Detailed GHG & Cost Analysis Outcomes

For Pleasanton CAP 2.0 | July 30, 2021

Contents

Executive Summary

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 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 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 **3.96 $MTCO_2e$ per capita in 2030**. The following CAP strategies and actions are the highest contributors of GHG emission reductions through 2030:
    - Carbon sequestration (Urban Forest Master Plan)
    - Renewable electricity (Zero emissions as default EBCE choice)
    - Vehicle decarbonization (ZEV Infrastructure Plan)
    - Decarbonization of buildings (Existing Building Electrification Plan)
- Modeling suggests that the total net present value (NPV) City cost over the next ten years through 2031 of implementing all the actions in the shortlist will be **$23 million**—equivalent to around **$2.3 million per year**.
- 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 $10 million**—equivalent to around **$1 million in savings per year** or $12 in annual savings per capita. 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 **5 to 8.25 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:
    - Bicycle, pedestrian, and trails network expansion
    - Wildfire preparation, prevention, and education
    - 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.

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 similar to 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 two categories:

- **Existing actions**: Actions that are already underway, planned, and/or budgeted for implementation and will result in future GHG emissions reductions.
- **CAP actions**: Actions that represent new or expanded activities as compared to the City's current or planned activities.

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.

Similar to 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 2031over 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 as a whole, 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; takes into account 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)*		
Sector	ID	Action	NPV Costs to City	NPV Costs to Community	Cumulative to 2030	City	Comm.	Co-Benefits
BE	1001	All-electric reach code	$49,020	-$2,784,572	11,615	$4	-$240	
BE	1164V	Existing Building Electrification Plan	$138,455	$137,032	16,511	$8	$8	
BE	1169	Refrigerant management in new construction	$42,675	-$262,307		N/A	N/A	
BE	1217	Modify Municipal Code definition of covered projects	$0	$287,074	1,290	$0	$223	
BE	1176	Community energy efficiency upgrades	$958,041	-$1,959,201	26,041	$37	-$75	
BE	1167	LEED certification for new construction	$7,843	-$180,389	227	$34	-$793	
BE	1008	Energy Benchmarking and City Facility Retrofits	-$3,103,111	$0	351	-$8,833	$0	
BE	1119	Zero emissions energy as default EBCE choice[1]	$0	$20,919,524	277,840	$0	$75	
BE	1163	Solar & storage on new construction	$0	$0	244	$0	$0	
T&LU	1056	ZEV Infrastructure Plan	$203,263	-$24,556	118,182	$2	$0	
T&LU	1190	Municipal small-engine electrification and off-road equipment	$0	$0		N/A	N/A	

[1] EBCE = East Bay Community Energy

			NPV Costs ($)		GHG Savings (MTCO2e)*	Cost Effectiveness ($/MTCO2e)*		
Sector	ID	Action	NPV Costs to City	NPV Costs to Community	Cumulative to 2030	City	Comm.	Co-Benefits
T&LU	1115	Community Small-engine electrification	$0	-$2,448,960	6,250	$0	-$392	
T&LU	1082	Bicycle, pedestrian, and trails network expansion	$13,108,964	-$3,800,771	3,204	$4,091	-$1,186	
T&LU	1078	Workplace bike amenities	$0	$2,593,114	955	$0	$2,716	
T&LU	1080	Bicycle rack incentive program	$7,562	-$730,532	1,823	$4	-$401	
T&LU	1079	Required bike parking at MF/Comm developments	$0	-$35,260	636	$0	-$55	
T&LU	1070	Increase active transportation	$0	-$392,340	920	$0	-$426	
T&LU	1180	Increase transit ridership	$75,384	-$1,277,220	5,071	$15	-$252	
T&LU	1184	VMT reduction for K-12 activities	$571,058	-$6,365,308	12,708	$45	-$501	
T&LU	1159	Shared parking	$0	$0		N/A	N/A	
T&LU	1230	Housing Element	$39,719	-$11,150,518	18,800	$2	-$593	
T&LU	1227	Trend changes from COVID	$0	$0		N/A	N/A	
T&LU	1086	Promote LEED Neighborhood Development	$910	-$850,666	16,611	$0	-$51	
M&C	1229	Textile recovery	$0	$0		N/A	N/A	
M&C	1194	Single use plastic reduction	$0	$0		N/A	N/A	
M&C	1047	Environmentally preferable purchasing policy	$0	$0		N/A	N/A	
M&C	1126	Collaborative consumption	$297,774	-$190,934		N/A	N/A	
M&C	1137	Repair Industry	$24,857	-$37,659		N/A	N/A	
M&C	1198	Embodied carbon reduction plan	$0	-$88,625		N/A	N/A	
NS	1150	Urban Forest Master Plan	$486,089	$469,585	366,263	$1	$1	
NS	1219	Soil management carbon sequestration projects	$34,711	$2,868,511	3,890	$9	$737	
NS	1220	Carbon sequestration research and tracking	$0	$0		N/A	N/A	
NS	1145	Climate adapted plantings	$0	$0		N/A	N/A	

			NPV Costs ($)		GHG Savings (MTCO2e)*	Cost Effectiveness ($/MTCO2e)*		
Sector	ID	Action	NPV Costs to City	NPV Costs to Community	Cumulative to 2030	City	Comm.	Co-Benefits
NS	1099	Restore and conserve native grassland, rangeland, and riparian habitats	$1,280,236	$0		N/A	N/A	
NS	1204	Community conservation programs	$0	$0		N/A	N/A	
WR	1087	Water fixture retrofits	$220,588	-$2,942,142		N/A	N/A	
WR	1094	Expand recycled water	$5,177,842	$0		N/A	N/A	
WR	1147	Water Efficiency Programs	$1,414,038	-$1,708,155		N/A	N/A	
WR	1092	Stormwater runoff reuse	-$400,570	-$113,123		N/A	N/A	
WR	1136	Green Stormwater Infrastructure Plan	$0	$0		N/A	N/A	
WR	1199	On-site stormwater management	$0	$0		N/A	N/A	
CRW	1026	Neighborhood resilience hubs	$369,290	$0		N/A	N/A	
CRW	1143	Community gardens	$115,355	$0		N/A	N/A	
CRW	1130	CalFresh, WIC & Senior FMNP expansion	$0	$0		N/A	N/A	
CRW	1010	Reduce heat island effect	$0	$80,022		N/A	N/A	
CRW	1096	Wildfire preparation, prevention, and education	$0	$0		N/A	N/A	
CRW	1216	Institutionalize climate action	$1,991,951	$0		N/A	N/A	
CRW	1032	Prioritize adaptation and resilience in capital projects	$46,192	$0		N/A	N/A	
CRW	1038	Critical facility relocation	$138,577	$0		N/A	N/A	
CRW	1023	Comprehensive climate outreach	$64,521	$0	27,346	$2	$0	
CRW	1228	Sustainability Awards	$4,981	$0		N/A	N/A	
CRW	1151	Update CAP checklist	$49,020	$0		N/A	N/A	
		TOTAL	**$23,415,234**	**-$9,988,378**	**916,777**	**$26**	**-$11**	

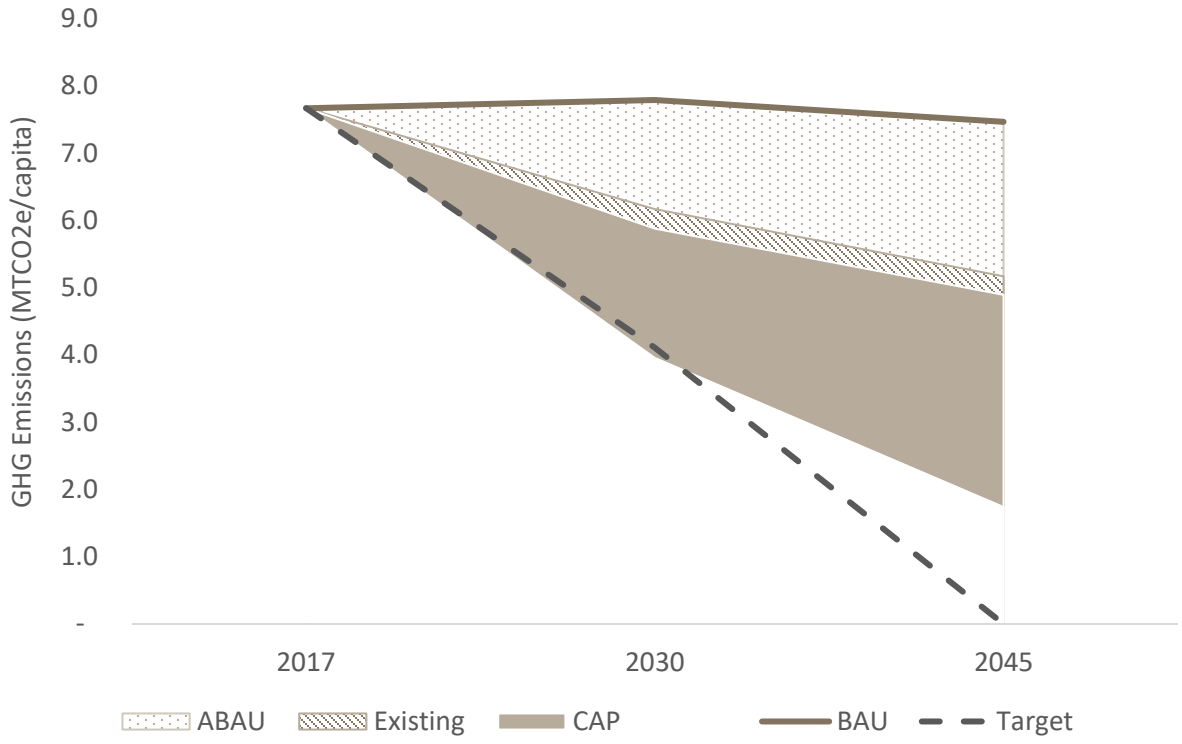
**Blank cells were not quantified because the action focuses on climate adaptation rather than climate mitigation.*

GHG Reductions

Modeling suggests that all currently proposed CAP 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 3.96 $MTCO_2e$ per capita in 2030. The following CAP strategies and actions are the highest contributors of GHG emission reductions through 2030:

- Carbon sequestration (Urban Forest Master Plan)
- Renewable electricity (Zero emissions as default EBCE choice)
- Waste diversion (SB 1383 implementation)
- Vehicle decarbonization (ZEV Infrastructure Plan)
- Decarbonization of buildings (Existing Building Electrification Plan)

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: Emission reductions resulting from CAP 2.0 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.

		Mass (MTCO2e)			Per-Capita (MTCO2e/person)		
Sector	Strategy	Cumulative	In 2030	In 2045	Cumulative	In 2030	In 2045
All	ABAU reduction	3,980,004	134,477	224,576	47.94	1.62	2.29
BE	Decarbonization of buildings	28,126	7,356	28,992	0.34	0.09	0.30
BE	Energy efficiency & consumption	27,909	4,342	143	0.34	0.05	0.00
BE	Renewable energy generation & storage	278,084	30,450	-	3.35	0.37	0.00
T&LU	Active, shared transport	31,567	7,140	6,124	0.38	0.09	0.06
T&LU	Sustainable land use	35,411	5,520	3,226	0.43	0.07	0.03
T&LU	Vehicle decarbonization	118,182	25,352	71,168	1.42	0.31	0.73
M&C	Waste diversion	-	-	-	--	-	-
M&C	Sustainable consumption	-	-	-	-	-	-
NS	Carbon sequestration	370,153	73,874	195,961	4.46	0.89	2.00
NS	Ecosystem resilience	-	-	-	-	-	-
WR	Supply & conservation	-	-	-	-	-	-
WR	Stormwater resilience	-	-	-	-	-	-
CRW	Community resilience	-	-	-	-	-	-
CRW	CC vulnerability	-	-	-	-	-	-
CRW	City ops integration	27,346	5,490	2,950	0.33	0.07	0.03
BE	Existing actions	2,118	183	-	0.03	0.00	0.00
T&LU	Existing actions	9,494	1,462	767	0.11	0.02	0.01
M&C	Existing actions	135,118	22,585	26,499	1.63	0.27	0.27
NS	Existing actions	-	-	-	-	-	-
WR	Existing actions	-	-	-	-	-	-
CRW	Existing actions	-	-	-	-	-	-
	Total Reductions	**5,043,510**	**318,229**	**560,407**	**60.75**	**3.83**	**5.73**
	Resulting Emissions	**-**	**328,415**	**170,149**	**-**	**3.96**	**1.74**

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

			MTCO2e Reductions (mass), by year		MTCO2e Reductions (mass), cumulative	
	ID	Action	In 2030	In 2045	Cumulative - through 2030	Cumulative - through 2045
1	1150	Urban Forest Master Plan	73,253	195,340	366,263	2,441,753
2	1119	Zero emissions energy as default East Bay Community Energy (EBCE) choice	30,374	0	277,840	524,332
3	MC2	SB 1383 Implementation	22,585	26,499	135,118	506,627
4	1056	ZEV Infrastructure Plan	25,352	71,168	118,182	855,919
5	1023	Comprehensive climate outreach	5,490	2,950	27,346	89,091
6	1176	Community energy efficiency upgrades	3,976	70	26,041	58,197
7	1230	Housing Element	3,717	2,257	18,800	64,825
8	1086	Promote LEED Neighborhood Development	1,803	969	16,611	36,376
9	1164V	Existing Building Electrification Plan	4,357	6,034	16,511	95,279
10	1184	VMT reduction for K-12 activities	2,529	1,365	12,708	40,539

Table 3. Emissions trajectories under examined scenarios.

	MTCO2e Emissions (mass emissions)		MTCO2e Emissions (per capita)	
	In 2030	In 2045	In 2030	In 2045
BAU Emissions	646,644	730,555	7.79	7.47
ABAU Emissions	512,167	505,979	6.17	5.17
Existing On-Going Cap Reductions	-24,229	-27,266	-0.29	-0.28
CAP Action Reductions	-159,523	-308,565	-1.92	-3.15
Projected Emissions	328,415	170,149	3.96	1.74
% Reduction (compared to 1990 baseline)	52%	75%	71%	87%
Target	341,188	0	4.11	0.00
Projected Gap from Target	-12,774	170,149	-0.15	1.74

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
BE	1001	All-electric reach code	0.05	0.05									0.10
BE	1164	Existing Building Electrification Plan					0.10	0.10	0.10	0.10	0.10	0.10	0.60
BE	1169	Refrigerant management in new construction								0.10	0.10	0.10	0.30
BE	1217	Modify Municipal Code definition of covered projects	0.02										0.02
BE	1176	Community energy efficiency upgrades				0.25	0.10	0.10	0.10	0.10	0.10	0.10	0.85
BE	1167	LEED certification for new construction	0.01										0.01
BE	1008	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
BE	1119	Zero emissions energy as default EBCE choice	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00
BE	1163	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	1056	ZEV Infrastructure Plan				1.00	0.50	0.50	0.50	0.50	0.50	0.50	4.00
T&LU	1190	Municipal small-engine electrification and off-road equipment				0.05	0.05	0.05	0.05	0.05	0.05		0.30
T&LU	1115	Community Small-engine electrification	0.05	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.23
T&LU	1082	Bicycle, pedestrian, and trails network expansion	0.50	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	25.28
T&LU	1078	Workplace bike amenities	0.01										0.01
T&LU	1080	Bicycle rack incentive program				0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.07

Sector	ID	Action	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
T&LU	1079	Required bike parking at MF/Comm developments	0.01										0.01
T&LU	1070	Increase active transportation				0.30	0.30	0.30	0.30	0.30	0.30	0.30	2.10
T&LU	1180	Increase transit ridership								0.59	0.59	0.59	1.76
T&LU	1184	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	1159	Shared parking								0.02			0.02
T&LU	1230	Housing Element	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.50
T&LU	1227	Trend changes from COVID	0.10	0.10									0.19
T&LU	1086	Promote LEED Neighborhood Development								0.02	0.01	0.01	0.04
M&C	1229	Textile recovery	0.01	0.01									0.02
M&C	1194	Single use plastic reduction	0.07	0.07	0.07	0.07							0.27
M&C	1047	Environmentally preferable purchasing policy	0.02										0.02
M&C	1126	Collaborative consumption			0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.62
M&C	1137	Repair Industry								0.10	0.10	0.10	0.30
M&C	1198	Embodied carbon reduction plan								0.05	0.08	0.08	0.21
NS	1150	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	1219	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
NS	1220	Carbon sequestration research and tracking				0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.13
NS	1145	Climate adapted plantings								0.01	0.01		0.02
NS	1099	Restore and conserve native grassland, rangeland, and riparian habitats								0.27	0.27	0.27	0.81
NS	1204	Community conservation programs				0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.24
WR	1087	Water fixture retrofits	0.03	0.03	0.03	0.03	0.03						0.15
WR	1094	Expand recycled water								0.25	0.25	0.25	0.75

Sector	ID	Action	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
WR	1147	Water Efficiency Programs	0.03	0.03	0.03	0.03	0.03						0.15
WR	1092	Stormwater runoff reuse	0.50	0.50	0.50	0.50	0.50						2.50
WR	1136	Green Stormwater Infrastructure Plan								0.10	0.10	0.10	0.30
WR	1199	On-site stormwater management	0.01										0.01
CRW	1026	Neighborhood resilience hubs								0.10	0.10	0.10	0.30
CRW	1143	Community gardens	0.10	0.10	0.10								0.30
CRW	1130	CalFresh, WIC & Senior FMNP expansion	0.10	0.10	0.10								0.30
CRW	1010	Reduce heat island effect	0.01										0.01
CRW	1096	Wildfire preparation, prevention, and education	1.50	1.50	1.50	1.50	1.50						7.50
CRW	1216	Institutionalize climate action	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CRW	1032	Prioritize adaptation and resilience in capital projects				0.04							0.04
CRW	1038	Critical facility relocation				0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.35
CRW	1023	Comprehensive climate outreach	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	1.50
CRW	1228	Sustainability Awards	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.10
CRW	1151	Update CAP checklist	0.10	0.10									0.20
		TOTAL	**4.96**	**6.91**	**6.73**	**8.28**	**7.62**	**5.56**	**5.56**	**7.18**	**6.67**	**6.61**	

Other Costs

Modeling suggests that the total net present value (NPV) City cost through 2031 of implementing all actions on the shortlist will be $23.4 million—equivalent to around $2.3 million per year.[2] The estimated cost to the community through 2031 is a net savings of $10 million—equivalent to around $1 million per year or $12 in annual savings per capita. 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 2031**	**NPV to 2031**
B&E	Decarbonization of buildings	$230,149	($2,909,848)
B&E	Energy efficiency & consumption	($2,137,227)	($1,852,516)
B&E	Renewable energy generation & storage	$0	$20,919,524
T&LU	Active, shared transport	$13,762,968	($12,457,277)
T&LU	Sustainable land use	$40,629	($12,001,184)
T&LU	Vehicle decarbonization	$203,263	($24,556)
M&C	Waste diversion	$0	$0
M&C	Sustainable consumption	$322,630	($317,218)
NS	Carbon sequestration	$520,801	$3,338,096
NS	Ecosystem resilience	$1,280,236	$0
WR	Supply & conservation	$6,812,468	($4,650,298)
WR	Stormwater resilience	($400,570)	($113,123)
CRW	Community resilience	$484,646	$0
CRW	CC vulnerability	$0	$80,022
CRW	City ops integration	$2,295,242	$0
	TOTAL (NPV through 2031)	**$23,415,234**	**($9,988,378)**
	AVG PER YEAR	**$2,341,523**	**($998,838)**
	AVG PER CAPITA-YEAR*	**$29**	**($12)**

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

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

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

			NPV Costs ($)	
Sector	ID	Action	NPV Costs to City	NPV Costs to Community
BE	1001	All-electric reach code	$49,020	-$2,784,572
BE	1164V	Existing Building Electrification Plan	$138,455	$137,032
BE	1169	Refrigerant management in new construction	$42,675	-$262,307
BE	1217	Modify Municipal Code definition of covered projects	$0	$287,074
BE	1176	Community energy efficiency upgrades	$958,041	-$1,959,201
BE	1167	LEED certification for new construction	$7,843	-$180,389
BE	1008	Energy Benchmarking and City Facility Retrofits	($3,103,111)	$0
BE	1119	Zero emissions energy as default East Bay Community Energy (EBCE) choice	$0	$20,919,524
BE	1163	Solar and storage on new construction	$0	$0
T&LU	1056	ZEV Infrastructure Plan	$203,263	-$24,556
T&LU	1190	Municipal small-engine electrification and off-road equipment	$0	$0
T&LU	1115	Community Small-engine electrification	$0	-$2,448,960
T&LU	1082	Bicycle, pedestrian, and trails network expansion	$13,108,964	-$3,800,771
T&LU	1078	Workplace bike amenities	$0	$2,593,114
T&LU	1080	Bicycle rack incentive program	$7,562	-$730,532
T&LU	1079	Required bike parking at MF/Comm developments	$0	-$35,260
T&LU	1070	Increase active transportation	$0	-$392,340
T&LU	1180	Increase transit ridership	$75,384	-$1,277,220
T&LU	1184	VMT reduction for K-12 activities	$571,058	-$6,365,308
T&LU	1159	Shared parking	$0	$0
T&LU	1230	Housing Element	$39,719	-$11,150,518
T&LU	1227	Trend changes from COVID	$0	$0
T&LU	1086	Promote LEED Neighborhood Development	$910	-$850,666
M&C	1229	Textile recovery	$0	$0
M&C	1194	Single use plastic reduction	$0	$0
M&C	1047	Environmentally preferable purchasing policy	$0	$0
M&C	1126	Collaborative consumption	$297,774	-$190,934
M&C	1137	Repair Industry	$24,857	-$37,659
M&C	1198	Embodied carbon reduction plan	$0	-$88,625
NS	1150	Urban Forest Master Plan	$486,089	$469,585
NS	1219	Soil management carbon sequestration projects	$34,711	$2,868,511
NS	1220	Carbon sequestration research and tracking	$0	$0
NS	1145	Climate adapted plantings	$0	$0
NS	1099	Restore and conserve native grassland, rangeland, and riparian habitats	$1,280,236	$0
NS	1204	Community conservation programs	$0	$0
WR	1087	Water fixture retrofits	$220,588	-$2,942,142
WR	1094	Expand recycled water	$5,177,842	$0
WR	1147	Water Efficiency Programs	$1,414,038	-$1,708,155
WR	1092	Stormwater runoff reuse	($400,570)	-$113,123
WR	1136	Green Stormwater Infrastructure Plan	$0	$0
WR	1199	On-site stormwater management	$0	$0
CRW	1026	Neighborhood resilience hubs	$369,290	$0
CRW	1143	Community gardens	$115,355	$0
CRW	1130	CalFresh, WIC & Senior FMNP expansion	$0	$0
CRW	1010	Reduce heat island effect	$0	$80,022
CRW	1096	Wildfire preparation, prevention, and education	$0	$0
CRW	1216	Institutionalize climate action	$1,991,951	$0
CRW	1032	Prioritize adaptation and resilience in capital projects	$46,192	$0
CRW	1038	Critical facility relocation	$138,577	$0
CRW	1023	Comprehensive climate outreach	$64,521	$0
CRW	1228	Sustainability Awards	$4,981	$0
CRW	1151	Update CAP checklist	$49,020	$0
		TOTAL	**$23,415,234**	**-$9,988,378**

Cost Effectiveness

On average, modeling suggests that implementing all of the actions on the shortlist will cost the City $26 per $MTCO_2e$ reduced and will save the community about $11 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
- Urban Forest Master Plan
- 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	1001	All-electric reach code	$4	-$240
BE	1164	Existing Building Electrification Plan	$8	$8
BE	1169	Refrigerant management in new construction	N/A	N/A
BE	1217	Modify Municipal Code definition of covered projects	$0	$223
BE	1176	Community energy efficiency upgrades	$37	-$75
BE	1167	LEED certification for new construction	$34	-$793
BE	1008	Energy Benchmarking and City Facility Retrofits	-$8,833	$0
BE	1119	Zero emissions energy as default East Bay Community Energy (EBCE) choice	$0	$75
BE	1163	Solar and storage on new construction	$0	$0
T&LU	1056	ZEV Infrastructure Plan	$2	$0
T&LU	1190	Municipal small-engine electrification and off-road equipment	N/A	N/A
T&LU	1115	Community Small-engine electrification	$0	-$392
T&LU	1082	Bicycle, pedestrian, and trails network expansion	$4,091	-$1,186
T&LU	1078	Workplace bike amenities	$0	$2,716
T&LU	1080	Bicycle rack incentive program	$4	-$401
T&LU	1079	Required bike parking at MF/Comm developments	$0	-$55
T&LU	1070	Increase active transportation	$0	-$426
T&LU	1180	Increase transit ridership	$15	-$252
T&LU	1184	VMT reduction for K-12 activities	$45	-$501
T&LU	1159	Shared parking	N/A	N/A
T&LU	1230	Housing Element	$2	-$593
T&LU	1227	Trend changes from COVID	N/A	N/A
T&LU	1086	Promote LEED Neighborhood Development	$0	-$51
M&C	1229	Textile recovery	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
M&C	1194	Single use plastic reduction	N/A	N/A
M&C	1047	Environmentally preferable purchasing policy	N/A	N/A
M&C	1126	Collaborative consumption	N/A	N/A
M&C	1137	Repair Industry	N/A	N/A
M&C	1198	Embodied carbon reduction plan	N/A	N/A
NS	1150	Urban Forest Master Plan	$1	$1
NS	1219	Soil management carbon sequestration projects	$9	$737
NS	1220	Carbon sequestration research and tracking	N/A	N/A
NS	1145	Climate adapted plantings	N/A	N/A
NS	1099	Restore and conserve native grassland, rangeland, and riparian habitats	N/A	N/A
NS	1204	Community conservation programs	N/A	N/A
WR	1087	Water fixture retrofits	N/A	N/A
WR	1094	Expand recycled water	N/A	N/A
WR	1147	Water Efficiency Programs	N/A	N/A
WR	1092	Stormwater runoff reuse	N/A	N/A
WR	1136	Green Stormwater Infrastructure Plan	N/A	N/A
WR	1199	On-site stormwater management	N/A	N/A
CRW	1026	Neighborhood resilience hubs	N/A	N/A
CRW	1143	Community gardens	N/A	N/A
CRW	1130	CalFresh, WIC & Senior FMNP expansion	N/A	N/A
CRW	1010	Reduce heat island effect	N/A	N/A
CRW	1096	Wildfire preparation, prevention, and education	N/A	N/A
CRW	1216	Institutionalize climate action	N/A	N/A
CRW	1032	Prioritize adaptation and resilience in capital projects	N/A	N/A
CRW	1038	Critical facility relocation	N/A	N/A
CRW	1023	Comprehensive climate outreach	$2	$0
CRW	1228	Sustainability Awards	N/A	N/A
CRW	1151	Update CAP checklist	N/A	N/A
		TOTAL	**$26**	**-$11**

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 - through 2050	Cumulative - through 2045	Cumulative - through 2030
1001	All-electric reach code	Yes	Direct	Near-term (1-3 years)	- 90% of natural gas switch to electricity for all new construction (assumes some exceptions).	N/A	349,891	216,497	11,615
1164	Existing Building Electrification Plan	Yes	Direct	Mid-term (4-7 years)	- 5% switch to electric by 2030.	Dublin CAP estimated 22% retrofits to all-electric (Appendix C, p.12)	125,398	95,279	16,511
1169	Refrigerant management in new construction	Yes	Supportive	Long-term (8-10 years)	N/A		-	-	-
1217	Modify Municipal Code definition of covered projects	Yes	Direct	Near-term (1-3 years)	- Covered buildings are 25% more efficient than previously.	US Green Building Council	8,124	7,748	1,290
1176	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.	58,516	58,197	26,041
1167	LEED certification for	Yes	Direct	Near-term (1-3 years)	- Covered buildings are 10% more efficient than current green building code.	Browne 2020 p. 8	1,574	1,527	227

Action Information							MTCO2e Savings		
ID	Action	Mitigation Action?	Direct/ Supportive	Timeframe	Key Assumptions	Key Sources	Cumulative - through 2050	Cumulative - through 2045	Cumulative - through 2030
	new construction								
1008	Energy Benchmarking and City Facility Retrofits	Yes	Direct	Near-term (1-3 years)	- 20% reduction in City facility energy use by 2025, steady thereafter.	ACEEE 2018	590	590	351
1119	Maintain zero-emissions energy as default EBCE choice	Yes	Direct	Near-term (1-3 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	524,332	524,332	277,840
1163	Solar and storage on new construction	Yes	Direct	Near-term (1-3 years)	- 10% of new construction will have on-site solar by 2030, with continuing trend thereafter.	Consistent with voluntary participation rate cited in Action 1176.	3,240	3,240	244
1023	Comprehensive climate outreach	Yes	Direct	Near-term (1-3 years)	- 3% reduction in activity data by 2030 (energy consumption, solid waste disposal); ramping up starting in 2022; steady thereafter.	Consultant estimate	32,621	13,977	5,295
B&E 1	Maintain highest EBCE choice for municipal operations	Yes	Direct	Ongoing	- All electricity use is zero emissions in 2022 and beyond.	Consultant estimate	3,398	3,398	2,118

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
1001	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.
1164	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. In order 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.
1169	Refrigerant management in new construction	$42,675	-$262,307	CA Energy Codes & Standards Cost-Effectiveness Explorer 2019	Staff time required for community outreach, standards/code development, and implementation.	https://explorer.localenergycodes.com/pleasanton-	While low GWP refrigerants impact consumer up-front costs, high efficiency appliances are cheaper to operate over

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
				Pleasanton studies. Similar to 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/	Standards/code takes three years to get into place.	city/forecast/12-PGE/studies/1,2,3	time - Assume $150 in net annual savings per single family household.
1217	Modify Municipal Code definition of covered projects	$0	$287,074	CA Energy Codes & Standards Cost-Effectiveness Explorer 2019 Pleasanton studies. Similar to 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).
1176	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	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.

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
					$50k annual incomes during the 10-year period.		
1167	LEED certification for new construction	$7,843	-$180,389	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.
1008	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
1119	Zero emissions energy as default East Bay Community Energy (EBCE) choice	$0	$20,919,524	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.
1163	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-	CA SGIP; Dublin CAP - Appx C p. 11	n/a - voluntary & variable

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
					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."		

Materials & Consumption

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
1229	Textile recovery	Yes	Supportive	Near-term (1-3 years)	N/A	N/A	N/A	N/A	N/A
1194	Single use plastic reduction	Yes	Supportive	Mid-term (4-7 years)	N/A	N/A	N/A	N/A	N/A
1047	Environmentally preferable purchasing policy	Yes	Supportive	Near-term (1-3 years)	N/A	N/A	N/A	N/A	N/A
1126	Collaborative consumption	Yes	Supportive	Near-term (1-3 years)	N/A	N/A	N/A	N/A	N/A
1137	Repair Industry	Yes	Supportive	Long-term (8-10 years)	N/A	N/A	N/A	N/A	N/A
1198	Embodied carbon reduction plan	Yes	Supportive	Long-term (8-10 years)	N/A	N/A	N/A	N/A	N/A
1023	Comprehensive climate outreach	Yes	Direct	Near-term (1-3 years)	- 3% reduction in activity data (energy consumption, solid waste disposal).	Consultant estimate	25,086	19,464	4,144
MC1	Local purchasing	Yes	Supportive	Ongoing	N/A	N/A	N/A	N/A	N/A
MC2	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
MC3	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	Status	NPV Costs to City	NPV Costs to Community	City Cost Source(s)	City Cost Assumptions/Comments	Community Cost Source(s)	Community Cost Assumptions/Comments
1229	Textile recovery	High Priority	$0	$0	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.
1194	Single use plastic reduction	High Priority	$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.
1047	Environmentally preferable purchasing policy	High Priority	$0	$0	"			No costs to the community as this action is focused on municipal operations.
1126	Collaborative consumption	High Priority	$297,774	-$190,934	"Redmond ESAP Action Costs - MWM Tab (FTE Assumption)		Consultant estimate	Assumes that 5% of total residents will participate in one collaborative consumption event, repairing one item that is worth $50 (i.e.., saving $50 that would have otherwise been wasted by disposing that item).
1137	Repair Industry	High Priority	$24,857	-$37,659				No costs to the community since the incentives are generated by the City. Assumes that the cost of incentives to the City is realized as cost-savings to the community.
1198	Embodied carbon reduction plan	High Priority	$0	-$88,625	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.	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	3,540,542	2,441,753	366,263
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**
1150	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 amount 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.
1219	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	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.

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**
					50% of these costs are already coverd through SB1383 activities.		
1220	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.
1145	Climate adapted plantings	$0	$0	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 since this is action is specifically targeting City-owned property.
1099	Restore and conserve native grassland, rangeland, and riparian habitats	$1,280,236	$0	Redmond ESAP Action Costs	Assume similar costs as Redmond ESAP N1.5.30 and ESAP N1.5.27 combined. Assume $60,000 (0.27 FTE equivalent) in restoration maintenance. Assume $1.5 million in restoration planning, modeling, capital investments for 2 major watershed basins.		No direct or significant financial cost change to community.
1204	Community conservation programs	$0	$0	Pleasanton Budget FY2019-FY2020 Operating Budget	Assume that the general fund subsidy for the Pleasanton Youth/Teen program is increased by 10% (of $76,737 over 4 years).		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
1087	Water fixture retrofits	$220,588	-$2,942,142	Redwood City's water conservation programs	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.	Redwood City's water conservation programs	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.
1094	Expand recycled water	$5,177,842	$0	Dublin San Ramon Services District	In 2017, Pleasanton and two other cities expanded their purple pipes. Project was 2 years and it cost 18.2 million shared between the 3 cities. Pleasanton's share was 6.06 million.		No direct or significant financial cost change to community.
1147	Water Efficiency Programs	$1,414,038	-$1,708,155	http://www.cityofpleasantonca.gov/gov/depts/os/env/water/rebates.asp	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). However, Pleasanton already has programs and this is an expansion that can	City of Pleasanton water rebates and Public Policy Institute of California lawns and water demand	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

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
					easily be done without adding much, so reduced to 0.03 FTE.		and 100 business participate at the max rebate of $5,000.
1092	Stormwater runoff reuse	-$400,570	-$113,123	Economic Evaluation of Stormwater Capture	In the reference dataset, stormwater capture projects had a median levelized cost of $816 per acre feet (n= 50) and 50% of projects were between $246 and $2,560 per acre feet. Urban stormwater capture projects monetized the volume of water in dollars, ranging from a total benefit of $365 to $12,800,000 per year. With a median net savings of $127,000. Includes one-time 0.5 FTE for feasibility analysis and ongoing 0.5 FTE for project implementation. Also includes $75k for consultant support of feasibility study.	Rainwater barrels and tanks	There would be a cost savings per year but it is based on size of catchment container and offset of water bill. I am putting an estimate of $120 per year amortized out over each monthly bill at 10 per month. Assume up to 1,000 residents/businesses participate in rainwater capture program.
1136	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.
1199	On-site stormwater management	$0	$0	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 - through 2050	Cumulative - through 2045	Cumulative - through 2030
1056	ZEV Infrastructure Plan	Yes	Direct	Mid-term (4-7 years))	- 20% increase in EV chargers. - 20% of passenger vehicle VMT from EVs by 2030. - 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	1,263,718	855,919	118,182
1190	Municipal small-engine electrification and off-road equipment	Yes	Supportive	Mid-term (4-7 years)	N/A	N/A	0	0	0
1115	Community Small-engine electrification	Yes	Direct	Near-term (1-3 years)	- 50% reduction in lawn & garden equipment emissions by 2030; ramping up in 2022. Steady thereafter.	EO N-79-20	41,127	31,346	6,250
1082	Bicycle, pedestrian, and trails network expansion	Yes	Direct	Near-term (1-3 years)	-50 miles of new bike lanes by 2030. - 1% passenger VMT reduction by 2030; steady thereafter. - 50% of MTCO2e savings are attributable to the CAP; remainder attributed to existing bike/ped and trails master plans.	Dublin CAP; California Air Pollution Control Offers Association guidance; Fehr & Peers 2019; Alameda County VMT reduction tool; also consulted Pleasanton CAP 1.0	11,740	10,250	3,204
1078	Workplace bike amenities	Yes	Direct	Near-term (1-3 years)	- Commuting is 30% of passenger VMT. - Bicycling commuting doubles by 2030. - 0.2% VMT reduction by 2030.	CAPCOA 2010 (p. 202)	3,490	3,047	955
1080	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	9,473	8,145	1,823
1079	Required bike parking at MF/Comm developments	Yes	Direct	Near-term (1-3 years)	- 0.1% reduction in passenger VMT by 2030, steady thereafter.	CAPCOA 2010 (p. 202); Alameda County VMT reduction tool	2,323	2,029	636

Action Information							MTCO2e Savings		
ID	**Action**	**Mitigation Action?**	**Direct/ Supportive**	**Timeframe**	**Key Assumptions**	**Key Sources**	**Cumulative - through 2050**	**Cumulative - through 2045**	**Cumulative - through 2030**
1070	Increase active transportation	Yes	Direct	Mid-term (4-7 years)	- 0.25% reduction in passenger VMT by 2030, steady thereafter.	CAPCOA 2010 (p. 179)	4,851	4,165	920
1180	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	43,541	35,327	5,071
1184	VMT reduction for K-12 activities	Yes	Direct	Near-term (1-3 years)	- 2% reduction in passenger VMT by 2030, steady thereafter.	Fehr & Peers 2019; Alameda County VMT reduction tool	46,424	40,539	12,708
1159	Shared parking	Yes	Supportive	Long-term (8-10 years)	N/A		0	0	0
1230	Housing Element	Yes	Direct	Near-term (1-3 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.	74,559	64,825	18,800
1227	Trend changes from COVID	Yes	Supportive	Near-term (!-3 years)	N/A		0	0	0
1086	Promote LEED Neighborhood Development	Yes	Direct	Near-term (1-3 years)	- 1.5% reduction in passenger VMT by 2030, steady thereafter. -Assumed to have the same impact as the Housing element action (1230).	Impact of Jobs-Housing Balance on Passenger Vehicle Use and Greenhouse Gas Emissions. CARB. 2014. Alameda County VMT reduction tool	40,556	36,376	16,611
1023	Comprehensive climate outreach	Yes	Direct	Near-term (1-3 years)	- 3% reduction in activity data (energy consumption, solid waste disposal).	Consultant estimate	63,578	55,650	17,907
TLU1	Trails Master Plan	Yes	Supportive	Ongoing	N/A	N/A	5,870	5,125	1,602
TLU2	Bicycle & Pedestrian Master Plan	Yes	Supportive	Ongoing	- 50% of action 1082 savings attributed to the current plan.	N/A	5,870	5,125	1,602
TLU3	Regional transit support	Yes	Direct	Ongoing	- 11,000 VMT reduced per day - Start in 2025.	Mike Tassano (City Traffic Engineer)	15,133	13,460	5,253
TLU4	Complete Streets Implementation	Yes	Direct	Ongoing	- 0.5% VMT reduction annually.	Consultant estimate	1,774	1,646	1,036

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
1056	ZEV Infrastructure Plan	$203,263	-$24,556	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.
1190	Municipal small-engine electrification and off-road equipment	$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.
1115	Community Small-engine electrification	$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 taken into account. 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**
1082	Bicycle, pedestrian, and trails network expansion	$13,108,964	-$3,800,771	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**
1078	Workplace bike amenities	$0	$2,593,114	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	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 0.1% per year (453,081 VMT - from impact analysis). Savings from fuel cost reductions.
1080	Bicycle rack incentive program	$7,562	-$730,532	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 (849,283 VMT - from impact analysis). Savings from fuel cost reductions. Assumes displaced VMT are from gasoline-powered vehicles.
1079	Required bike parking at MF/Comm developments	$0	-$35,260	Pleasanton CAP 1.0	Pleasanton CAP 1.0 estimates 25 hours of staff time per municipal code update.	Key Assumptions (Cost Effectiveness Explorer), Madrax: How to Affordably Park Multiple Bicycles	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. Average passenger VMT reduction of 0.1% per year (308,253 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
1070	Increase active transportation	$0	-$392,340	Redmond ESAP Action Costs	Designated to 0.3 FTE due to additional staff time needed to identify potential funding opportunities to expand electric bicycle usage and pedestrianizing of streets.	Pleasanton Impact Analysis	Average passenger VMT reduction of 0.1% per year (456,117 VMT - from impact analysis). Savings from fuel cost reductions.
1180	Increase transit ridership	$75,384	-$1,277,220	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 1.1% per year (5,464,707 VMT - from impact analysis). Savings from fuel cost reductions. Assumes displaced VMT are from gasoline-powered vehicles.
1184	VMT reduction for K-12 activities	$571,058	-$6,365,308	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 (6,160,757 VMT - from impact analysis). Savings from fuel cost reductions. Assumes displaced VMT are from gasoline-powered vehicles.
1159	Shared parking	$0	$0	Pleasanton CAP 1.0	Based on Pleasanton CAP 1.0 CBA TDM1-1 (assumes 40 hours of staff time).		No direct or significant financial cost change to community.
1230	Housing Element	$39,719	-$11,150,518	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 (8,801,254 VMT - from impact analysis). Savings from fuel cost reductions. Assumes displaced VMT are from gasoline-powered vehicles.
1227	Trend changes from COVID	$0	$0	Redmond ESAP Action Costs	Assuming 200 hours of staff time dedicated towards research and mapping of transportation trends.		No direct or significant financial cost change to community.
1086	Promote LEED Neighborhood Development	$910	-$850,666	Pleasanton CAP 1.0	Assuming 50 hours of staff time dedicated towards research and production of a LEED promotional brochure and CAP checklist update. Assume 0.05 FTE for ongoing outreach costs.	USGBC Certification Fees, City of Pleasanton Major Development Projects, Pleasanton Impact Analysis, Impact of Jobs-Housing Balance on Passenger Vehicle Use and Greenhouse Gas Emissions	Average passenger VMT reduction of 1.5% per year (7,990,212 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 - through 2050	Cumulative - through 2045	Cumulative - through 2030
1026	Neighborhood resilience hubs	No	N/A	Mid-term (4-7 years)	N/A	N/A	N/A	N/A	N/A
1143	Community gardens	No	N/A	Mid-term (4-7 years)	N/A	N/A	N/A	N/A	N/A
1130	CalFresh, WIC & Senior FMNP expansion	Yes	Direct	Near-term (1-3 years)	- 3% reduction in activity data (energy consumption, solid waste disposal).	Consultant estimate	N/A	N/A	N/A
1010	Reduce heat island effect	Yes	Supportive	Near-term (1-3 years)	N/A	N/A	N/A	N/A	N/A
1096	Wildfire preparation, prevention, and education	Yes	Supportive	Near-term (1-3 years)	N/A	N/A	N/A	N/A	N/A
1216	Institutionalize climate action	Yes	Supportive	Ongoing	N/A	N/A	N/A	N/A	N/A
1032	Prioritize adaptation and resilience in capital projects	No	N/A	Ongoing	N/A	N/A	N/A	N/A	N/A
1038	Critical facility relocation	No	N/A	Ongoing	N/A	N/A	N/A	N/A	N/A
1023	Comprehensive climate outreach[4]	No	N/A	Mid-term (4-7 years)	N/A	N/A	102,726	89,091	27,346
1228	Sustainability Awards	No	N/A	Mid-term (4-7 years)	N/A	N/A	N/A	N/A	N/A
1151	Update CAP checklist	Yes	Direct	Near-term (1-3 years)	- 3% reduction in activity data (energy consumption, solid waste disposal).	Consultant estimate	N/A	N/A	N/A
CRW1	School climate action planning	Yes	Supportive	Near-term (1-3 years)	N/A	N/A	N/A	N/A	N/A
CRW2	Access to green spaces	Yes	Supportive	Near-term (1-3 years)	N/A	N/A	N/A	N/A	N/A
CRW3	Community cooling centers	Yes	Supportive	Ongoing	N/A	N/A	N/A	N/A	N/A

[4] Mitigations accounted for in each respective sector (i.e., Buildings and Energy, Transportation and Land Use, and Materials and Consumption).

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
1026	Neighborhood resilience hubs	$369,290	$0	USDN-Resilience Hubs pg. 67-68	These are the calculations for 3 hubs. One-time cost at $135,273 x 3 hubs is $405,819. Annual cost per hub is $4,612.		No direct or significant financial cost to community.
1143	Community gardens	$115,355	$0	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 start up cost.	Oakland Parks and Rec	If partnered with a nonprofit, no additional cost to low-income communities.
1130	CalFresh, WIC & Senior FMNP expansion	$0	$0	San Jose Parks and Rec partnering with Fresh Approach	The city provides administrative, office and staff support to help the program. Numbers are based off of administrative support position from Parks and Rec.		No direct or significant financial cost change to community.
1010	Reduce heat island effect	$0	$80,022	Pleasanton CAP 1.0; Ann Arbor CAP 3.0 p. 104-105 (tree canopy)	Staff time required for 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.	San Antonio CBA; Ann Arbor CAP 3.0 p. 104-105 (tree canopy); Pleasanton internal estimates	Hard and soft costs to plant 200 trees per year and/or similar measures. Action is for new development applications with planting and building already occurring; may entail changing paving color. Building Code already requires parking lot trees.
1096	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.
1216	Institutionalize climate action	$1,991,951	$0	Pleasanton CAP 2.0; Dublin CAP Appx C p. 10	Staff time for promotion and monitoring will be ongoing but should decrease over time and related costs in future years should decrease annually, particularly as external funding sources are identified.		No direct or significant financial cost change to community.
1032	Prioritize adaptation and resilience in capital projects	$46,192	$0	Ann Arbor CAP 3.0 p. 100-101	One-time costs to conduct analysis, develop plans, and implement. Assumes once in place, City engineering staff will reference the plan with projects in a similar manner to the CAP checklist.		No direct or significant financial cost change to community.
1038	Critical facility relocation	$138,577	$0	Sample case studies: https://www.epa.gov/arc-x/anacortes-washington-rebuilds-water-treatment-plant-climate-	One-time costs are estimated for City to conduct analysis and develop high-level plans similar to the case studies identified using available EPA tools. FTE is for ongoing review. Cost estimate does not include relocation. FEMA funding may be available for detailed relocation plan development.		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
				change, https://www.epa.gov/arc-x/quinault-indian-nation-plans-relocation			
1023	Comprehensive climate outreach	$64,521	$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.		No direct or significant financial cost change to community.
1228	Sustainability Awards	$4,981	$0	ILG Beacon Program; Dublin CAP p. 1-7	Assume staff time for criteria development, selection, and webpage maintenance similar to https://dublin.ca.gov/1323/Green-Shamrock-Business-Recognition-Prog		No direct or significant financial cost change to community.
1151	Update CAP checklist	$49,020	$0	US GBC policy brief 2018; LEEDv4 in SF 2017; Dublin CAP Appx C p. 11	Assume 0.1 FTE staff time for analysis and implementation.		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 Planing 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 sucbconsultant 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 SiteDevelopment 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 Commision	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