc vehicles	
	Number and type of vehicle replaced with alternative fuel vehicle	
Increase Bicycle Lane Miles	Average round-trip distance for bicycle commuters	Jurisdiction, SANDAG, literature or case study
	Workforce or labor force	Jurisdiction or California Employment Development Department
	Current bicycle lane miles by bicycle class	Jurisdiction
	Bicycle lane miles constructed by bicycle class	Jurisdiction
Install Traffic Lights or Roundabouts	Estimated total VMT in San Diego region	EMFAC default estimate
	Estimated total vehicle fuel consumption in San Diego region	EMFAC default estimate
	Constructed roundabouts and traffic signal retiming projects	Jurisdiction (capital improvement projects or circulation element projects)
	Equivalent fuel savings per intersection with improved traffic flow	Jurisdiction, SANDAG, literature or case study
Recycled Water Program	Constructed additional recycled water supply	Jurisdiction, water agency and recycled water provider

	Tertiary (advanced) water treatment energy intensity	Water reclamation facility, literature or case study
	Recycled water distribution energy intensity	Water reclamation facility, literature or case study
Water Disclosure and Conservation Ordinance	Number of housing units or percentage of total major renovation building permits by type (single-family, multi-family, etc.)	Jurisdiction
	Number of existing housing units by type	Jurisdiction
	Water savings from a typical home replacing water fixtures and fittings	Jurisdiction, Literature and case studies
	Percentage of the units that completed audits that replace the water fixtures and fittings	Jurisdiction
	Types of "non-compliant" plumbing fixtures and fittings	
	Types of "required" efficient plumbing fixtures and fittings	Jurisdiction
Increase Solid Waste Diversion	Total or per capita waste disposal	
Increase Urban Tree Canopy Cover	Number and type of new trees planted	Jurisdiction
	Carbon sequestration rate of by tree species	California Emissions Estimator Model (CALEEMOD), literature and case studies

	Species, planting locations, ages of the new trees	Jurisdiction
	Carbon sequestration of the new trees based on specific tree information	CUFR Tree Calculator

The availability of data to monitor non-quantifiable or supporting activities, such as educational outreach, is primarily in the control of the local jurisdiction. This data should include whether or not the jurisdiction has completed the supporting activities committed to in the CAP.

State Guidance on Tracking and Reporting Program Results

Although there are no standardized forms or format for CAP monitoring and reporting, GPs and GP updates require a monitoring plan[1]. The California Office of Planning and Research (OPR) recently updated its GP Guidelines (2017), which provide recommended content for annual progress reports for GPs[2] as well as how to integrate environmental mitigation monitoring into GP annual reporting.[3] CEQA mitigation monitoring and reporting are administrative regulations that are well established in the CEQA guidelines[4]. Therefore, CAP monitoring may have a relationship to how a jurisdiction monitors and reports on the GP. In particular, a CAP may sometimes be is used to streamline new development project mitigation requirements. In this case the mitigation monitoring program for these individual projects may be an element of CAP monitoring.

More on the relationships between GPs, CEQA, and CAP monitoring is provided in Technical Appendix V (CEQA and Climate Action Planning) of SANDAG's Regional Framework.

Guidance on performance monitoring of GHG reduction measures is provided in the monitoring module User Guide of the Statewide Energy Efficiency Collaborative's ClearPath California tool (2014)[5]. This guidance distinguishes between bottom-up and top-down methods, where bottom-up approaches are used to monitor individual actions, and GHG inventories on a regular basis are considered top-down methods. The Guidance is designed to help identify and record the most useful data to assess the effectiveness of actions and measures, and to fill the monitoring data tables in the tool that are needed to track

- implementation progress (planned, achieved, and gap) by measure and overall;
- implementation efficacy (expected CO_2e reductions, achieved reductions, and gap) by measure and overall;
- indicators

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[1] Government Code Section 65400(b)(1)

[2] State of California General Plan Guidelines 2017, page 258 ff, available at opr.ca.gov.

[3] ibid, page 277.

[4] CEQA Guidelines, Section 15097 California Code of Regulations Mitigation Monitoring or Reporting, CCR Title 14, chapter 3, Article 7.

[5] Draft Monitoring Module, User's Guide. Detailed Guidance Using SEEC ClearPath California, September 2014. This is one of four guides related to the SEEC Clearpath tool. The remaining guides are the Inventory Module User Guide, the Forecast Module User Guide and the Planning Module User Guide.

- cost inputs by measure.

The monitoring module can be populated through monitoring calculators selected by the user by category to produce an implementation details report documenting

a) the status data such as a category, point of contact, notes
b) implementation progress to compare monitoring records with a CAP measure
c) implementation efficacy for each year, comparing the expected reduction with the achieved reduction linked to a specific CAP measure
d) an indicator monitoring report pulled from inventory module records
e) financial impacts of actions
f) GHG impacts achieved

As stated in the guide, most of the reports and outputs are based on values input by the user from an externally performed evaluation as the tool is not meant to estimate reductions. The reports and outputs are all in table formats such as shown in Figures 3-7.

Figure 3. Creation of Monitoring Record in the ClearPath Monitoring Module with User Inputs

Figure 4. Implementation Progress Report from the ClearPath Monitoring Module Based on User Inputs

Implementation Efficacy

Comparison of CO2e reductions of Monitoring Records to linked Reduction Measure Records

		2014	2016
Title 24 Commercial / Annual Electric Savings (MMBtu / Year) - Usage	Planned	90077.0	90077.0
	Achieved	3412.0	170600.0
	Impact Gap	-86665.0	80523.0

		2014	2016
Title 24 Commercial / Annual Electric Savings (MMBtu / Year) - CO2e	Planned	2670.1446664879795	2435.238689453699
	Achieved	0.091441	5.0
	Impact Gap	-2670.0532254879795	-2430.238689453699

		2014	2016
Title 24 Commercial / Annual Gas Savings (MMBtu / Year) - Usage	Planned	27000.0	27000.0
	Achieved	11000.0	10000.0
	Impact Gap	-16000.0	-17000.0

		2014	2016
Title 24 Commercial / Annual Gas Savings (MMBtu / Year) - CO2e	Planned	1435.1991412208909	1435.1991412208906
	Achieved	588.0	534.0
	Impact Gap	-847.1991412208909	-901.1991412208906

Figure 5. Implementation Efficacy Report Produced by the ClearPath Monitoring Module Based on User Inputs

Indicator Report

Comparison of indicators by year across reporting tags

Grouping Tag	Calculator Name	Record Name	Scope	Output Name	1990	2010	2011	2012
02027	Emissions from Grid Electricity	Riverdale Electric		MMBtu per Household		2.0		2.0
02027	Emissions from Grid Electricity	Riverdale Electric		CO2e per Household (MT)		0.11239		0.11093
02027	Emissions from Grid Electricity	Riverdale Electric		MMBtu per Person		0.94283		0.93857
02027	Emissions from Grid Electricity	Riverdale Electric		CO2e per Person (MT)		0.056196		0.055466

Figure 6. Indicator Report Produced from the ClearPath Monitoring Module Based on User Inputs

Outputs

Name	Value
Electricity Saved (MMBtu)	0
Electicity CO2e Reduced	0
Natural Gas Saved (MMBtu)	0
Natural Gas CO2e Reduced	0
Propane Saved (MMBtu)	0
Propane CO2e Reduced	0
LPG Saved (MMBtu)	0
LPG CO2e Reduced	0
Butane Saved (MMBtu)	0
Butane CO2e Reduced	0
Kerosene Saved (MMBtu)	0
Kerosene CO2e Reduced	0
Gasoline Saved (MMBtu)	0
Gasoline CO2e Reduced	0
Fuel Oil #2 Saved (MMBtu)	0
Fuel Oil #2 CO2e Reduced	0
Fuel Oil #5 Saved (MMBtu)	0
Fuel Oil #5 CO2e Reduced	0
Fuel Oil #6 Saved (MMBtu)	0
Fuel Oil # 6 CO2e Reduced	0
Cost Effectiveness ($ / MTCO2e Reduced)	

Notes

Figure 7. Example Monitoring Outputs Record from ClearPath Monitoring Module Based on User Inputs

Best Practices for Local Jurisdiction Staff

Monitoring CAP implementation requires coordination from local jurisdiction staff in order to obtain the necessary data. Ideally, a CAP administrator (or designated staff person) will guide CAP development and implementation; be knowledgeable about the departments and personnel involved in each measure of the CAP and the staff associated with monitoring the relevant GP policies, actions, and reduction measures; and the consultants associated with CAP and GP updates and monitoring.

Below are best practices for staff involved in monitoring CAP implementation:

- Understand what data are needed, why, and when;
- Provide baseline data for CAP GHG reduction measures.
- Develop an internal process to collect data at regular intervals. To ensure continuity of data collection and management across departments and over time, the local jurisdiction can establish procedures for data collection and management with responsibilities for each department and staff position, rather than an individual staff member. Data collection and management can be institutionalized and become a regular part of normal operations. Establishing a formal data collection process for the CAP can be based on the frequency of data availability. Permit tracking systems may be customized to provide information relevant to CAPs.
- Identify the local contacts who have the data for the water, wastewater, and solid waste emissions inventory categories.
- Ensure secure storage and data access for jurisdiction staff or consultants as required. Proof of secure storage is required for SDG&E data due to privacy requirements, and non-disclosure agreements are also required between consultant-utility, jurisdiction-utility, or both. Establishing a process for the provision of the data, including to which authorized person or persons the data should be provided, where the data is physically stored (in terms of which computers and servers), how the data is stored (encryption), and password access are all current practices in secure data management.
- Estimate cost and staffing for implementation and monitoring of the CAP to understand resource needs (see Technical Appendix IV, CAP Implementation Cost Analysis)

3 CAP MONITORING FRAMEWORK

The CAP monitoring framework has several levels; each level provides a different perspective on CAP progress and may be prepared at varying intervals during CAP implementation based on the considerations described in the previous section. The levels include: monitoring overall emissions, GHG emissions by category, monitoring activity associated with each measure or action, the emission reductions associated with the measure or action, and the status of non-quantifiable measures. The monitoring framework allows both a high-level evaluation of overall targets and sufficient detail to evaluate measures and actions to help determine what activities are working well and what changes might be needed to improve CAP implementation. Figure 8 summarizes the monitoring framework, and the following sections describe each level in more detail.

Figure 8. CAP Monitoring Framework

Monitoring Total GHG Emissions

Evaluating total GHG emissions answers two questions in the monitoring and evaluation process: (1) did total emissions increase or decrease; and (2) are total emissions on track to meet adopted CAP targets?

This level of analysis is insufficient to provide insight into the factors that contribute to changes in emissions levels. Analyzing each category of emissions can provide an additional layer of detail. Many CAPs also track GHG emissions from government operations, which this appendix does not address.

How often to monitor total emissions and conduct an inventory varies, as shown in Table 1. The State produces an annual inventory with a lag of 2-3 years. That is, the 2016 inventory will likely be available earliest in 2018. SANDAG produces a regional inventory every four years as part of the Regional Transportation Plan update. The last regional inventory was for the year 2012 and the next regional inventory will be produced in 2018 for the year 2016. With the Energy Roadmap Program, SANDAG plans to provide jurisdictions updated inventories every two years, beginning with a 2016 inventory to align with the regional inventory.

Data availability determines when the inventory can be prepared. Similar to the state, local data collection processes can take up to 18 months from the end of the desired inventory year (e.g. a 2018 inventory will likely be prepared in mid-2020).

The results of several years of inventories indicates the trend of emissions changes. For example, the State inventory shows a decreasing trend in overall GHG emissions (Figure 9) when considering the years 2000 to 2014. California now appears to be on the path to meet its 2020 target. However, from the years 2000 to 2007 the average emissions were slightly increasing and it is only since 2008 that the trend is decreasing. Any individual year may be higher or lower than the previous, therefore several years of inventories are needed before a trend can be clearly identified.
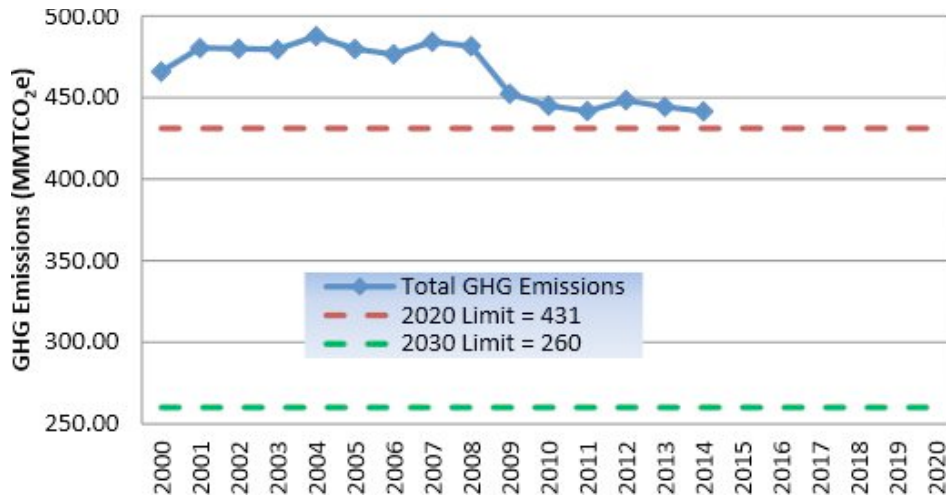
Figure 9. California's GHG Inventory and Trends

3.1.1 Monitoring GHG Emissions by Category

Evaluating emissions by category provides an understanding of where emission levels are increasing or decreasing and the effect on overall emissions. For example, the City of San Francisco monitors total GHG emissions and GHG emissions by category. Figure 10 shows the City of San Francisco's emissions by category from the year 1990 to 2010. In this example, the emissions in the waste category increased between 1990 and 2005 but decreased from 2005 to 2010. The building electricity category appears to have steadily decreased in emissions, while other categories' emissions have remained approximately the same. Overall, San Francisco shows a decrease in its total emissions from 2000 to 2010; however, it appears to not quite have met its reduction target of 20% below 1990 by 2010.

Figure 10. Example of GHG Trends in San Francisco Inventory Categories

Another important consideration is to determine why GHG emissions increased or decreased in a given category and identify barriers to progress. Apart from data uncertainties as a contributor to apparent

increases or decreases, a range of other factors could affect emissions. Some factors may be outside the control of the local jurisdiction. The following sections describe some of these factors outside of CAP implementation that may affect emissions in a given year for each category.

3.1.1.1   On-Road Transportation
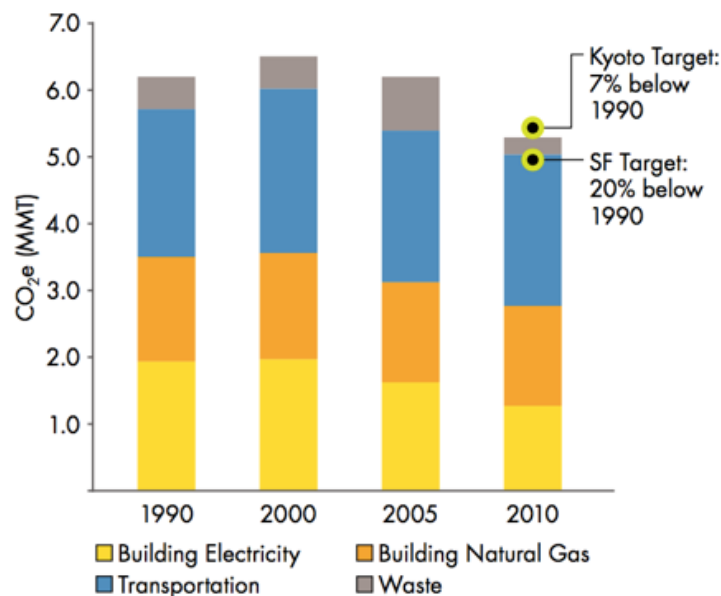
- On-road transportation category is complex and many factors influence GHG emissions by impacting VMT, vehicle efficiency, and use of zero emission vehicles. Unlike other inventory categories where activity is measured, and lacking fuel data at the city level, VMT cannot be measured directly at the jurisdiction level, so modeled VMT is used instead.
- Fuel prices affect miles driven and types of vehicles purchased. The types of vehicles purchased determines the GHG emissions factor in the State's EMFAC model (see Technical Appendix II, GHG Reduction Calculation Methods for CAP Measures).
- The state of the economy affects miles driven. Miles driven typically decrease during recession years and increase in boom years. However, GHG emissions may still decrease depending on the type and fuel economy of the vehicles being driven.
- Emerging technologies, such as rideshare, bikeshare, microtransit, autonomous vehicles, and connected vehicles, have the potential to dramatically influence GHG emissions. The impacts on VMT, vehicle ownership, single-occupant trips, and roadway capacity is unclear.

3.1.1.2   Electricity

- SDG&E's power source mixes can change from year to year. The emission factor is based on the amount of renewable source generation. When the San Onofre nuclear power plant went off-line in 2012 for example, GHG emissions increased because the temporary use of natural gas plants increased the emissions factor of grid power.
- The number of accounts in each class (residential, non-residential) can change from year to year as new customers enter or leave. This can lead to large changes when dealing with industrial and commercial facilities and can mask real CAP-related reductions in GHG emissions from the electricity and natural gas categories.
- External factors, such as weather (e.g., temperature, humidity), affect electricity consumption.
- The state of the economy affects end-use energy consumption, similar to the miles driven in the on-road transportation category.

3.1.1.3   Water and Wastewater

- Water consumption is affected by mandates to conserve.
- Water rates affect water use; therefore, tracking water rates by service agency is useful.
- Weather (especially rainfall) in a given year will impact both water consumption and associated energy and GHG emissions. Drought years may lead to cities importing more water, which uses more energy and potentially leads to greater GHG emissions. On the other hand, if sufficient water is stored in the region in a drought year, there may be less than expected imports during a drought year.
- Reductions in water use will lead to reductions in wastewater treatment emissions.

3.1.1.4   Solid Waste
- o   Changes to disposal rates or recycling rates impact solid waste emissions.

Data needs and frequency of data availability to monitor category emissions are the same data needed for an inventory and summarized in Table 2. They are described in detail in Technical Appendix I (GHG Inventories, Projections, and Target Selection).

3.1.2   Monitoring CAP Measures and Actions

GHG reduction strategies, measures and/or actions can be tracked by tracking the activities associated with each, and their GHG reduction amounts. However, solely tracking the level of activity can be misleading if the associated emissions reductions are declining for other reasons. Therefore, monitoring progress in implementing and achieving the goals of CAP strategies, measures and actions includes:

- tracking the data inputs used to calculate emissions reductions;
- tracking associated local jurisdiction activities – these can be qualitative or quantitative;
- To the extent possible, tracking other related data that might be useful and relevant to any particular strategy, measure or action.

The way to track these three components is to establish performance metrics, for each component. A variety of performance metrics can be established with baseline data during CAP development and additional metrics can be developed any time thereafter to be used to monitor and report several components of measures and actions.

Performance metrics are also used to monitor emissions by category or overall emissions. The next section provides more detail on performance metrics for each level of the monitoring framework.

Performance Metrics to Monitor CAP Categories, Strategies, Measures and Actions

A performance metric is a specific and measurable level of achievement within a particular timeframe or target year. A performance metric may lead to a particular end result or goal. While CAPs always have targets for overall GHG reduction, they may or may not have goals by emissions category. If a category of emissions has several strategies to achieve reductions, strategies may or may not have associated GHG reduction goals or other goals. For local measures within a category and strategy, CAPs generally have specific actions which have been used to quantify GHG reduction estimates in target years as well as non-quantifiable local activities associated with a measure. Performance metrics based on specific activity data can be developed and tracked annually or even more frequently for local measures. A performance metric related to staff time, money spent, or number of workshops can also be developed but may not be quantifiable with respect to GHG reduction. Therefore, performance metrics can be qualitative or quantitative.

The data needs, availability and sources for CAP measures are provided in Table 3 and are largely the same as those used to identify and develop the CAP measures during CAP development (see Appendix 2, GHG Reduction for CAP Measures). The methods for calculating emissions reductions are also provided in Appendix 2 and are the same as the methods used during the monitoring process. The analysis included in the CAP is for the purpose of planning and estimating GHG reductions even if not all actions can be quantified. In addition, performance metrics associated with a strategy, category, measure or action can be used to track factors that may influence the CAP, such as regional gross domestic product (RGPD). A metric that considers trends in overall GHGs per RGPD can show how productive a jurisdiction

might be relative to reductions in GHGs. The metric GHGs per unit of RGDP is typically not within the scope of the CAP but nonetheless provides a useful indicator of change.

Table 4 shows a variety of performance metrics that might be used to track progress of CAPs by category, strategy, measure and action. Metrics included in the CAP would require collecting data across a wide range of activities that could include numerous departments and divisions within a jurisdiction, as well as external entities.

While performance metrics may be provided in the CAP or developed later through a progress reporting process, there may also be CAP relevant metrics provided in a GP implementation or GP monitoring plan.

Table 4 Illustrative Examples of Performance Metrics

GHG Emissions Category	Strategy	Measure/Policy Examples	Actions	Performance Metrics
Electricity and Natural Gas	Increase Renewable Energy	Local - Require installation of 10 MW additional residential PV or PV on 3,000 homes by 2020	Adopt ordinance to increase residential PV	- Number of educational outreach events - Value of rebates and incentives provided per year - Zoning amendments to streamline permit applications - MW residential PV installed per year - Number of residential PV permits per year - Average kW PV/household per year - CO2e avoided/unit
			Installation of 1 MW additional residential PV or PV on 3,000 homes by 2020	
		State -implemented regionally – Achieve 33% renewables in electricity by 2020, and 50% by 2030	Amount of renewables in grid energy	-% renewables in gross supply by jurisdiction per year - CO2e avoided/year
	Increase Building Energy Efficiency	Local - Reduce energy use by 15% per unit in 20% of residential housing units by 2020 and 50% of units by 2035.	Adopt a residential energy disclosure ordinance	- Number of homes disclosing energy use - Number of homes conducting energy reduction activities - Energy use per household per year - Electricity use per household per year - Natural gas use per household per year
		State – achieved locally - reduce commercial building energy use	Establish commercial building energy use per square foot by jurisdiction	- Commercial building energy use per square foot - Incentives and rebates distributed locally by jurisdiction for commercial retrofits
On-road Transportation	Reduce VMT	Increase mass transit commute mode share to 10% by 2020 and 25% by 2035	Work with transit agencies to identify bus routes and priorities to increase frequencies	- Number of meetings held with transportation agency per year - Number of outreach events to identify community needs for transit and areas - Baseline number and frequency of potential buses affecting commuters - New frequency by jurisdiction and commute

			Identify smart growth areas for improved transit access	- Number of smart growth areas by jurisdiction - Outreach to public and employers related to smart growth areas - Incentives and rebates available for increased transit access for commuters per year - Employer applications and amount for transit rebates/incentives per year
	Promote Alternate Fuels and Alternative Fuel Vehicles	Increase AF stations	Work with SDG&E and CSE to identify locations and implement	- Number and type of AF stations per year installed
		Increase EVs in passenger fleet	State – achieved locally	- Number of EV rebates per year - Value of EV rebates per year - Estimated EV and other AFVs miles driven per year
	Reduce Fuel Use	Traffic light retiming or synchronization for 100 signals	Retime 100 traffic signals by 2020	- Number of signals re-timed to achieve smoother flow
		Install 4 roundabouts	Identify and install roundabouts at 4 appropriate junctions by 2020	- Number of roundabouts installed or planned per year
		Improve fuel economy of vehicles	State- achieved locally	-Modeled change in fleet fuel economy in region by year
Waste	Increase solid waste diversion from landfill	Divert 75% solid waste from landfills by 2020 and 90% by 2035	Adopt zero waste ordinance	- Total solid waste produced per year - Amount and type of waste diverted per year
		Compost 90% of organics by 2035	Plan and develop composting facilities	- Build compositing facilities

Non-quantified CAP measures and actions may also be known as "supporting activities." The purpose of tracking and monitoring these non-quantified actions is to determine whether a jurisdiction has completed the activities it committed to in the CAP, and, if not, why these activities were not completed. It is also possible that a local jurisdiction could complete the CAP actions without achieving the associated GHG emissions reductions. The opposite could also be true, and the GHG reduction measure and associated performance metrics might be met without any action by the local jurisdiction. This information can help local jurisdictions determine how to prioritize its implementation efforts and allocate funds to support CAP implementation.

3.1.3 Other CAP-Related Metrics

In addition to the performance metrics included in a CAP, additional metrics can be tracked to assess trends associated with CAP strategies, measures and actions. Metrics can capture broad macroeconomic themes, such as GHG emissions per dollar of RGDP, or they can be more specific and focus on a

particular category of emissions. For example, energy related metrics, including energy per capita or energy per household, could be used to evaluate broader trends related to the CAP but not explicitly included in the CAP.

Metrics could be developed to monitor overall efficiencies. For example, because on-road transportation is responsible for a significant portion of overall communitywide emissions, developing metrics to assess the overall efficiency of the transportation system in terms of access, mobility, and associated GHG emissions could help a jurisdiction understand what measures and policies could be most effective. For example, moving miles from electric vehicles charged with high levels of renewable electricity to diesel or natural gas buses with low ridership may not be a good trade-off for reducing GHG emissions in a jurisdiction, and metrics that enable this kind of evaluation may be valuable in a CAP.

Examples of other metrics for communitywide energy and water efficiency measures are given in Figure 11.

Energy (fuel, electricity, natural gas)	Total energy use Total energy per person Energy per household Energy per dollar of GDP
Electricity	Total electricity use Electricity per person Electricity per household Electricity per sq. ft. of commercial area Electricity per industrial output
Natural Gas	Total natural gas use Natural gas per person Natural gas per household Natural gas per sq. ft. of commercial area Natural gas per industrial output
Water	Water per person Water per household Water per commercial customer Water per industrial customer Recycled water per person

Figure 11. Examples of Additional Potential Performance Metrics Related to CAPs

These metrics are essentially combinations of publicly available datasets and could be quickly developed. Such metrics could be shared publicly to help develop long-term assessments of climate action planning in any jurisdiction and support data transparency initiatives.

CAP Updates

The monitoring process described above could inform a CAP update. Updating a CAP provides an opportunity to set a new baseline using the latest inventory methodologies and data sources, and update the emissions projection with the latest growth forecasts and/or new targets. During a CAP update, jurisdictions can also use monitoring data to inform changes to the CAP measures.

4   MONITORING OTHER FACTORS THAT CAN AFFECT THE CAP

The primary goal of the CAP is to reduce GHG emissions; however, there are other benefits that can result from CAP measures and actions, also called "co-benefits". For example, reducing tailpipe emissions from vehicles can improve local air quality, which can have a positive effect on public health; installing solar PV or conducting energy efficiency retrofits can reduce costs for users through energy and water utility savings; and, increasing use of labor-intensive activities, like solar installation and energy efficiency retrofits, can create jobs and positively affect the local economy. At the same time, there may be negative externalities, such as costs associated with adopting new technologies or building infrastructure.

Co-benefits may be identified in a qualitative manner in a CAP. A comprehensive benefit-cost analysis (BCA) of CAP measures would include co-benefits. (see Technical Appendix 3, Benefit-Cost Analysis for CAP Measures).

Local Air Quality Benefits

CAPs do not quantify local air quality benefits from measures and there is no requirement to do so. However, GHG reduction policies will also reduce air pollutants, such as particulate matter, oxides of nitrogen, and sulfur dioxide, from local transportation measures. These air pollutants have a direct effect on smog formation and public health.

Jurisdictions do not monitor regulated air pollutants within CAPs. However, environmental justice issues have become more prominent in State climate change legislation; in 2017, Governor Brown signed AB 617 in an effort to link reduction of GHGs and air pollutants (both criteria and toxic) from non-vehicular sources to disadvantaged communities and the air quality within these communities. Air districts are now required to monitor select locations and develop measures to reduce these emissions from stationary sources.

Public Health

To the extent that CAP measures reduce conventional air pollutants, there will be a direct effect on public health.

Cost

The costs of monitoring CAPs would include staff costs to implement the CAP and collect and manage data, as well as consultant costs, if needed. The BCA framework developed by EPIC (provided in Technical Appendix III, Benefit-Cost Analysis for CAP Measures) includes the cost of implementation, which, in turn, includes the costs for monitoring the CAP over its lifetime.

Economic Impacts and Jobs

The City of San Diego and Encinitas CAPs have sections related to social equity and job creation and describe how this can be used to promote more equitable job growth and economic opportunity. In its chapter on monitoring and reporting, the City of San Diego commits to working with other regional organizations (such as Cleantech San Diego and the Center for Sustainable Energy) to monitor and report on annual jobs related to the CAP, which also includes associated wages. Cleantech San Diego

monitors the region's cleantech economy as a whole[6] and this data would also be available to other jurisdictions in the region. Tracking job changes due to CAP measures can be a part of CAP monitoring.

Monitoring the Weather

While this region's CAPs do not currently include weather monitoring, tracking annual weather patterns through publicly available sites (e.g. SDG&E's weather stations) can help to explain changes in energy and water use over time.

5   COMMUNICATING PROGRESS

Many CAPs specify that progress reports will be provided to the decision-making body and made available to the public on a regular basis. Some jurisdictions have also chosen to voluntarily report GHG emissions inventories and reduction progress to third parties such as the Carbon Disclosure Project (CDP). The following sections provide examples of progress reports from jurisdictions within the San Diego region and outside the region.

City of Encinitas

The City of Encinitas has also developed a dashboard called "Encinitas Environment", which allows visitors to explore Encinitas's CAP goals and progress, including related environmental benefits. Figure 12 shows a screenshot of the City of Encinitas's dashboard. Each image can be opened for more details on each topic.
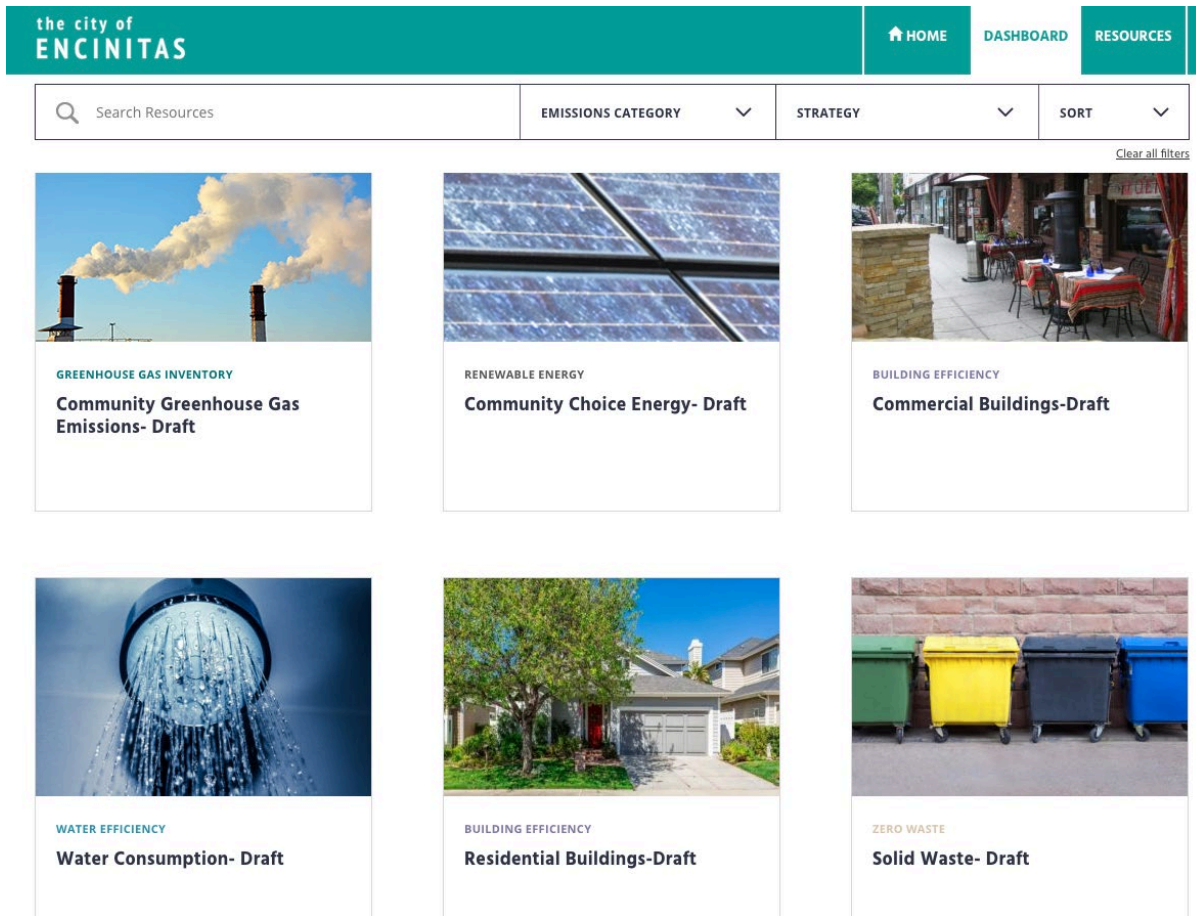
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[6] See http://cleantechsandiego.org/facts/

Figure 12. City of Encinitas Dashboard[7]

City of San Diego

The City of San Diego has a "Sustainability" webpage, which provides the links to the CAP and to its CAP annual reports. The annual report includes details of progress for each of the five strategies in the CAP (Figure 13). The Sustainability webpage also links to a "Sustainability Progress Report", a one-page "postcard" that highlights the annual achievements in the CAP progress report (Figure 14).

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[7] City of Encinitas CAP Dashboard, available at http://www.encinitasenvironment.org/.
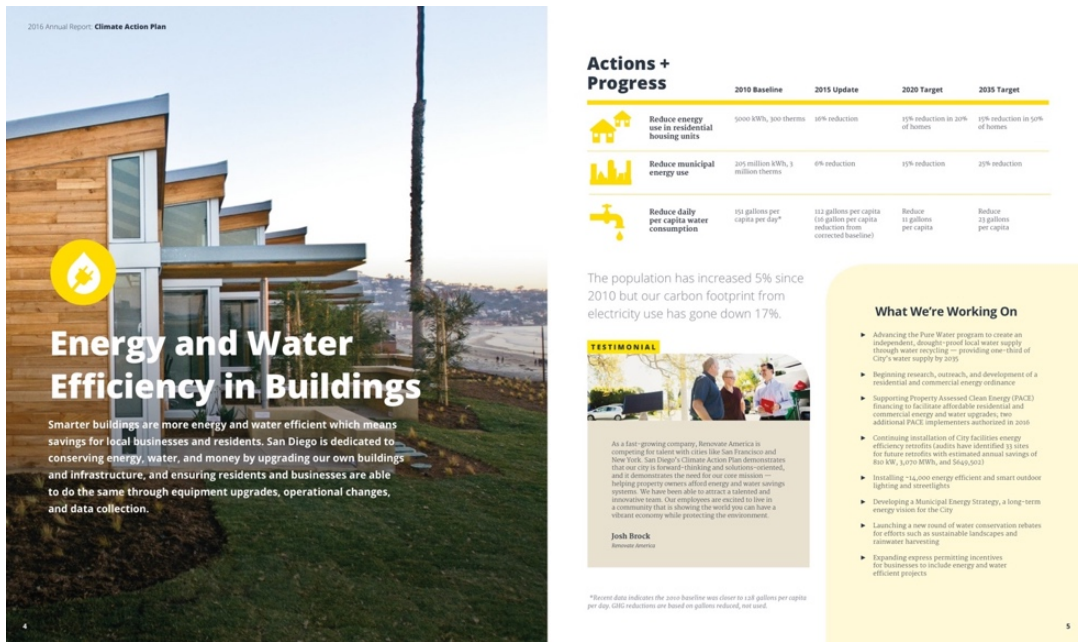
Figure 13. City of San Diego CAP Annual Report - Energy and Water Efficiency

Figure 14. Sustainability Annual Report, City of San Diego

City of Berkeley

The City of Berkeley reports on its CAP progress through its Office of Energy and Sustainable Development webpage, in the form of a short presentation with the overall achievements, progress towards GHG emissions targets, and trends (Figure 15).
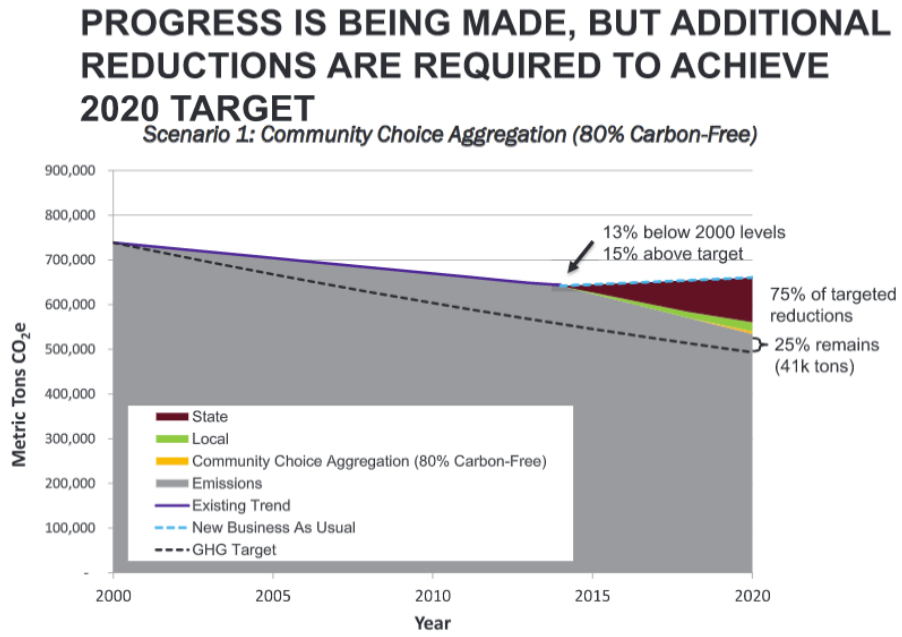

Figure 15. Overall GHG Emissions Progress Reporting, City of Berkeley

The website then provides tabs for progress in each category of emissions reductions (Figure 16).

Figure 16. Berkeley Progress Report on the Web

Each category goes into the details of the measures and lists the goals and actions, as well as performance metrics and status for each measure (Figure 17).

Figure 17. City of Berkeley Progress Report Detail

City of Seattle

The City of Seattle's Office of Sustainability and Environment webpage provides the history of Seattle's CAP development, with links to the CAP and implementation strategy. The CAP does not have a chapter on monitoring and reporting, and there has been no specific annual CAP monitoring. However, its 2014 "Moving the Needle" report tracks and reports on many of the measures included in its 2008/update 2013 CAP (also Figure 18 and Figure 19 for presentation of Seattle's progress and goals).

MOVING THE NEEDLE 2014
City of Seattle's Environmental Achievements   3

Buildings & Energy
Leading with conservation & renewable energy

Seattle is fortunate to have a robust supply of clean hydroelectric power with 7 of its own hydro facilities and several renewable power contracts. Today, hydropower supplies 92 percent of Seattle's electricity. Conservation has long been the City's first-priority, with energy conservation programs dating back to the 1970s.

RANKED 1ST IN THE NATION for green building policy

1ST UTILITY IN THE NATION to achieve zero-net carbon emissions

ENVIRONMENTAL STEWARDSHIP is fundamental to how we manage our energy resources. Seattle protects some **13,000 acres of habitat** in our hydro watersheds, including old-growth forest & spawning grounds for salmon.

OUR STRATEGIES:

The City is committed to meeting future energy needs through conservation and renewables as well as protecting our important energy resources for today's generation and the next. Our strategies include:

Energy Conservation
Energy efficiency is our first-priority for meeting electricity needs.

Green Buildings
Seattle is one of the top green building markets in the nation.

Renewable Energy
Seattle is well-positioned to meet future energy needs with low carbon sources.

THE BENEFITS:

Climate Protection Healthy People Natural Resource Protection

Less Waste Economic Benefit Clean Air

THE CHALLENGE AHEAD:

Aggressive energy codes and green buildings programs are dramatically reducing the amount of energy new buildings use. Now our challenge is to achieve the same results in the buildings that we already live and work in.

Figure 18. City of Seattle 2014 Progress Report

MOVING THE NEEDLE 2014
City of Seattle's Environmental Achievements   4

Energy Conservation

GOAL 1 105,200 MEGAWATT HOURS OF ELECTRICITY SAVED ANNUALLY ACHIEVED!

121,290 Megawatt hours saved in 2013. This is equivalent to:

14,190 homes powered for one year or 16,040 vehicles garaged for one year

GOAL 2 REDUCE HOME ENERGY USE BY 20% AND COMMERCIAL ENERGY USE BY 10% BY 2030 (2008 BASELINE)

3% Reduction RESIDENTIAL
2% reduction COMMERCIAL

2008: 18.4M BTU
2012: 17.9M BTU

2008: 27.9M BTU
2012: 27.4M BTU

A BTU accounts for total energy (not just electricity) & is the amount of energy needed to heat one pound of water one degree.

GOAL 3 20% ENERGY SAVINGS IN CITY FACILITIES BY 2020 (2008 BASELINE)

Progress to date (estimated): 4%

Seattle's 2013 Resource Conservation Management Plan outlines strategies to achieve our goal.

Green Buildings

GOAL 4 INCREASE THE NUMBER AND LEVEL OF GREEN CERTIFIED BUILDINGS

Built Green: Residential 40% increase (2009 - 2013)

1-3 Stars
4 Stars
5 Stars

LEED Rated: Primarily commercial 179% increase (2009 - 2013)

LEED & Silver
Gold
Platinum

32 out of 34 City-owned buildings completed between 2000-2013 achieved a LEED rating:

Platinum: King St Station
Gold: 20 projects
Silver: 9 projects
Certified: 2 projects

Renewable Energy

GOAL 5 15% OF ELECTRICITY ACQUIRED FROM NEW RENEWABLE SOURCES BY 2020

In 2013, almost 5% of Seattle's electricity came from new renewable sources. New renewable sources includes:

Methane gas capture from Columbia Ridge Landfill (Seattle's municipal solid waste)

Wind projects

Waste-to-heat cogeneration at West Point Treatment Plant (Seattle's wastewater)

GOAL 6 INCREASE SOLAR ENERGY PRODUCTION IN THE COMMUNITY

Over 1,000 residents & businesses have installed solar panels in Seattle since 2006.

Our solar capacity is now 6 MW → 38 times more than in 2008.

Seattle Aquarium recently installed a solar installation through Seattle City Light's Community Solar Program.

THE LEADING EDGE

COMMUNITY POWER WORKS

Seattle's energy upgrade program helps residents with low-cost energy assessments, rebates, financing, and pre-approved contractors. Community Power Works delivers energy efficiency solutions and lasting environmental and economic benefits. Customers gain more than energy savings – they're making their homes healthier, safer, more comfortable places to be.

Learn more about Seattle's environmental work
WWW.SEATTLE.GOV/ENVIRONMENT

3,040 families with upgrades complete or in progress

1,175 of these are low-income families

30% average energy savings

220,847 TONS of greenhouse gas emissions avoided over the lifetime of the measures
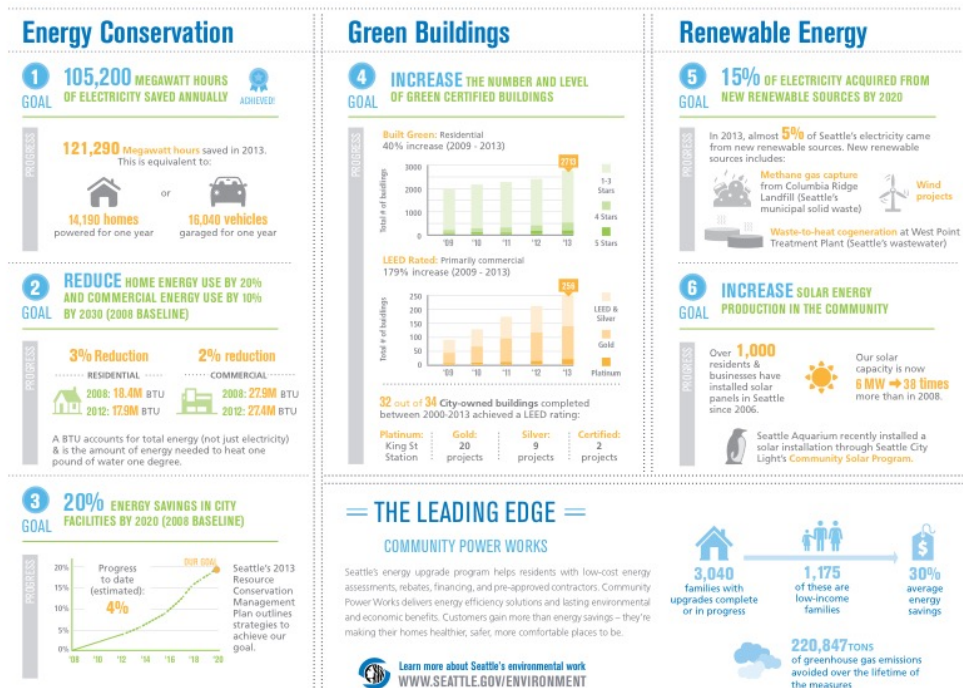
Figure 19. City of Seattle Goals

Conclusion

This appendix to the SANDAG Regional Climate Action Planning Framework discussed:

- The purpose of monitoring and reporting on CAP progress
- Considerations related to monitoring, such as frequency of data availability, and data sources
- Limitations of data related to monitoring
- State guidance available for monitoring and reporting for local CAPs, and best practices for local staff
- The CAP monitoring framework, including GHG inventories, GHG inventory categories, CAP reduction measure activity, CAP reduction measure GHG emission reductions, and non-quantifiable measures
- Identifying and tracking performance metrics related to CAP measures and actions
- Tracking metrics outside the CAP framework but of relevance to CAPs, such as co-benefits;
- Communicating results and example formats used in reporting progress.