GHG Reduction Strategies Quantification and Evidence

For Pleasanton CAP 2.0 | January 6, 2022 – REVISED September 1, 2022

Contents

Executive Summary

This document summarizes findings from a quantitative assessment of draft Pleasanton CAP 2.0 actions. The quantitative assessment provides high-level estimates of the **costs** and **emission reductions** associated with each action to provide a defensible plan for meeting the City's emission reduction goals. Key findings of the analyses include:

- Modeling suggests that implementation of proposed primary CAP 2.0 measures could **exceed the City's proposed 2030 target** (4.11 MTCO2e per capita) and SB-32 required reductions, resulting in emissions that drop from 13.6 $MTCO_2e$ per capita in 1990 to **4.09 $MTCO_2e$ per capita in 2030**. The following CAP strategies and actions are the highest contributors of GHG emission reductions through 2030:
    - Vehicle decarbonization (ZEV Infrastructure Plan)
    - Renewable electricity (Zero emissions as default EBCE choice)
    - Organic waste prevention and management (SB 1383 implementation)
    - Community small engine electrification
    - Existing Building Electrification Plan
    - Comprehensive climate awareness, education, and outreach
- Modeling suggests that the total net present value (NPV) City cost over the next ten years through 2031 of implementing all the primary CAP 2.0 actions will be **$2.8 million**—equivalent to around **$276,000 per year**.[1]
- The estimated NPV cost to the community over the next ten years through 2031 of implementing all the actions in the shortlist is a **net savings of $5.9 million**—equivalent to around **$587,000 in savings per year**. Much of these savings to the community are in the form of rebates/incentives and fuel cost savings.
- Implementing all the actions in the shortlist will require staff time, ranging from an estimated **1.6 FTE per year through 2031.** These FTE may be absorbed into existing staff duties or new staff may be hired. The following actions have the highest total FTE estimated from 2022-2031:
    - Wildfire preparation, prevention, and education
    - Increase transit ridership
    - ZEV Infrastructure Plan
    - VMT reduction for K-12 activities
    - Urban Forest Master Plan

This document is organized as follows:

- The **Overview** introduces the approach and key assumptions that drove the analysis.
- The **Findings Summary** provides the emissions reductions, City staff time, NPV, and cost-effectiveness for proposed CAP 2.0 actions.
- The remaining sections detail emissions reduction and cost results by sector**:**
    - **Buildings & Energy**
    - **Materials & Consumption**
    - **Natural Systems**
    - **Water Resources**
    - **Transportation & Land Use**
    - **Community Resilience & Wellbeing**
- A detailed **References** list documents the sources used to conduct the analyses.

[1] Does not include City labor costs.

Overview

This document summarizes findings from a quantitative assessment of the prioritized shortlist of actions for inclusion in the draft Pleasanton CAP 2.0. The quantitative assessment provides high-level estimates of the **costs** and **emission reductions** associated with each action (detailed below), to provide a defensible plan for meeting the City's emission reduction goals.

Some actions in the CAP are directly **quantifiable**, while others are not. Many of the actions in the prioritized shortlist may not be readily quantifiable, may result in inconsequential GHG reductions, or may have indirect benefits that do not result in emissions reductions as calculated in the City's inventory. These actions, often defined as "**supportive**," may be critical for implementation success even if they are not quantified. For example, actions to enhance energy battery storage are crucial for large-scale implementation of renewable energy and electrification, but do not themselves reduce GHG emissions. Another example is education and incentive programs, which can encourage reductions but do not necessarily result in significant reductions, depending on the reach, efficacy, and permanence of the implemented changes. In contrast, an ordinance to require all-electric new construction is a quantifiable action that carries a very high and defensible likelihood of significant and measurable emissions reductions.

Some proposed CAP 2.0 actions are focused on improving community resiliency to climate change impacts rather than reducing GHG emissions. While the resilience benefits of these **"climate adaptation" actions** were not quantified, taking action to build climate resiliency and preparedness are nonetheless critical for addressing climate change in the Pleasanton community and should be considered as an important part of Pleasanton's climate action strategy.

The project team took an action quantification approach like that taken by the City of Dublin for their recent CAP, which provided quantitative estimates for CAP measures (see table on the following page). The approach of quantifying actions ensures that the package of measures in the Pleasanton CAP 2.0 will result in sufficient emissions reductions needed to meet short-term goals and establish a strong foundation for meeting long-term goals.

Action impact was explicitly modelled based on **available information** and **case studies**, including data on historic and projected energy usage, population and development trends, and technology and policy impact. The consultant drew from literature and expert opinion—including studies done by the U.S. Department of Energy and California Air Resources Board—as well as from available City data and staff input.

Actions were analyzed based on predetermined implementation **timeframes**, which were categorized as follows:

- Near-term (1-3 years); 2022 to end of 2024
- Mid-term (4-7 years); 2025 to end of 2028
- Long-term (8-10 years); 2029 to end of 2031

Actions were further divided into the following categories:

- **Existing actions**: Actions that are already underway, planned, and/or budgeted for implementation and will result in future GHG emissions reductions.
- **Primary CAP actions**: Actions to be implemented as part of CAP 2.0 implementation.
- **Secondary CAP actions**: Actions to be implemented as time and resources allow.

Cost Estimation

Action implementation costs were estimated for both costs to the City and community:

- **Community costs** estimate how much it will cost an average resident, business, or developer to implement the measure as compared to a business-as-usual scenario.
- **City costs** estimate costs related to consultant services and procurement.

Like the impact analysis, the consultant estimated costs for all measures in the prioritized shortlist. The estimated cost was based on consultant experience, available literature, consultation with peer cities, and City staff input, and included the following cost elements:

- **Initial start-up costs**, in the form of consultant and capital expenses.
- **Ongoing costs** through 2031 over a 10-year timeframe, including continued labor expenses, maintenance, and monitoring/evaluation of resource needs.

City staff time required for action implementation was evaluated separately and is not included in the cost estimations as some of the anticipated staff time may be absorbed into existing City staff.

City staff reviewed the cost estimations—especially the City cost element (e.g., estimated FTE requirements). To the extent possible, the consultant provided citations for consulted literature and case studies, although information on climate action costs is very limited at this time.

Where known, the analysis includes consideration of partnerships. However, the analysis does not include potential grants and other funding sources, so estimates here may be conservative representations of the City's final cost. A more detailed funding plan will be provided in future stages of the plan.

Emission Reduction Estimation

The consultant explicitly modelled emissions reductions associated with proposed CAP 2.0 actions. Modeling built from the emissions forecast and considered interacting actions to avoid double counting, such as impacts of EV vehicle use on community electricity consumption. All assumptions are provided for transparency and City/stakeholder review and outcomes are visualized in both table and graphical format.

Findings Summary

Results from the cost and impact analysis are summarized in the table below. The "Summary At-a-Glance" table on the subsequent page includes the following information associated with each proposed CAP 2.0 action:

- **Net Present Value (NPV) cost to the City and community:** The anticipated net cost of the action for the City government and Pleasanton community, considering current and future costs and cost savings benefits (through 2031). Negative NPV values represent cost savings.
- **GHG savings:** Estimated cumulative GHG emission reduction benefits resulting from action implementation (through 2030).
- **Cost effectiveness:** Estimated cost effectiveness of the action (cost per unit GHG emission reduction achieved).
- **Co-benefits:** Benefits that would result from the action in addition to direct climate benefits, including resilience, equity, job creation, public health, ecosystem and habitat health, and mobility and transport safety. In addition to the co-benefits highlighted, many actions—including many not quantified for GHG savings—also present an opportunity for City leadership, are foundational to overall sustainability or to ensure the success of more directly impactful actions, or support youth engagement and capacity for climate action

The Summary At-a-Glance table is followed by the following additional summary sections:

- **GHG Reductions** highlights the combined impact of all strategies and actions in reaching Pleasanton's overall and per capita emissions reduction targets. It also summarizes which strategies and actions contribute most to emissions reduction.
- **Cost** details the estimated city staff time, in FTE, required to implement CAP 2.0. It also includes the NPV cost by strategy and by action, organized by sector.
- **Cost effectiveness** includes the overall cost-effectiveness of CAP 2.0 implementation for the City and community, highlights the most cost-effective actions, and summarizes cost effectiveness for every action.

Summary At-a-Glance

Co-Benefits Key		
Resilience	Public health	Ecosystem and habitat health
Equity	Job creation	Mobility & transport safety

Acronym/Abbreviation Key		
Comm.	Community	
NPV	Net present value	Net current value of all current and future cash flows associated with the project; considers both costs and cost savings (i.e., benefits). Negative values are a net cost savings.
GHG	Greenhouse gas	Methane, carbon dioxide, and nitrous oxides that contribute to climate change
$MTCO_2e$	Metric tons carbon dioxide equivalent	Common unit for quantifying GHG emissions
	Denotes actions with notable direct or indirect GHG savings that were not quantified due to measurement constraints.	

			NPV Costs ($)		GHG savings (MTCO2e)	Cost Effectiveness ($/MTCO2e)		Co-benefits
Sector	ID	Action	NPV Costs to City	NPV Costs to Community	Cumulative Savings - to 2030	City	Comm-unity	
BE	P1	All-electric reach code	$49,020	($2,784,572)	10,136	$5	($275)	
BE	P2	Existing Building Electrification Plan	$138,455	$137,032	49,533	$3	$3	
BE	S1	Refrigerant management in new construction	$42,675	($262,307)		N/A	N/A	
BE	P3	Modify Municipal Code definition of covered projects	$0	$287,074	1,290	$0	$223	
BE	S2	Community energy efficiency upgrades	$958,041	($1,959,201)	8,260	$116	($237)	
BE	S3	Energy Benchmarking and City Facility Retrofits	($3,103,111)	$0	351	($8,833)	$0	
BE	E2	Zero emissions energy as default EBCE choice	N/A	N/A	269,609	N/A	N/A	
BE	P4	Solar and storage on new construction	$0	$0	2,341	$0	$0	
TLU	P5	ZEV Infrastructure Plan	$217,582	($31,005)	315,283	$1	$0	
TLU	P6	Small-engine and off-road equipment electrification - municipal	$0	$0		N/A	N/A	
TLU	P7	Small-engine electrification - community	$0	($2,448,960)	76,247	$0	($32)	
TLU	E3	Bicycle, pedestrian, and trails network expansion	N/A	N/A	5,883	N/A	N/A	

			NPV Costs ($)		GHG savings (MTCO2e)	Cost Effectiveness ($/MTCO2e)		Co-benefits
Sector	ID	Action	NPV Costs to City	NPV Costs to Community	Cumulative Savings - to 2030	City	Comm-unity	
TLU	P8	Bicycle amenities	$0	$2,492,542	1,753	$0	$1,422	
TLU	P9	Bicycle rack incentive program	$7,562	($777,244)	1,650	$5	($472)	
TLU	P10	Increase transit ridership	$75,384	($585,351)	4,601	$16	($127)	
TLU	S4	VMT reduction for K-12 activities	$571,058	($6,358,627)	11,663	$49	($546)	
TLU	E6	Housing Element	N/A	N/A	17,257	N/A	N/A	
TLU	P11	Promote LEED Neighborhood Development	$910	($849,750)	15,331	$0	($55)	
MC	E10	Textile recovery	N/A	N/A		N/A	N/A	
MC	P12	Single use plastic reduction	$0	$0		N/A	N/A	
MC	S6	Embodied carbon reduction plan	$0	($88,625)		N/A	N/A	
MC	S5	Environmentally preferable purchasing policy	$0	$0		N/A	N/A	
NS	P13	Urban Forest Master Plan	$486,089	$469,585	1,195	$407	$393	
NS	P14	Soil management carbon sequestration projects	$34,711	$2,868,511	3,890	$9	$737	
NS	S7	Carbon sequestration research and tracking	$0	$0		N/A	N/A	
WR	P15	Water efficiency programs including water fixture retrofits	$1,634,626	($4,650,298)		N/A	N/A	
WR	S8	Green Stormwater Infrastructure Plan	$0	$0		N/A	N/A	
WR	E17	On-site stormwater management	N/A	N/A		N/A	N/A	
CRW	E21	Community gardens	N/A	N/A		N/A	N/A	
CRW	S9	Wildfire preparation, prevention, and education	$0	$0		N/A	N/A	
CRW	P16	Comprehensive climate awareness, education, recognition, and outreach	$118,522	$0	26,254	$5	$0	
		TOTAL	$1,231,524	($14,541,197)	822,527	$1	-$18	

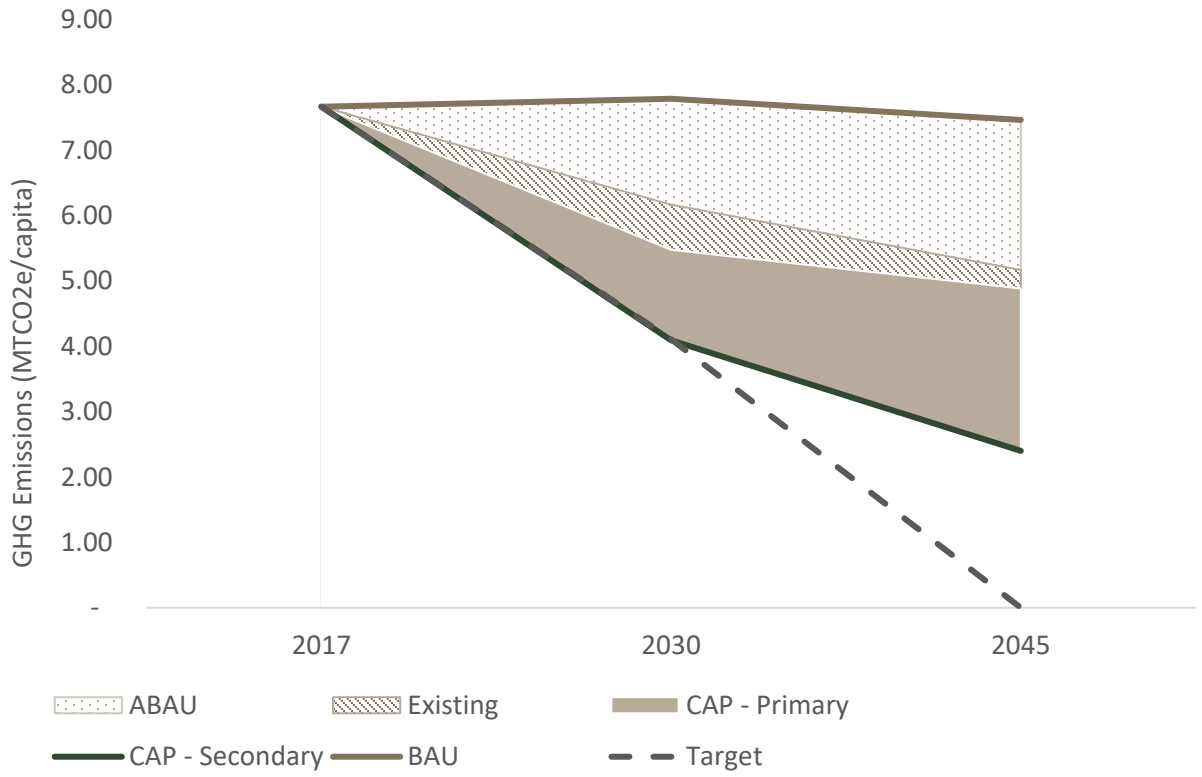
**Blank cells were not quantified.*

GHG Reductions

Modeling suggests that proposed CAP 2.0 primary measures result in the City achieving its 2030 emission goal (4.11 $MTCO_2e$ per capita) and SB 32 requirements. Specifically, modeling indicates the City could surpass this goal—reducing emissions to 4.09 $MTCO_2e$ per capita in 2030. The following CAP strategies and actions are the highest contributors of GHG emission reductions through 2030:

- Vehicle decarbonization (ZEV Infrastructure Plan)
- Renewable electricity (Zero emissions as default EBCE choice)
- Organic waste prevention and management (SB 1383 implementation)
- Community small engine electrification
- Existing Building Electrification Plan
- Comprehensive climate awareness, education, and outreach

Figure 1. Aggregated pre-capita GHG emissions.



Acronym Key:

ABAU: adjusted business-as-usual; emission reductions resulting from external federal and state policies.
Existing: emission reductions resulting from continuation of existing City actions.
CAP - Primary: Emission reductions resulting from primary CAP 2.0 action implementation.
CAP - Secondary: Emission reductions resulting from secondary CAP 2.0 action implementation.
BAU: business-as-usual; emissions trajectory assuming no climate action.
Target: Target emissions trajectory

Table 1. GHG emission reductions associated with state and federal legislation adjustments, all potential CAP 2.0 strategies and actions, and existing City actions (in MTCO2e). Unless otherwise indicated, reductions are isolated to those achieved within the indicated year compared to the BAU scenario. Cumulative values are through 2030.

			MTCO2e Reductions (mass)			MTCO2e Reductions (per capita)		
Sector	**Strategy**	**Type**	**Cumulative to 2030**	**2030**	**2045**	**Cumulative to 2030**	**2030**	**2045**
All	ABAU reduction		947,836	134,477	224,576	11.42	1.62	2.29
BE	Decarbonization of buildings	Existing	271,838	29,649	(0)	3.27	0.36	(0.00)
BE	Decarbonization of buildings	Primary	59,668	15,698	41,059	0.72	0.19	0.42
BE	Decarbonization of buildings	Secondary	-	-	-	-	-	-
BE	Energy efficiency & consumption	Existing	-	-	-	-	-	-
BE	Energy efficiency & consumption	Primary	1,290	279	65	0.02	0.00	0.00
BE	Energy efficiency & consumption	Secondary	8,611	1,335	0	0.10	0.02	0.00
BE	Renewable energy generation & storage	Existing	-	-	-	-	-	-
BE	Renewable energy generation & storage	Primary	2,341	726	(0)	0.03	0.01	(0.00)
BE	Renewable energy generation & storage	Secondary	-	-	-	-	-	-
TLU	Active, shared transport	Existing	11,722	1,839	427	0.14	0.02	0.00
TLU	Active, shared transport	Primary	19,666	4,220	1,452	0.24	0.05	0.01
TLU	Active, shared transport	Secondary	-	-	-	-	-	-
TLU	Sustainable land use	Existing	17,257	3,251	865	0.21	0.04	0.01
TLU	Sustainable land use	Primary	15,331	1,577	372	0.18	0.02	0.00
TLU	Sustainable land use	Secondary	-	-	-	-	-	-
TLU	Vehicle decarbonization	Existing	-	-	-	-	-	-
TLU	Vehicle decarbonization	Primary	391,530	85,195	209,826	4.72	1.03	2.14
TLU	Vehicle decarbonization	Secondary	-	-	-	-	-	-
MC	Waste diversion	Existing	135,118	22,585	26,499	1.63	0.27	0.27
MC	Waste diversion	Primary	-	-	-	-	-	-
MC	Waste diversion	Secondary	-	-	-	-	-	-
MC	Sustainable consumption	Existing	-	-	-	-	-	-
MC	Sustainable consumption	Primary	-	-	-	-	-	-
MC	Sustainable consumption	Secondary	-	-	-	-	-	-
NS	Carbon sequestration & ecosystem resilience	Existing	-	-	-	-	-	-
NS	Carbon sequestration & ecosystem resilience	Primary	5,085	860	1,259	0.06	0.01	0.01
NS	Carbon sequestration & ecosystem resilience	Secondary	-	-	-	-	-	-
WR	Supply & conservation	Existing	-	-	-	-	-	-
WR	Supply & conservation	Primary	-	-	-	-	-	-
WR	Supply & conservation	Secondary	-	-	-	-	-	-
WR	Stormwater resilience	Existing	-	-	-	-	-	-
WR	Stormwater resilience	Primary	-	-	-	-	-	-
WR	Stormwater resilience	Secondary	-	-	-	-	-	-
CRW	Community resilience & vulnerability	Existing	-	-	-	-	-	-
CRW	Community resilience & vulnerability	Primary	26,254	5,133	1,829	0.32	0.06	0.02
CRW	Community resilience & vulnerability	Secondary	-	-	-	-	-	-
	Total Reduction		1,913,547	306,823	508,227	23.05	3.70	5.19
	Resulting Emissions		6,128,331	339,21	222,328	N/A	4.09	2.27

Table 2. Top 10 actions for reducing GHG emissions through 2030.

			MTCO2e Reductions (mass), by year		MTCO2e Reductions (mass), cumulative	
	ID	Action	2030	2045	Cumulative - to 2030	Cumulative - to 2045
1	P5	ZEV Infrastructure Plan	67,550	186,998	315,283	2,263,229
2	E2	Zero emissions energy as default EBCE choice	29,457	(0)	269,609	485,837
3	E7	SB 1383 Implementation	22,585	26,499	135,118	506,627
4	P7	Small-engine electrification - community	17,646	22,828	76,247	382,395
5	P2	Existing Building Electrification Plan	13,070	18,101	49,533	285,836
6	P16	Comp. climate awareness, education, and outreach	5,133	1,829	26,254	75,906
7	E6	Housing Element	3,251	865	17,257	48,585
8	P11	Promote LEED Neighborhood Development	1,577	372	15,331	28,784
9	S4	VMT reduction for K-12 activities	2,211	523	11,663	30,606
10	P1	All-electric reach code	2,628	22,959	10,136	204,985

Table 3. Emissions trajectories under examined scenarios.

	MTCO2e Emissions (mass emissions)		MTCO2e Emissions (per capita)	
	In 2030	In 2045	In 2030	In 2045
BAU	646,644	730,555	7.79	7.47
ABAU	512,167	505,979	6.17	5.17
Existing	454,844	478,189	5.48	4.89
CAP - Primary	341,155	222,328	4.11	2.27
CAP - Secondary	339,821	222,328	4.09	2.27
% CAP Reduction (compared to 1990 baseline)	51%	68%	70%	83%
Target	341,188	-	4.11	-
Gap	(33)	222,328	(0.00)	2.27

Cost

City Staff Time

The consultant examined anticipated City staff resources required for CAP implementation, detailed by action below. City staff time are presented in full-time equivalencies (FTE). City staff FTE are a required City resource—the FTE requirements may become part of existing staff duties and assigned to various divisions, or new staff may be required.

Sector	ID	Action	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
B&E	P1	All-electric reach code	0.00	0.00									**0.00**
B&E	P2	Existing Building Electrification Plan					0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
B&E	S1	Refrigerant management in new construction								0.00	0.00	0.00	**0.00**
B&E	P3	Modify Municipal Code definition of covered projects	0.02										**0.02**
B&E	S2	Community energy efficiency upgrades				0.25	0.10	0.10	0.10	0.10	0.10	0.10	**0.85**
B&E	S3	Energy Benchmarking and City Facility Retrofits	0.25	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	**0.97**
B&E	E2	Zero emissions energy as default East Bay Community Energy (EBCE) choice											**0.00**
B&E	P4	Solar and storage on new construction	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.11**
T&LU	P5	ZEV Infrastructure Plan			1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	**4.50**
T&LU	P6	Small-engine and off-road equipment electrification - municipal				0.05	0.05	0.05	0.05	0.05	0.05	0.05	**0.35**
T&LU	P7	Small-engine electrification - community	0.05	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	**0.23**
T&LU	E3	Bicycle, pedestrian, and trails network expansion											**0.00**
T&LU	P8	Bicycle amenities including required bike parking at MF/Comm developments	0.02										**0.02**
T&LU	P9	Bicycle rack incentive program				0.01	0.01	0.01	0.01	0.01	0.01	0.01	**0.07**
T&LU	P10	Increase transit ridership								0.59	0.59	0.59	**1.76**
T&LU	S4	VMT reduction for K-12 activities	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50			**4.00**
T&LU	E6	Housing Element											**0.00**
T&LU	P11	Promote LEED Neighborhood Development								0.02	0.01	0.01	**0.04**
M&C	E10	Textile recovery		0.01									**0.01**
M&C	P12	Single use plastic reduction	0.07	0.07	0.07	0.07							**0.27**
M&C	S6	Embodied carbon reduction plan								0.05	0.08	0.08	**0.21**
M&C	S5	Environmentally preferable purchasing policy	0.02										**0.02**
NS	P13	Urban Forest Master Plan	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	**4.00**
NS	P14	Soil management carbon sequestration projects	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	**2.50**

Sector	ID	Action	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
NS	S7	Carbon sequestration research and tracking				0.02	0.02	0.02	0.02	0.02	0.02	0.02	**0.13**
WR	P15	Water efficiency programs including water fixture retrofits	0.06	0.06	0.06	0.06	0.06						**0.30**
WR	S8	Green Stormwater Infrastructure Plan								0.10	0.10	0.10	**0.30**
WR	E17	On-site stormwater management											**0.00**
CRW	E21	Community gardens											**0.00**
CRW	S9	Wildfire preparation, prevention, and education	1.50	1.50	1.50	1.50	1.50						**7.50**
CRW	P16	Comprehensive climate awareness, education, recognition, and outreach	0.36	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	**1.80**
		TOTAL	**3.52**	**3.06**	**4.05**	**3.88**	**3.66**	**2.10**	**2.10**	**2.86**	**2.37**	**2.37**	**29.97**

Other Costs

Modeling suggests that the total net present value (NPV) City cost through 2031 of implementing all primary CAP 2.0 actions will be $2.8 million—equivalent to around $276,000 per year.[2] The estimated cost to the community through 2031 is a net savings of $5.9 million—equivalent to around $587,000 per year. Much of these savings to the community are in the form of rebates/incentives and fuel cost savings.

Table 4. Net costs associated with proposed CAP 2.0 strategies and actions therein (negative values are net cost savings).

			Net Cost to City	Net Cost to Community
Sector	**Strategy**		**NPV to 2030**	**NPV to 2030**
BE	Decarbonization of buildings	Primary	$187,475	($2,647,540)
BE	Decarbonization of buildings	Secondary	$42,675	($262,307)
BE	Energy efficiency & consumption	Primary	$0	$287,074
BE	Energy efficiency & consumption	Secondary	($2,145,070)	($1,959,201)
BE	Renewable energy generation & storage	Primary	$0	$0
BE	Renewable energy generation & storage	Secondary	$0	$0
TLU	Active, shared transport	Primary	$82,946	($1,319,014)
TLU	Active, shared transport	Secondary	$571,058	($6,358,627)
TLU	Sustainable land use	Primary	$910	($849,750)
TLU	Sustainable land use	Secondary	$0	$0
TLU	Vehicle decarbonization	Primary	$217,582	($31,005)
TLU	Vehicle decarbonization	Secondary	$0	$0
MC	Waste diversion	Primary	$0	$0
MC	Waste diversion	Secondary	$0	$0
MC	Sustainable consumption	Primary	$0	$0
MC	Sustainable consumption	Secondary	$0	($88,625)
NS	Carbon sequestration & ecosystem resilience	Primary	$520,801	$3,338,096
NS	Carbon sequestration & ecosystem resilience	Secondary	$0	$0
NS	Ecosystem resilience	Primary	$0	$0
NS	Ecosystem resilience	Secondary	$0	$0
WR	Supply & conservation	Primary	$1,634,626	($4,650,298)
WR	Supply & conservation	Secondary	$0	$0
WR	Stormwater resilience	Primary	$0	$0
WR	Stormwater resilience	Secondary	$0	$0
CRW	Community resilience & vulnerability	Primary	$118,522	$0
CRW	Community resilience & vulnerability	Secondary	$0	$0
	TOTAL		**$1,231,524**	**($14,541,197)**
	AVG PER YEAR		**$123,152**	**($1,454,120)**
	AVG PER CAPITA-YEAR		**$2**	**($18)**
	TOTAL (PRIMARY ONLY)		**$2,762,861**	**($5,872,437)**
	AVG PER YEAR (PRIMARY ONLY)		**$276,286**	**($587,244)**

[2] Does not include costs associated with City staff time or potential funding sources (e.g., grants).

Sector	Strategy		Net Cost to City NPV to 2030	Net Cost to Community NPV to 2030
	AVG PER CAPITA-YEAR (PRIMARY ONLY)		$1,940	($4,125)
	TOTAL (SECONDARY ONLY)		($1,531,337)	($8,668,760)
	AVG PER YEAR (SECONDARY ONLY)		($153,134)	($866,876)
	AVG PER CAPITA-YEAR (SECONDARY ONLY)		($20)	($113)

*Using average projected population over the implementation period (2022 through end of 2031).

Table 5. Net present value (NPV) net cost estimates for CAP 2.0 action implementation (through 2031).

Sector	ID	Action	NPV Costs to City	NPV Costs to Community
B&E	P1	All-electric reach code	$49,020	($2,784,572)
B&E	P2	Existing Building Electrification Plan	$138,455	$137,032
B&E	S1	Refrigerant management in new construction	$42,675	($262,307)
B&E	P3	Modify Municipal Code definition of covered projects	$0	$287,074
B&E	S2	Community energy efficiency upgrades	$958,041	($1,959,201)
B&E	S3	Energy Benchmarking and City Facility Retrofits	($3,103,111)	$0
B&E	E2	Zero emissions energy as default East Bay Community Energy (EBCE) choice		
B&E	P4	Solar and storage on new construction	$0	$0
T&LU	P5	ZEV Infrastructure Plan	$217,582	($31,005)
T&LU	P6	Small-engine and off-road equipment electrification - municipal	$0	$0
T&LU	P7	Small-engine electrification - community	$0	($2,448,960)
T&LU	E3	Bicycle, pedestrian, and trails network expansion		
T&LU	P8	Bicycle amenities including required bike parking at MF/Comm developments	$0	$2,492,542
T&LU	P9	Bicycle rack incentive program	$7,562	($777,244)
T&LU	P10	Increase transit ridership	$75,384	($585,351)
T&LU	S4	VMT reduction for K-12 activities	$571,058	($6,358,627)
T&LU	E6	Housing Element		
T&LU	P11	Promote LEED Neighborhood Development	$910	($849,750)
M&C	E10	Textile recovery		
M&C	P12	Single use plastic reduction	$0	$0
M&C	S6	Embodied carbon reduction plan	$0	($88,625)
M&C	S5	Environmentally preferable purchasing policy	$0	$0
NS	P13	Urban Forest Master Plan	$486,089	$469,585
NS	P14	Soil management carbon sequestration projects	$34,711	$2,868,511
NS	S7	Carbon sequestration research and tracking	$0	$0
WR	P15	Water efficiency programs including water fixture retrofits	$1,634,626	($4,650,298)
WR	S8	Green Stormwater Infrastructure Plan	$0	$0
WR	E17	On-site stormwater management		
CRW	E21	Community gardens		
CRW	S9	Wildfire preparation, prevention, and education	$0	$0
CRW	P16	Comprehensive climate awareness, education, recognition, and outreach	$118,522	$0
		TOTAL	**$1,231,524**	**-$14,541,197**

Cost Effectiveness

On average, modeling suggests that implementing all the actions on the shortlist will cost the City $2 per $MTCO_2e$ reduced and will save the community about $18 per $MTCO_2e$ reduced. Highly cost-effective actions include:

- All-electric reach code
- Existing Building Electrification Plan
- ZEV Infrastructure Plan
- Bicycle rack incentive program
- Required bike parking at MF/Comm developments
- LEED Neighborhood development
- Housing Element of General Plan
- Community climate outreach

Table 6. Cost effectiveness of proposed draft CAP 2.0 actions. Actions marked as "N/A" were not quantified for GHG emission reductions.[3]

			Cost Effectiveness ($/MTCO2e)	
Sector	ID	Action	City	Community
BE	P1	All-electric reach code	$5	($275)
BE	P2	Existing Building Electrification Plan	$3	$3
BE	S1	Refrigerant management in new construction	N/A	N/A
BE	P3	Modify Municipal Code definition of covered projects	$0	$223
BE	S2	Community energy efficiency upgrades	$116	($237)
BE	S3	Energy Benchmarking and City Facility Retrofits	($8,833)	$0
BE	E2	Zero emissions energy as default East Bay Community Energy (EBCE) choice	N/A	N/A
BE	P4	Solar and storage on new construction	$0	$0
TLU	P5	ZEV Infrastructure Plan	$1	($0)
TLU	P6	Small-engine and off-road equipment electrification - municipal	N/A	N/A
TLU	P7	Small-engine electrification - community	$0	($32)
TLU	E3	Bicycle, pedestrian, and trails network expansion	N/A	N/A
TLU	P8	Bicycle amenities including required bike parking at MF/Comm developments	$0	$1,422
TLU	P9	Bicycle rack incentive program	$5	($472)
TLU	P10	Increase transit ridership	$16	($127)
TLU	S4	VMT reduction for K-12 activities	$49	($546)
TLU	E6	Housing Element	N/A	N/A
TLU	P11	Promote LEED Neighborhood Development	$0	($55)
MC	E10	Textile recovery	N/A	N/A
MC	P12	Single use plastic reduction	N/A	N/A
MC	S6	Embodied carbon reduction plan	N/A	N/A
MC	S5	Environmentally preferable purchasing policy	N/A	N/A
NS	P13	Urban Forest Master Plan	$407	$393
NS	P14	Soil management carbon sequestration projects	$9	$737
NS	S7	Carbon sequestration research and tracking	N/A	N/A
WR	P15	Water efficiency programs including water fixture retrofits	N/A	N/A
WR	S8	Green Stormwater Infrastructure Plan	N/A	N/A
WR	E17	On-site stormwater management	N/A	N/A

[3] Table presents costs over implementation timeframe (2022 to 2031) divided by cumulative $MTCO_2e$ reductions through target year (2030).

			Cost Effectiveness ($/MTCO2e)	
Sector	ID	Action	City	Community
CRW	E21	Community gardens	N/A	N/A
CRW	S9	Wildfire preparation, prevention, and education	N/A	N/A
CRW	P16	Comprehensive climate awareness, education, recognition, and outreach	$5	$0
		TOTAL	**$2**	**($17)**

Buildings & Energy

GHG Reductions

GHG analysis assumptions and outcomes for the buildings & energy sector are summarized below. Blank "MTCO2e savings" cells indicate that the action was identified as supportive and not quantified.

Action Information							MTCO2e Savings		
ID	Action	Mitigation Action?	Direct/ Supportive	Timeframe	Key Assumptions	Key Sources	Cumulative - to 2050	Cumulative - to 2045	Cumulative - to 2030
P1	All-electric reach code	Yes	Direct	Near-term (0-3 years)	- 90% of natural gas switch to electricity for all new construction (assumes some exceptions).	N/A	337,817	204,985	10,136
P2	Existing Building Electrification Plan - VOLUNTARY	Yes	Direct	Mid-term (4-7 years)	- 15% switch to electric by 2030. - Replace 30% of space/water heating equipment by 2030	Dublin CAP estimated 22% retrofits to all-electric (Appendix C, p.12) given heating energy use trends and equipment life spans	550,810	285,836	49,533
S1	Refrigerant management in new construction	Yes	Supportive	Long-term (8-10 years)	N/A		-	-	-
P3	Modify Municipal Code definition of covered projects	Yes	Direct	Near-term (0-3 years)	- Covered buildings are 25% more efficient than previously.	US Green Building Council	15,945	7,748	1,290
S2	Community energy efficiency upgrades	Yes	Direct	Mid-term (4-7 years)	- 2025 start date. - 15% reduction in energy use as a result of program. (Assume slightly more savings than source due to inclusion of incentives.)	Dublin CAP identifies a meta-analysis that found that education-only campaigns can produce 10-12% energy savings.	43,479	17,907	8,260
S3	Energy Benchmarking and City Facility Retrofits	Yes	Direct	Near-term (0-3 years)	- 20% reduction in City facility energy use by 2025, steady thereafter.	ACEEE 2018	1,517	590	351

Action Information							MTCO2e Savings		
ID	Action	Mitigation Action?	Direct/ Supportive	Timeframe	Key Assumptions	Key Sources	Cumulative - to 2050	Cumulative - to 2045	Cumulative - to 2030
E2	Zero emissions energy as default East Bay Community Energy (EBCE) choice	Yes	Direct	Near-term (0-3 years)	- Zero electricity EF for residential/commercial starting in 2023. - Assume 5% opt-out rate.	California Public Utilities Commission (as referenced in Dublin CAP Appendix C, p. 5); EBCE	485,837	485,837	269,609
P4	Solar and storage on new construction	Yes	Direct	Near-term (0-3 years)	- 90% of new construction will have on-site solar by 2030, with continuing trend thereafter.	Consistent with voluntary participation rate cited in Action 1176.	36,981	18,135	2,341
P15	Water efficiency and retrofits	Both	Supportive	Mid-term (4-7 years)	- 3% reduction in activity data by 2030 (energy consumption, solid waste disposal); ramping up starting in 2022; steady thereafter.	Consultant estimate	33,421	14,190	5,642
E1	Maintain the highest renewable energy choice as the default for all municipal facilities, including opportunities to secure Power Purchase Agreements with other EBCE jurisdictions.	Yes	Direct	Ongoing	- All electricity use is zero emissions in 2022 and beyond.	Consultant estimate	9,306	3,577	2,230

Cost

Cost assumptions and outcomes for the buildings & energy sector are summarized below:

Action Information		Outputs		City Inputs		Community References	
ID	**Action**	**NPV Costs to City**	**NPV Costs to Community**	**City Cost Source(s)**	**City Cost Assumptions/Comments**	**Community Cost Source(s)**	**Community Cost Assumptions/Comments**
P1	All-electric reach code	$49,020	($2,784,572)	CA Energy Codes & Standards Cost-Effectiveness Explorer 2019 Pleasanton studies; Dublin CAP - Appx C p. 8	Staff time required for cost effectiveness evaluation plus community outreach, reach code development, drafting an ordinance for City Council consideration, and initial implementation of the new ordinance. Reach code takes two years to get into place.	CA Energy Codes & Standards Cost-Effectiveness Explorer 2019 Pleasanton studies; Dublin CAP - Appx C p. 7; Electrification Cost Effectiveness Memo_Update_Final	All-electric buildings are generally cheaper to build and cheaper to operate over time when compared to traditional buildings with both gas and electricity - Assume $95/yr in net utility savings per single-family household, $21/yr for multi-family homes, $24,300/yr for businesses (blend of retail and office buildings). Assumes new construction reflected by anticipated increases in households and businesses.
P2	Existing Building Electrification Plan	$138,455	$137,032	ACEEE Electrifying Commercial Buildings 2020 p. v; Dublin CAP - Appx C p. 13	One-time costs are to develop the plan and electrify municipal buildings. FTE is for ongoing implementation.	E3 report p. xi, 66 & 81; ACEEE Electrifying Commercial Buildings 2020 p. v; Dublin CAP - Appx C p. 13	According to E3, 84% of single-family households and 8% of multifamily households would achieve net lifecycle cost savings by completing a retrofit of the HVAC and hot water heater. An additional 16% of single-family homes and 39% of multifamily homes would see lifecycle costs of less than $100 a year. (The remaining 53% of multifamily households could see up to $200/yr added costs.) ACEEE's 2020 study found that 27% of commercial floor space heated with fossil fuel systems can be electrified today with a simple payback of less than 10 years and without any rebates or carbon pricing. To achieve a 10% overall reduction in natural gas use by 2030, retrofits on 20% of multi-family homes (8% with net savings, 12% with $100/yr lifecycle costs) are assumed to begin mid-way into the implementation period to allow for program ramp-up.

Action Information		Outputs		City Inputs		Community References	
ID	Action	NPV Costs to City	NPV Costs to Community	City Cost Source(s)	City Cost Assumptions/Comments	Community Cost Source(s)	Community Cost Assumptions/Comments
S1	Refrigerant management in new construction	$42,675	($262,307)	CA Energy Codes & Standards Cost-Effectiveness Explorer 2019 Pleasanton studies. Like action 1001 (Dublin CAP - Appx C p. 8) but forging new ground; good background info: https://www.cmsmechanical.com/the-path-to-a-safe-refrigerant-transition/	Staff time required for community outreach, standards/code development, and implementation. Standards/code takes three years to get into place.	https://explorer.localenergycodes.com/pleasanton-city/forecast/12-PGE/studies/1,2,3	While low GWP refrigerants impact consumer up-front costs, high efficiency appliances are cheaper to operate over time - Assume $150 in net annual savings per single family household.
P3	Modify Municipal Code definition of covered projects	$0	$287,074	CA Energy Codes & Standards Cost-Effectiveness Explorer 2019 Pleasanton studies. Like action 1001 (Dublin CAP - Appx C p. 8) but no need for cost-effectiveness study; requires more community outreach and education than amending energy code: https://localenergycodes.com/content/reach-codes/building-efficiency-renewables	Staff time required for community outreach, code development, and implementation. Assumes 1 year for code update to get into place.	https://explorer.localenergycodes.com/pleasanton-city/forecast/12-PGE/studies/2,3?exclude_package_types=13,19,55,1,4,6,20,15&show_only_cost_effectiveness=	Expanding electrification requirements to cover new multi-family housing and commercial buildings may increase annual costs ($168 per multi-family household), however including energy efficiency and high efficiency appliance requirements will likely result in substantial net savings ($1,389 per retail building).

Action Information		Outputs		City Inputs		Community References	
ID	Action	NPV Costs to City	NPV Costs to Community	City Cost Source(s)	City Cost Assumptions/Comments	Community Cost Source(s)	Community Cost Assumptions/Comments
S2	Community energy efficiency upgrades	$958,041	($1,959,201)	EPA Energy Star Portfolio Manager p. 10; Ann Arbor CAP 3.0 - p. 52-55; Dublin CAP - Appx C p. 10	Assumes staff time for program implementation and annual funding for energy audits (300 per year averaging $500 each); one-time cost to develop and set up incentives and annual cost to partner with organizations and offer rebates to enable low-income residents to benefit from energy efficiency improvements. Assumes rebates averaging $10k covering half of Pleasanton households with under $50k annual incomes during the 10-year period.	EPA Energy Star Portfolio Manager p. 10; Dublin CAP - Appx C p. 10	Annual savings for City-funded energy audits (300 per year averaging $500 each) plus net energy savings related to undertaking energy efficiency and renewable energy improvements.
1167	LEED certification for new construction			CA Energy Codes & Standards Cost-Effectiveness Explorer 2019 Pleasanton studies. Similar to action 1001 (Dublin CAP - Appx C p. 8) but may require analysis beyond existing studies: https://localenergycodes.com/content/reach-codes/building-efficiency-renewables	One-time required for initial analysis to ensure effort will result in desired energy/GHG savings plus community outreach, code development, drafting an ordinance for City Council consideration, and implementation of the new ordinance. Code revision takes 1 year to get into place.	US GBC policy brief 2018; LEEDv4 in SF 2017; Browne 2020 p. 8	LEED Silver typically can be achieved with no additional costs; improves the quality, efficiency, and comfort of new buildings at no additional net cost to building owners and occupants. Achieving desired energy and GHG savings will also result in net utility savings for new construction, assumes 20% as seen in DC.

Action Information		Outputs		City Inputs		Community References	
ID	Action	NPV Costs to City	NPV Costs to Community	City Cost Source(s)	City Cost Assumptions/Comments	Community Cost Source(s)	Community Cost Assumptions/Comments
S3	Energy Benchmarking and City Facility Retrofits	($3,103,111)	$0	Corte Madera CAP p. 43-44; https://www.energysage.com/local-data/solar-panel-cost/ca/alameda-county/pleasanton/; https://www.energysage.com/local-data/energy-storage-cost/ca/alameda-county/pleasanton/	Assume staff and consultant time for benchmarking + performance monitoring; energy efficiency measures selected achieving 12-year simple payback shown as annual savings starting in year 3, including lighting and upgrades totaling $560k plus installing solar+storage at 20 city facilities averaging 60 kW of PV each (averaging 14% capacity factor) and 52 kWh of batteries.	n/a - city facilities	n/a - city facilities
E2	Zero emissions energy as default East Bay Community Energy (EBCE) choice			EBCE Power Mix & Compare Plans; Dublin CAP - Appx C p. 24	Staff time for cost effectiveness analysis, supporting decision-making, and supporting education/outreach.	EBCE Power Mix & Compare Plans; Community Power Coalition; Dublin CAP - Appx C p. 5	Opting-up communitywide accounts to EBCE's Renewable 100 power portfolio will increase rates by 2%; assumes a 5% opt out rate.

Action Information		Outputs		City Inputs		Community References	
ID	**Action**	**NPV Costs to City**	**NPV Costs to Community**	**City Cost Source(s)**	**City Cost Assumptions/Comments**	**Community Cost Source(s)**	**Community Cost Assumptions/Comments**
P4	Solar and storage on new construction	$0	$0	CA Energy Codes & Standards Cost-Effectiveness Explorer; CA SGIP; Dublin CAP p. 1-7; Appx C p. 7 & 11	California Green building Code requires solar on new residential construction (other than for homes damaged or destroyed by disaster); assumes staff time to develop, administer and conduct outreach - 40 hours of one-time staff costs to update checklist and develop promo materials, and 20 hours per year for ongoing outreach and implementation. Dublin CAP: "City cost associated with battery storage permit streamlining are anticipated to be between $7,000 and $10,000. Anticipated costs will be from staff time for review and possible updating of the battery storage permit application. Future staff time may be saved due to potential application streamlining."	CA SGIP; Dublin CAP - Appx C p. 11	n/a - voluntary & variable

Materials & Consumption

GHG Reductions

Action Information							MTCO2e Savings		
ID	Action	Mitigation Action?	Direct/Supportive	Timeframe	Key Assumptions	Key Sources	Cumulative - to 2050	Cumulative - to 2045	Cumulative - to 2030
E10	Textile recovery	Yes	Supportive	Near-term (0-3 years)	N/A	N/A	N/A	N/A	N/A
P12	Single use plastic reduction	Yes	Supportive	Mid-term (4-7 years)	N/A	N/A	N/A	N/A	N/A
S5	Environmentally preferable purchasing policy	Yes	Supportive	Near-term (0-3 years)	N/A	N/A	N/A	N/A	N/A
S6	Embodied carbon reduction plan	Yes	Supportive	Long-term (8-10 years)	N/A	N/A	N/A	N/A	N/A
P15	Water efficiency and retrofits	Both	Supportive	Mid-term (4-7 years)	- 3% reduction in activity data (energy consumption, solid waste disposal).	Consultant estimate	25,086	19,464	4,144
E9	Local purchasing	Yes	Supportive	Ongoing	N/A	N/A	N/A	N/A	N/A
E7	SB 1383 Implementation	Yes	Direct	Ongoing	- 75% reduction in organics, applied in 2025 and continued through 2030 (and thereafter)	SB 1383 (consistent with Dublin CAP - Appendix C, p22)	642,951	506,627	135,118
E8	Outreach and Education	Yes	Supportive	Ongoing	N/A	N/A	N/A	N/A	N/A

Cost

Action Information		Outputs		City Inputs		Community References	
ID	Action	NPV Costs to City	NPV Costs to Community	City Cost Source(s)	City Cost Assumptions/Comments	Community Cost Source(s)	Community Cost Assumptions/Comments
E10	Textile recovery			Redmond ESAP Action Costs - MWM Tab	No City costs other than FTE. Based on Redmond action to increase opportunities for sort and drop-off of reuse and recyclable materials.		No direct community costs as action is led by City -- however, haulers may choose to pass on some costs to customers.
P12	Single use plastic reduction	$0	$0	Ann Arbor CAP (pg. 62-63); Dublin CAP - Appendix C (pg. 23, 27)	Ideally the staff time needed to develop code will be built into existing processes. Costs for staff time is estimated between $10,000 and $15,000 (~0.1 FTE). The estimated cost range is based on the average cost to develop a new policy and/or code for the City of Dublin. (e.g., EPP, Low-Carbon Concrete, Life Cycle Emissions Code). Assumes nominal costs for partnership w/StopWaste.		There are no anticipated costs to the community.
S5	Environmentally preferable purchasing policy	$0	$0	Redmond ESAP Action Costs - MWM Tab (FTE Assumption) Dublin CAP - Appendix C (pg. 27) (Cost Assumptions)	Initial costs for developing the policy are estimated to be between $5,000 to $10,000 in staff time (~0.02-0.05 FTE). Assumes a lower-end estimate given the existing resources from Alameda County. Assumes it will take less than 1 year to develop and approve EPP. Assumes costs for environmentally friendly purchases are cost neutral to traditional products -- however, prices will vary by product.		No costs to the community as this action is focused on municipal operations.
S6	Embodied carbon reduction plan	$0	($88,625)	Marin County Code Amendment Toolkit; Dublin CAP - Appendix C (pgs. 6.4-5 & 23)	A regional plan, so City costs would just include staff time. One-time costs for staff time to conduct outreach and work with partners to develop a plan will range from $8,000- $15,000 (~0.1 FTE). Assumes that additional ongoing FTE required will be comparable to the $8,000 - $17,000 range, or ~0.1 FTE for plan implementation. Inspired by the average costs associated with developing comparable plans in the Dublin CAP (i.e., Renewable Resource Buildout Plan, Bike/Ped Plan, Parking Management Plan, TDM Plan).	USFS Life-Cycle Assessments Can Help You Make Sustainable Choices	Costs to the community were based on a U.S. Forest Service sample analysis. Conducting the LCA was ~$10,000 but had an average cost-savings ratio of 3.87 (i.e., $38,700).

Natural Systems

GHG Reductions

Action Information							MTCO2e Savings	
ID	Action	Mitigation Action?	Direct/ Supportive	Timeframe	Key Assumptions	Key Sources	Cumulative - through 2050	Cumulative - through 2045	Cumulative - through 2030
1150	Urban Forest Master Plan	Yes	Direct	Near-term (1-3 years)	- 200 trees planted per year. - Annual sequestration assumes average 10" DBH of representative tree species.	Pleasanton CAP 1.0 EC4-3	11,554	7,968	1,195
1219	Soil management carbon sequestration projects	Yes	Direct	Near-term (1-3 years)	- All City managed acres under improved soil management by 2023. - 20% of community acres under improved soil management by 2030; steady thereafter. - Net sequestration at a rate of 0.2 MTCO2e/acre.	i-Tree Planting Calculator; City Parks Dept; De Gryze et al. 2009	16,314	13,208	3,890
1220	Carbon sequestration research and tracking	Yes	Supportive	Mid-term (4-7 years)	N/A	N/A	-	-	-
1145	Climate adapted plantings	Both	Supportive	Long-term (8-10 years)	N/A	N/A	-	-	-
1099	Restore and conserve native grassland, rangeland, and riparian habitats	No	N/A	Long-term (8-10 years)	N/A	N/A	-	-	-
1204	Community conservation programs	No	N/A	Mid-term (4-7 years)	N/A	N/A	-	-	-
NS1	Pesticide Posting Program	No	N/A	Ongoing	N/A	N/A	-	-	-
NS2	Municipal Landscape Management Practice	Both	N/A	Ongoing	N/A	N/A	-	-	-
NS3	Sustainable land management education	Both	Supportive	Ongoing	N/A	N/A	-	-	-

Cost

Action Information		Outputs		City Inputs		Community References	
ID	**Action**	**NPV Costs to City**	**NPV Costs to Community**	**City Cost Source(s)**	**City Cost Assumptions/Comments**	**Community Cost Source(s)**	**Community Cost Assumptions/Comments**
P13	Urban Forest Master Plan	$486,089	$469,585	Redmond ESAP Action Costs, Pleasanton CAP 1.0	See Redmond ESAP N1.89, N1.90, and N5.495. Assume same budget proposal for tree planting in public open space ($305,000). $150,000 one-time cost for developing the Urban Forest Master Plan. Combined staff cost for evaluating tree canopy and developing tree canopy plans for neighborhoods. Assume 200 trees planted per year with $50 in tree planting materials per tree. Assume $10,000 in annual incentives towards community planting (see Pleasanton CAP 1.0 EC4-3).	City of Oceanside - CAP Benefit Cost Report (pg. 17) El Cajon CAP_BenefitCostAnalysis (pg. 27)	Assume cost of $3.06 per MTCO2e reduced, with an average annual MTCO2e savings of 20,348 per year (see impact analysis). The City of Oceanside CBA mentions that they can achieve an annual reduction of ~176 MTCO2e reductions a year from trees at a cost of ~$315. This has been adapted to Pleasanton to assume a cost of $539 (average of Oceanside and El Cajon CBAs). The community is anticipated to incur costs associated with the purchase, planting, and maintenance of trees within the urban forest. The price is estimated as the average costs outlined in the City of Oceanside and El Cajon CBA's. Overall costs to the community may be reduced based on the number of incentives the City provides. While there are other external benefits associated with tree planting (e.g., reduced energy costs), these benefits are difficult to estimate with confidence and are therefore not included in this analysis. Assumes $10k a year in incentives from City.

Action Information		Outputs		City Inputs		Community References	
ID	**Action**	**NPV Costs to City**	**NPV Costs to Community**	**City Cost Source(s)**	**City Cost Assumptions/Comments**	**Community Cost Source(s)**	**Community Cost Assumptions/Comments**
P14	Soil management carbon sequestration projects	$34,711	$2,868,511	Pleasanton CAP 1.0, Redmond ESAP Action Costs	Pleasanton CAP 1.0 says that the cost for implementing the community zero-waste plan and encouraging composting, recycling, and waste reduction would be 1/4 FTE (See SW2-2, SW2-6, SW2-7, SW2-16). Assume similar costs for implementing carbon sequestration projects and encouraging composting. Assume subsidy is equal to that of climate-adapted planting subsidy in Redmond ESAP (See N2.2.46). In Redmond, the initial cost is $30,000 in startup costs with initial incentives and $5000 in additional annual subsidies. Assume 50% of these costs are already covered through SB1383 activities.	CalRecycle_Estimated Costs of SB1383 (pg. 14)	Average cost per business would be approximately $662 annually and assumes 5% of businesses participate each year. Average increased cost per household of $17 per year and assumes that 5% of residents participate each year. Costs include the direct costs of expanding organic waste management infrastructure, expanding organic waste collection, and impacts from education, enforcement, and monitoring of soil projects.
S7	Carbon sequestration research and tracking	$0	$0	Redmond ESAP Action Costs	Assuming 40 hours of staff time dedicated towards research and mapping of carbon sequestration projects. This is based off of similar action of tracking trend changes from COVID.		No direct or significant financial cost change to community.

Water Resources

GHG Reductions

No actions in this sector were quantified for GHG impact because they were either classified as "supportive" or climate adaptation actions.

Cost

Action Information		Outputs		City Inputs		Community References	
ID	Action	NPV Costs to City	NPV Costs to Community	City Cost Source(s)	City Cost Assumptions/Comments	Community Cost Source(s)	Community Cost Assumptions/Comments
P15	Water efficiency programs including water fixture retrofits	$1,634,626	($4,650,298)	Redwood City's water conservation programs; http://www.cityofpleasantonca.gov/gov/depts/os/env/water/rebates.asp	If using Redwood City's programs as an example, I estimated free home water savings kit at $55, smart irrigation meter at $170. The cost to the city is $225.00 per 1000 residents- $225x 1000= $225,000. I estimated .25 FTE to work with Zone 7, schedule retrofit upgrades and perform water conservation evaluations. However, Pleasanton already has programs, and this is an expansion that can easily be done without adding much, so reduced to 0.03 FTE. Current incentives residential $.25 per sf and $.50 per sf to Irrigation Meter Customers who replace lawn for Bay-friendly landscape. Garden By Number Program offers $50 to transform the front lawn. Per the Policy Institute of California, on page 9 Table 2, average lawn for the Bay Area is estimated at 6300sf. If using current Pleasanton incentives, that would max out the $1,000 cap per resident. Assume 1,000 residents participate at the max rebate ($1,000) over 5 years (200/year). Assume 100 business participate at the max rebate ($5,000) over 5 years (20/year). Again, this is an expansion that can easily be done without adding much, so reduced to 0.03 FTE.	Redwood City's water conservation programs; City of Pleasanton water rebates and Public Policy Institute of California lawns and water demand	Cost savings of $225 per resident who uses incentive ($55 + $170) estimated that 1,000 residents use this incentive. Annual savings of 50% on outdoor water use and 35% on monthly water usage per resident who uses the total of this incentive (smart irrigation meter, upgrades fixtures and has a home evaluation done by a water technician per the Redwood City's estimates). Assume average monthly bill is $100. Current incentives residential $.25 per sf and $.50 per sf to Irrigation Meter Customers who replace lawn for Bay-friendly landscape. Garden By Number Program offers $50 to transform the front lawn. Per the Policy Institute of California, on page 9 Table 2, average lawn for the Bay Area is estimated at 6300sf. If using current Pleasanton incentives, that would max out the $1,000 cap per resident. Assume 1,000 residents participate at max rebate of $1,000 and 100 business participate at the max rebate of $5,000.
S8	Green Stormwater Infrastructure Plan	$0	$0	City of Dublin Green Stormwater Infrastructure Plan Appendix A pg 35	- .1 FTE to work with partners.		No direct or significant financial cost change to community.

Action Information		Outputs		City Inputs		Community References	
ID	**Action**	**NPV Costs to City**	**NPV Costs to Community**	**City Cost Source(s)**	**City Cost Assumptions/Comments**	**Community Cost Source(s)**	**Community Cost Assumptions/Comments**
E17	On-site stormwater management			Pleasanton CAP 1.0	Pleasanton CAP 1.0 estimates 25 hours of work for municipal code update.		No direct or significant financial cost change to community.

Transportation & Land Use

GHG Reductions

Action Information							MTCO2e Savings		
ID	**Action**	**Mitigation Action?**	**Direct/ Supportive**	**Timeframe**	**Key Assumptions**	**Key Sources**	**Cumulative - to 2050**	**Cumulative - to 2045**	**Cumulative - to 2030**
P5	ZEV Infrastructure Plan	Yes	Direct	Mid-term (4-7 years)	- 30% of passenger vehicle VMT from EVs by 2030. - 25% of commercial vehicle VMT from EVs by 2030 (including installation of sufficient charging stations for heavy-duty vehicles). - ZEV Infrastructure Plan will identify quantity of chargers needed to achieve target EV transition above. - Start ramping up beginning in 2023.	CARB (infrastructure needs); California Energy Commission (EV counts for Alameda County); N-79-20 (projected EV sales); similar assumptions were used for Dublin CAP; assume adoption of EV Charger & Parking Ordinance; the draft Advanced Clean Fleets regulation is working to accelerate the market for zero-emission trucks and buses by requiring fleets to transition to ZEVs, where feasible. Proposed requirements include a requirement that fleets purchase only ZEVs beginning in 2024 and remove ICE vehicles at end of their useful life OR ~30-50% of fleet is ZEV by 2030.[4]	3,333,735	2,263,229	315,283
P6	Small-engine and off-road equipment electrification - municipal	Yes	Supportive	Mid-term (4-7 years)	N/A	N/A	0	0	0

[4] https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets/advanced-clean-fleets-fact-sheets

Action Information							MTCO2e Savings		
ID	**Action**	**Mitigation Action?**	**Direct/ Supportive**	**Timeframe**	**Key Assumptions**	**Key Sources**	**Cumulative - to 2050**	**Cumulative - to 2045**	**Cumulative - to 2030**
P7	Small-engine electrification - community	Yes	Direct	Near-term (0-3 years)	- 95% reduction in lawn & garden equipment emissions by 2030; ramping up in 2022. Assumes ban on gas/diesel-powered lawn/garden equipment by 2030. Steady thereafter. - 25% reduction in emissions from other nonroad equipment (with focus on construction) by 2030, steady thereafter.[5] Would require that half of all construction equipment used in City is zero emissions by 2030.[6]	EO N-79-20[6] ; McKinsey & Company (2019)[7]; Pleasanton is currently drafting policy that would ban gas/diesel-powered leaf blowers	501,720	382,395	76,247
P8	Bicycle amenities	Yes	Direct	Near-term (0-3 years)	- Commuting is 30% of passenger VMT. - Bicycling commuting doubles by 2030. - 0.3% VMT reduction by 2030.	CAPCOA 2010 (p. 202); Alameda County VMT reduction tool	4,768	4,603	1,753
P9	Bicycle rack incentive program	Yes	Direct	Mid-term (4-7 years)	- 0.5% reduction in passenger VMT by 2030, steady thereafter.	CAPCOA 2010 (p. 202); Alameda County VMT reduction tool	6,217	5,969	1,650

[5] With an emphasis on construction equipment, which comprises 50% of projected offroad GHG emissions.

[6] EO N-79-20 directs CARB to achieve 100% zero emissions for off-road vehicles and equipment operations by 2035, where feasible. As part of effort, CARB has been working to introduce regulations and programs, such as the Zero-Emission forklifts program and zero-emission airport ground support equipment program. CARB is also currently developing proposed amendments to the In-Use Off-Road Diesel-Fueled Fleets Regulation to further reduce emissions beyond current regulations (https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation/proposed-amendments-use-road-diesel). Also, there is an increasing list of zero-emission off-road equipment cases currently available or under demonstration stages, including several electric construction equipment examples (https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road-1).

[7] https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/harnessing-momentum-for-electrification-in-heavy-machinery-and-equipment

Action Information							MTCO2e Savings		
ID	**Action**	**Mitigation Action?**	**Direct/ Supportive**	**Timeframe**	**Key Assumptions**	**Key Sources**	**Cumulative - to 2050**	**Cumulative - to 2045**	**Cumulative - to 2030**
P10	Increase transit ridership	Yes	Direct	Long-term (8-10 years)	- 3% reduction in passenger VMT by 2040, steady thereafter.	Pleasanton CAP 1.0; Fehr & Peers 2019; Alameda County VMT reduction tool	25,776	24,241	4,601
S4	VMT reduction for K-12 activities	Yes	Direct	Near-term (0-3 years)	- 2% reduction in passenger VMT by 2030, steady thereafter.	Fehr & Peers 2019; Alameda County VMT reduction tool	31,703	30,606	11,663
E6	Housing Element	Yes	Direct	Near-term (0-3 years)	- 3% reduction in passenger vehicle VMT annually by 2030. -10% improvement in jobs within 4 mi of residence by 2030 and continuing trend thereafter. - 0.3% VMT reduction per 1% improvement. - Start ramping up in 2023.	Impact of Jobs-Housing Balance on Passenger Vehicle Use and Greenhouse Gas Emissions. CARB. 2014.	50,399	48,585	17,257
P11	Promote LEED Neighborhood Development	Yes	Direct	Near-term (0-3 years)	- 1.5% reduction in passenger VMT by 2030, steady thereafter.	Impact of Jobs-Housing Balance on Passenger Vehicle Use and Greenhouse Gas Emissions. CARB. 2014. Alameda County VMT reduction tool	29,564	28,784	15,331
P16	Comprehensive climate awareness, education, and outreach	Both	Direct	Near-term (0-3 years)	- 3% reduction in activity data (energy consumption, solid waste disposal).	Consultant estimate	43,734	42,252	16,467
E3	Bicycle & Pedestrian Master Plan and Trails Master Plan	Yes	Direct	Near-term (0-3 years)	-50 miles of new bike lanes by 2030. - 1% passenger VMT reduction by 2030; steady thereafter.	-50 miles of new bike lanes by 2030. - 1% passenger VMT reduction by 2030; steady thereafter.	16,035	15,479	5,883
E4	Regional transit support	Yes	Direct	Ongoing	- 11,000 VMT reduced per day - Start in 2025.	Mike Tassano (City Traffic Engineer)	10,756	10,443	4,837
E5	Complete Streets Implementation	Yes	Direct	Ongoing	- 0.5% VMT reduction annually.	Consultant estimate	1,443	1,419	1,002

Cost

Action Information		Outputs		City Inputs		Community References	
ID	**Action**	**NPV Costs to City**	**NPV Costs to Community**	**City Cost Source(s)**	**City Cost Assumptions/Comments**	**Community Cost Source(s)**	**Community Cost Assumptions/Comments**
P5	ZEV Infrastructure Plan	$217,582	($31,005)	Alternative Fuels Data Center: California Laws and Incentives; Dublin CAP	One time cost to develop an EV infrastructure plan is anticipated to be $150,000 and 40 hours of staff labor towards municipal ordinances. Costs to the City to install and maintain publicly available charging stations are anticipated to be in excess of $100,000. Assume 50% of these costs are ongoing maintenance costs that will be covered by EBCE. Assume that 75% of the total project costs are covered by the Peninsula-Silicon Valley Project. Assume 1/2-time staff dedicated towards implementing this plan and another 1/2 staff towards outreach and engagement efforts.	Pleasanton Impact Analysis (ZEV Projection Model), Zero Emission Vehicle and Infrastructure Statistics, Cost-effectiveness Explorer, Pleasanton Housing Design Guidelines, Pleasanton Municipal Code, Dublin CAP	-Assume 4-year waiting period for implementation to start. - Assume 296 new multi-family units built by 2030 (30/year); 1.75 parking spaces/unit. - EV Infrastructure requirements will increase construction costs by $400 or more per parking space. - Savings come from retrofit estimates of $2,700 per parking space (cheaper to build new than retrofit). -Assume 20% of new MF units must have EV charging.
P6	Small-engine and off-road equipment ele ctrification - municipal	$0	$0	Redmond ESAP Action Costs (See T1.3.0).	Estimate 0.05 FTE to implement this action (fleet evaluation, replacement support and coordination). Assume no cost or savings as electric and gasoline off-road equipment usually break-even in costs in 5-10 years.		No direct or significant financial cost change to community.

Action Information		Outputs		City Inputs		Community References	
ID	**Action**	**NPV Costs to City**	**NPV Costs to Community**	**City Cost Source(s)**	**City Cost Assumptions/Comments**	**Community Cost Source(s)**	**Community Cost Assumptions/Comments**
P7	Small-engine electrification - community	$0	($2,448,960)	Yountville Gas Leaf blower Ban	Incentive program with $30,000 budget funded by TVAQCA or BAAQMD to residents on a first-come, first-serve basis. Assume that the City costs are all staff time.	Consumer Reports: Leaf Blower Buying Guide, Consumer Reports: Electric Lawn Mowers That Rival Gas Models, Consumer Reports: Chainsaw Face-off, Home Depot: Pre-mixed Fuel Pack, Power Outdoor Equipment Global Market	Voluntary measure so assumption of $0 cost to community. Electric maintenance equipment can be slightly more expensive up-front but have similar overall costs as gasoline versions within 5-10 years with fuel cost-savings considered. The one exception is leaf blowers which have cheaper upfront and maintenance costs. Outdoor equipment sales were equal to 113 million units, which is roughly 34% of the U.S. population (332,643,210) in 2020. Assume 3% of Pleasanton households switches out their leaf blowers each year (because this is incentive-based). The cost difference between a gasoline vs electric leaf blower is $480 - $220 = $260. The cost of a 6 pack of pre-mixed fuel is $34.41.

Action Information		Outputs		City Inputs		Community References	
ID	**Action**	**NPV Costs to City**	**NPV Costs to Community**	**City Cost Source(s)**	**City Cost Assumptions/Comments**	**Community Cost Source(s)**	**Community Cost Assumptions/Comments**
E3	Bicycle, pedestrian, and trails network expansion			Pleasanton Bike/Ped Plan, CAP 1.0, Pleasanton Trails Master Plan	Costs reflect costs associated with Bike/Ped Master Plan and Trails Master Plan implementation: - Assume 1/2-time staff position for Transit, Pedestrian and Bicycle Facilities Coordinator. - Assume 75 initial staff hours towards municipal code revisions and competitive grant applications and progress reporting indicators (see Pleasanton CAP 1.0 NM1-1, 1-2, 1-11). - $400,000 in annual maintenance costs according to the PBMP (included in the ongoing FTE cost). - Assume doubling of Area 6 trails maintenance crew which is currently 3 crew members who spend 15% of their time on trails maintenance (0.15 FTE*3 crew members = 0.45 FTE) (see Trails Master Plan p.130). - Trails Master Plan construction, amenities, and trail road crossing costs total to $63,846,398 in 2018 dollars (Table 5-5 in TMP). - Bike and Pedestrian Plan costs total to $69,945,000 total in 2016 dollars (Table 7-2 in PBMP). - Assumes that city covers 20% match of capital infrastructure costs according to Pleasanton Bike/Ped Plan Funding sources notes in Appendix D (p. 164). - Assumes that 50% of costs attributed to existing, planned Trails Master Plan and Bike/Ped Plan implementation (consistent with impact analysis).	Pleasanton Impact Analysis	Assume average annual passenger VMT reduction of ~3 million by 2030 (see impact analysis - ~1% VMT reduction by 2030). Estimated reduced gasoline costs for switching from car travel to bike/ped travel. Assumes displaced VMT are from gasoline-powered vehicles.

Action Information		Outputs		City Inputs		Community References	
ID	**Action**	**NPV Costs to City**	**NPV Costs to Community**	**City Cost Source(s)**	**City Cost Assumptions/Comments**	**Community Cost Source(s)**	**Community Cost Assumptions/Comments**
P8	Bicycle amenities incl uding required bike parking at MF/Comm developments	$0	$2,492,542	Pleasanton CAP 1.0	Pleasanton CAP 1.0 Cost Benefit Analysis (CBA) estimates 25 hours of staff time per municipal code update.	Madrax: How to Affordably Park Multiple Bicycles, Recreation Management: Fundamental Considerations in Locker Room Design and Maintenance, City of Pleasanton Major Development Projects; Key Assumptions (Cost Effectiveness Explorer)	Assume 3 new commercial developments per year. Assume each new commercial development builds 24 secure bike parking spaces with a cost of $290 per bike. Assume each building has 640 square feet of locker room for each gender with a cost of $700 per square foot (70% of high-end gym locker room cost per square foot). Average passenger VMT reduction of 0.2% per year (925,731 VMT - from impact analysis). Savings from fuel cost reductions. Assumes displaced VMT are from gasoline-powered vehicles. Assume 259 (4% of 6,470 multi-family units) new multi-family units built each year. Assume large multi-family developments build bike storage for 10% of its units with a cost of $290 per bike.
P9	Bicycle rack incentive program	$7,562	($777,244)	Orlando Bicycle Rack Request Program	In 2019 dollars. Assume $700 annual budget for bike rack installations. Assumes 40 hrs of staff time to set up the program. Assume 20 hours of annual staff time towards maintaining the inventory and corresponding with businesses and residents. Orlando has an annual budget of $5000 to $7000 for bike rack installations. With an installation price of $100-350 per bike rack (we assume the upper end of $350 per bike rack). Pleasanton is 10x smaller in land area than Orlando, so we assume $700 budget with $350 per bike rack which is 2 bike rack installations per year.		Average passenger VMT reduction of 0.2% per year (903,589 VMT - from impact analysis). Savings from fuel cost reductions. Assumes displaced VMT are from gasoline-powered vehicles.

Action Information		Outputs		City Inputs		Community References	
ID	**Action**	**NPV Costs to City**	**NPV Costs to Community**	**City Cost Source(s)**	**City Cost Assumptions/Comments**	**Community Cost Source(s)**	**Community Cost Assumptions/Comments**
P10	Increase transit ridership	$75,384	($585,351)	Pleasanton CAP 1.0	Combined Pleasanton CAP 1.0 Cost Benefit Analysis estimates for TR1-2 through TR1-5 (100 hours upfront cost in staff time and 180 hours annually in staff costs= 0.087 FTE). Also included annual cost estimates for 0.5 FTE of a Transit, Pedestrian, and Bicycle Facilities Coordinator and 75k in capital improvements converted from 2012 dollars to 2021 dollars (See NM1-12).	Pleasanton Impact Analysis	Average passenger VMT reduction of 0.5% per year (2,504,481 VMT - from impact analysis). Savings from fuel cost reductions. Assumes displaced VMT are from gasoline-powered vehicles.
S4	VMT reduction for K-12 activities	$571,058	($6,358,627)	Pleasanton CAP 1.0, Redmond ESAP Action Costs	Based on NM1-8 in Pleasanton CAP 1.0 CBA and Redmond's ESAP actions-T1.1.13. Added the costs from these actions.	Pleasanton Impact Analysis	Average passenger VMT reduction of 1.1% per year (6,154291 VMT - from impact analysis). Savings from fuel cost reductions. Assumes displaced VMT are from gasoline-powered vehicles.
E6	Housing Element			Pleasanton CAP 1.0, Redmond ESAP Action Costs	Based on Pleasanton CAP 1.0 CBA staff research and municipal code revision cost and time estimates for measures LU1-1 through LU1-7 and LU2-1-LU2-7.	Pleasanton Impact Analysis	Average passenger VMT reduction of 1.7% per year (9,102,419 VMT - from impact analysis). Savings from fuel cost reductions. Assumes displaced VMT are from gasoline-powered vehicles.

Community Resilience & Wellbeing

GHG Reductions

Action Information							MTCO2e Savings		
ID	Action	Mitigation Action?	Direct/Supportive	Timeframe	Key Assumptions	Key Sources	Cumulative - to 2050	Cumulative - to 2045	Cumulative - to 2030
S9	Wildfire preparation, prevention, and education	Both	Supportive	Near-term (0-3 years)	N/A	N/A	N/A	N/A	N/A
P16	Comprehensive climate awareness, education, and outreach	Yes	Direct	Near-term (0-3 years)	- 3% reduction in activity data (energy consumption, solid waste disposal).	Consultant estimate	83,116	75,869	26,242
E18	School climate action planning	Yes	Supportive	Ongoing	N/A	N/A	N/A	N/A	N/A
E19	Access to green spaces	No	0	Ongoing	N/A	N/A	N/A	N/A	N/A
E20	Community cooling centers	No	0	Ongoing	N/A	N/A	N/A	N/A	N/A
E21	Community gardens	Both	Supportive	Near-term (0-3 years)	N/A	N/A	N/A	N/A	N/A

Cost

Action Information		Outputs		City Inputs		Community References	
ID	Action	NPV Costs to City	NPV Costs to Community	City Cost Source(s)	City Cost Assumptions/Comments	Community Cost Source(s)	Community Cost Assumptions/Comments
E21	Community gardens			Local Government Commission	The city provides administrative, office and staff support and in-kind equipment contributions. It oversees eight community gardens at a total annual cost of $40,000. FTE breakdown based on Alameda's community garden in Sweeney Park in conjunction with Alameda Food Bank. Does not reflect one time startup cost.	Oakland Parks and Rec	If partnered with a nonprofit, no additional cost to low-income communities.
S9	Wildfire preparation, prevention, and education	$0	$0	Saratoga Community Wildfire Protection Plan	Funding could be from FEMA and grants from state and federal agencies to offset costs. Used FTE from Fire, Public Works and Sustainability Departments to accomplish this measure. Ex. Funding offsets - $3,465,000 for CFIP cost share grants		There is no direct or significant financial cost change to the community.
P16	Comprehensive climate awareness, education, recognition, and outreach	$118,522	$0	Ann Arbor CAP 3.0 p. 62-63 & 94-95 ($1MM total over 10 years)	Staff time to develop plan, develop and implement calculator and webpages including annual cost for translations. Assume 0.1 FTE staff time for CAP checklist analysis (Year 1) plus 0.1 FTE (Year 2) for implementation of update. Assume start up and annual staff time and direct costs for award criteria development, selection, webpage maintenance and promotional materials like https://dublin.ca.gov/1323/Green-Shamrock-Business-Recognition-Prog		No direct or significant financial cost change to community.

References

GHG Analysis

Source Name	URL (if applicable)	Description
Dublin CAP		Appendix C contains detailed impact information and evidence per measure.
Pleasanton CAP 1.0		Impact estimations in the city's last CAP - Appendix D.
Hopkins et al. 2018. Decarbonization of Heating Energy Use in California Buildings	https://www.synapse-energy.com/sites/default/files/Decarbonization-Heating-CA-Buildings-17-092-1.pdf	Cited by Dublin CAP; stats on proportion of residential and commercial water and space heating from natural gas.
EIA 2018 Comparison of commercial green vs. non-green certified buildings	https://www.eia.gov/consumption/commercial/data/2012/pdf/green_buildings_cbecs.pdf	Study found that green certified buildings use about 25% less energy per square foot).
US Green Building Council, "LEED certification for residential"	https://www.usgbc.org/leed/rating-systems/residential	Cites that on average, certified homes use 20 to 30 percent less energy than non-green homes.
Browne-LEED Certification_July 2020	https://cfo.dc.gov/sites/default/files/dc/sites/ocfo/publication/attachments/LEED%20Certification%20Nyanya%20Browne_July%202020.pdf	Report on the effect of LEED certification on residential and commercial office buildings in Washington DC in 2018
ACEEE Strategies for Energy Savings in Buildings 2018	https://www.aceee.org/toolkit/2018/04/strategies-energy-savings-buildings	Reports that efficiency retrofits after energy audits can typically reduce energy bills by 5-30%. Comprehensive upgrades can reduce commercial building use by 20-50%.
CARB_Technical_Analysis_EV_Charging_Nonresidential_CALGreen_2019_2020	https://ww2.arb.ca.gov/sites/default/files/2020-09/CARB_Technical_Analysis_EV_Charging_Nonresidential_CALGreen_2019_2020_Intervening_Code.pdf	EV Charging Infrastructure: Nonresidential Building Standards. CARB staff recommends a minimum 10 percent requirement for new construction to assist with filling the mid-range gap in Level 2 chargers needed by 2025.
EO-N-79-20	https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf	Executive order calling for all passenger vehicle sales to be ZEVs by 2035 and by 2045 for medium- and heavy-duty vehicles.
California Energy Commission: Zero Emission Vehicle and Infrastructure Statistics	https://www.energy.ca.gov/data-reports/energy-insights/zero-emission-vehicle-and-charger-statistics	Statistics on the number of vehicles by fuel type in CA, including by County.
Fehr & Peers 2019 TDM-Strategies-Evaluation	https://www.fehrandpeers.com/wp-content/uploads/2019/12/TDM-Strategies-Evaluation.pdf	Provides updated elasticities and GHG reduction estimates compared to the CAPCOA 2010 guidelines for TDM measures.
CAPCOA 2010 Quantifying Greenhouse Gas Mitigation Measures	https://www.contracosta.ca.gov/DocumentCenter/View/34123/CAPCOA-2010-GHG-Quantification-PDF	GHG emission reduction estimates for a variety of project-level mitigation measures.
CARB 2014_Impact_of_Jobs-Housing_Balance_on_Passenger_Vehicle_Use_and_Greenhouse_Gas	https://ww2.arb.ca.gov/sites/default/files/2020-06/Impact_of_Jobs-Housing_Balance_on_Passenger_Vehicle_Use_and_Greenhouse_Gas_Emissions_Policy_Brief_0.pdf	
SB 1383	https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1383	Requires actions to produce a 75% reduction in disposal of organic waste by 2025.

Source Name	URL (if applicable)	Description
California Public Utilities Commission, as cited in "Community Power Coalition" presentation	https://www.mcecleanenergy.org/wp-content/uploads/2018/06/June-2018_FINAL-1.pdf	Source cited in Dublin CAP for info on CCA opt-out rates.
i-Tree Planting Calculator	https://planting.itreetools.org/help/	Estimates carbon sequestration rates for tree plantings of various types, sizes, etc.
De Gryze et al. 2009 Modeling shows that alternative soil management can decrease GHGs	https://escholarship.org/content/qt83p4m8qn/qt83p4m8qn_noSplash_8dfcc7dde94247d48b7c00319007875e.pdf?t=lnp5mk	Provides estimates for carbon sequestration associated with improved soil management.

Cost Analysis

Source Filename	Description
Dublin CAP	Sept 2020; Appendix C contains detailed cost information and evidence per measure.
Pleasanton CAP 1.0	There were cost estimations in the city's last CAP - Appendix D.
Redmond ESAP Action Costs	Spreadsheet used by subconsultant to estimate costs to City of implementing plan measures.
Walnut Creek CAP	Appendix 2 contains the quantification of costs and reductions of municipal measures (page A2-1)
El Cajon CAP_BenefitCostAnalysis	Presents costs to the City and community per MTCO2e reduced for various measures
08-10-2017 LEEDv4BDC vs CalGreen cost	Information about LEED certification.
LEED v4 Cost -USGBC Policy Brief 2018	Information about LEED certification.
Electrification Cost Effectiveness Memo_Update_Final	Oct 2020 Memo provided by subconsultant Rincon that estimates costs for building electrification.
Browne-LEED Certification_July 2020	https://cfo.dc.gov/sites/default/files/dc/sites/ocfo/publication/attachments/LEED%20Certification%20Nyanya%20Browne_July%202020.pdf
ACEEE Electrifying Commercial Buildings 2020	https://www.aceee.org/sites/default/files/pdfs/b2004.pdf
EPA Energy Star Portfolio Manager 2013	https://www.epa.gov/sites/production/files/2015-08/documents/overview_of_epas_energy_star_portfolio_manager.pdf
EBCE Power Mix & Compare Plans	https://ebce.org/our-power-mix/; https://ebce.org/compare-plans-business/; https://ebce.org/compare-plans-residential/index.htm
Community Power Coalition 2018	https://www.mcecleanenergy.org/wp-content/uploads/2018/06/June-2018_FINAL-1.pdf
CA SGIP	https://www.cpuc.ca.gov/sgip/
Local Gov't Commission- community gardens	https://www.lgc.org/resource/community-gardens/
Oakland Parks and Rec- Community Gardens	https://localwiki.org/oakland/Community_Gardens
USDN- Resilience Hub	http://resilience-hub.org/wp-content/uploads/2019/10/USDN_ResilienceHubsGuidance-1.pdf
SF Living Roof Cost Benefit Study page 9	https://default.sfplanning.org/Citywide/livingroof/SFLivingRoofCost-BenefitStudyReport_060816.pdf
Dublin San Ramon Services District - recycled wastewater	https://www.dsrsd.com/Home/Components/News/News/1318/18?selectview=1&npage=4&arch=1
San Jose Park and Rec- Fresh Approach farmers market	https://www.sanjoseca.gov/Home/Components/News/News/2607/5103
Saratoga Community Wildfire Protection Plan Table 6.1-6.5 Timelines	https://www.saratoga.ca.us/DocumentCenter/View/1760/Saratoga-Community-Wildfire-Protection-Plan-CWPP?bidId=
Santa Clara County CCWP- funding sources for fire resiliency (D-3)	https://www.sccfd.org/images/documents/fire_prevention/CWPP/CWPP_Strategic_Countywide_Appendices_08_29_16.pdf
ILG Beacon Program	https://www.ca-ilg.org/beacon-program
CA Energy Codes & Standards Cost-Effectiveness Explorer	https://explorer.localenergycodes.com/pleasanton-city/forecast/12-PGE/studies/1,2,3?exclude_prototypes=5,6,7,3,21&show_only_cost_effectiveness=
City of Pleasanton Economic Profile	http://dev.cityofpleasantonca.gov/gov/depts/ed/profile.asp

Source Filename	Description
U.S. Energy Information Administration	https://www.eia.gov/tools/faqs/faq.php?id=45&t=8#:~:text=One%20thousand%20cubic%20feet%20(Mcf,1.037%20MMBtu%2C%20or%2010.37%20therms
Utilities Local: Pleasanton, CA	https://utilitieslocal.com/states/california/pleasanton/
U.S. Census QuickFacts	https://www.census.gov/quickfacts/pleasantoncitycalifornia
Pleasanton_FY1921_BugdetBook_Master_Doc 071919	City of Pleasanton Operating Budget for Fiscal Year 2019-2020 through Fiscal Year 2020-2021.
Ann Arbor Zero-Climate-Action-Plan-_3.0 Apr 2020	Ann Arbor's Living Carbon Neutrality Plan
CalRecycle_Estimated Costs of SB1383	Presents monetary costs and non-monetary benefits of SB1383 implementation
Trails Master Plan	Includes cost estimates.
Pleasanton Bike/Ped Plan	Includes cost estimates.
Consumer Reports: Pay Less with Vehicle Maintenance with an EV	https://www.consumerreports.org/car-repair-maintenance/pay-less-for-vehicle-maintenance-with-an-ev/#:~:text=Consumers%20who%20purchase%20an%20electric,powered%20car%2C%20CR's%20study%20shows.&text=%E2%80%9CThe%20oil%20changes%20and%20engine,by%20the%20EV's%20relative%20simplicity.%E2%80%9D
Zero Emission Vehicle and Infrastructure Statistics	https://www.energy.ca.gov/data-reports/energy-insights/zero-emission-vehicle-and-charger-statistics
Yountville Gas Leaf Blower Ban	https://www.townofyountville.com/departments-services/public-works/electric-leaf-blower-incentive-program
Consumer Reports: Leaf Blower Buying Guide	https://www.consumerreports.org/cro/leaf-blowers/buying-guide/index.htm#:~:text=Gas%20handheld%20leaf%20blowers%20go,limited%20runtime%20per%20battery%20charge.&text=Wheeled%20blowers%20pack%20the%20most%20power%20by%20far.
Consumer Reports: Electric Lawn Mowers That Rival Gas Models	https://www.consumerreports.org/push-mowers/electric-lawn-mowers-that-rival-gas-models/#:~:text=The%20best%20electric%20push%20mower,out%20after%20about%2010%20years.
Consumer Reports: Chainsaw Face-off	https://www.consumerreports.org/chainsaws/electric-dewalt-vs-gas-stihl-chainsaw/
Home Depot: Pre-mixed Fuel Package	https://www.homedepot.com/p/TruFuel-50-1-Pre-Mixed-Fuel-6-Pack-6525638/202604386?source=shoppingads&locale=en-US&mtc=Shopping-B-F_D28I-G-D28I-28_37_OUTDOOR_POWER_ACC-NA-NA-NA-SMART-NA-NA-SMART_SHP&cm_mmc=Shopping-B-F_D28I-G-D28I-28_37_OUTDOOR_POWER_ACC-NA-NA-NA-SMART-NA-NA-SMART_SHP-71700000079956011-58700006728091443-92700060957828827&gclid=CjwKCAjwhMmEBhBwEiwAXwFoEa8n7-xTZnHJg721HVvXRH0PzUvSfsgtSWb0CHt5jzPgBXHdTuCkixoCpCMQAvD_BwE&gclsrc=aw.ds
USGBC Certification Fees	https://www.usgbc.org/tools/leed-certification/fees
City of Pleasanton: Housing Site Development Standards and Design Guidelines	http://www.cityofpleasantonca.gov/civicax/filebank/blobdload.aspx?BlobID=33648
City of Pleasanton: Municipal Code	http://qcode.us/codes/pleasanton/?view=desktop&topic=18-18_88-18_88_035
City of Pleasanton Major Development Projects	http://www.cityofpleasantonca.gov/gov/depts/cd/planning/plans_n_programs/major_development_projects.asp
Alternative Fuels Data Center: California Laws and Incentives	https://afdc.energy.gov/laws/all?state=CA

Source Filename	Description
Power Outdoor Equipment Global Market	https://www.researchandmarkets.com/reports/338686/powered_outdoor_equipment_global_market
Madrax: How to Affordably Park Multiple Bicycles	https://blog.madrax.com/blog/indoor-bike-storage-solutions#:~:text=The%20cost%20for%20a%206,of%20%24521.50%20per%20parked%20bicycle.
Recreation Management: Fundamental Considerations in Locker Room Design and Maintenance	https://recmanagement.com/feature_print.php?fid=200705fe01
Orlando Bicycle Request Program	https://www.orlandosentinel.com/business/os-bz-bike-rack-request-program-20190612-baewcdvj6fgnvbk6dcvtal3rgq-story.html
City of Pleasanton - Incentive programs for Bay-Friendly Landscape	http://www.cityofpleasantonca.gov/gov/depts/os/env/water/rebates.asp
City of Dublin- 2019 Green Stormwater Infrastructure Plan	https://dublin.ca.gov/DocumentCenter/View/20955/2019-Green-Stormwater-Infrastructure-Plan-APPROVED
Economic Evaluation of Stormwater Capture	Diringer, S. E., Shimabuku, M., & Cooley, H.. (2020). Economic evaluation of stormwater capture and its multiple benefits in California. PLOS ONE, 15(3), e0230549. https://doi.org/10.1371/journal.pone.0230549
Rainwater barrels and tanks/ Incentives SF	https://www.urbanfarmerstore.com/wp-content/uploads/2018/10/Sizes-Prices-SF-Subsidy-Program-2018-9s.pdf
SF Water Public Utilities Commission	https://sfwater.org/index.aspx?page=178
Redwood City's Water Conservation programs	https://www.redwoodcity.org/departments/public-works/water/conservation/programs-and-giveaways
Public Policy Institute of Cal. Lawns and Water Demand (page 9)	https://www.ppic.org/content/pubs/cep/EP_706EHEP.pdf
Louisville-JeffersonCountyDiversionPlan_Appx C	Appendix C of the 10-year solid waste plan includes detailed cost information for waste reduction programs (section C4. Strategy Cost Assumptions)
Marin County Code Amendment Toolkit	https://www.marincounty.org/depts/cd/divisions/sustainability/low-carbon-concrete-project
USFS_Life-Cycle Assessments Can Help You Make Sustainable Choices	https://www.fs.fed.us/t-d/pubs/htmlpubs/htm08732839/page02.htm