



CITY OF  
**PALO ALTO**

SUSTAINABILITY  
AND CLIMATE  
ACTION PLAN

Draft – April 2016



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# FORWARD

We live in a time of challenge and change. The California economy, powered by the innovation engine of Silicon Valley, anchored in Palo Alto, has transformed the world. Companies like Google, Twitter, and Facebook have transformed the way we live and work. And now the world threatens to transform California. The drought—or, as some suggest, the “multi-decadal mega-drought”<sup>1</sup>—challenges not just our lawns, agriculture and hydroelectric power supplies, but the premise on which California civilization was built. Climate chaos may not devastate us the way that it threatens to devastate coastal regions from Bangladesh to south Florida, but heat, flooding and super storms will take their toll, and will take hundreds of billions of dollars to adapt to.

And yet... this cloud presents a silver lining. Perhaps a golden one. For in the challenge of responding to climate change, we find ourselves facing what Pogo called insurmountable opportunities, what those wild eyed radicals at Goldman Sachs see as the massive economic opportunity of a new energy economy—once again anchored here.

We are called upon to lead. Many would say the United States has lagged in response to climate challenge, compared to Europe, or China, though President Obama recent Executive Orders on emissions, energy has called the federal government to the challenge. Many would say that California has led in response to climate challenge—from revolutionizing utility regulation in the 1970s to driving the market for clean energy to our world-leading climate goals—now ratcheted up again by Governor Brown's recent Executive Orders on emissions, energy and water. Many would say that Palo Alto has been a leader in this process, with our early climate action plan, our carbon neutral electricity, and our actions to support green buildings and electric vehicles. Well, it's time for us to lead again, with a new sustainability and climate action plan that sets a new bar for leadership, that builds quality-of-life, prosperity and resilience for this community, and that sets an example once again for other communities to emulate.

We must understand and prepare for the risks ahead: climate change, with hotter and drier weather, combined with sea level rise and flooding; disruptions in resource flows and human migrations; the rise and collapse of companies and even industries; and the challenge of reinventing a way of life that was based on conditions that we may never see again.

This plan identifies a pathway to reduce our emissions 80% by 2030. Governor Brown has proposed 40% emissions reductions for California by 2030. Palo Alto is already at 36%. But achieving that next 40% will not be easy, since it will require transforming transportation and dramatically reducing the climate impact of our use of natural gas for heating our buildings and water.

Because we can do this. Here.

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<sup>1</sup> <http://www.climatecentral.org/news/is-the-wests-dry-spell-really-a-megadrought-16824>

# INTRODUCTION

As the heart of the region that drives the eighth largest economy in the world, what is created in Palo Alto has influence far beyond its borders. Palo Alto has made impressive—and in some cases remarkable—progress toward reducing its carbon impacts, greenhouse gas emissions, and resource consumption since establishing its first Climate Protection Plan in 2007.

While cities around the world ratchet up their own sustainability initiatives, Palo Alto will need to act boldly in order to maintain its legendary leadership position—and to ensure the wellbeing of this community in the face of the challenges ahead.

In the nine years since Palo Alto created one of the first climate protection plans in United States, the world has gotten hotter, the west has gotten dryer, and more cities have stepped into the ranks of climate leadership.

Palo Alto is poised to take the next step in climate and sustainability leadership. The Sustainability and Climate Action Plan (S/CAP) is Palo Alto's ambitious plan to create a prosperous, resilient city for all residents. To support Palo Alto's leadership position on climate protection, the S/CAP provides a roadmap for how the City will continue its environmental stewardship, and exceed state requirements for GHG emission reductions.

The S/CAP is intended as a strategic plan that sets direction and overall goals, suggests initial priority actions and proposes high-level implementation pathways to achieve them.

The S/CAP presents a scenario, not a prediction. It presents a clear direction—move rapidly toward deep decarbonization through a suggested portfolio of measures that show net positive financial benefit, and an estimate of the upfront investment required to generate those benefits. The specific measures, rates of adoption and impacts presented here are best estimates based on currently available information in a rapidly changing technology landscape; In order to be agile, adaptive and effective in the face of these changes, Palo Alto will update the S/CAP every five years, and develop more granular five-year work plans and short-term programs, rather than attempt to build a detailed 14-year work plan.

The time to act is now. In this new climate action plan, we identify a roadmap to move from carbon neutral electricity to a carbon neutral utility—and ultimately towards a carbon neutral city.

# ROADMAP TO A CARBON NEUTRAL CITY

## Palo Alto's Greenhouse Gas Baseline and Trends

By 2015, Palo Alto had already reduced GHG emissions an estimated 36% since 1990<sup>2</sup>—a remarkable achievement in 24 years, with most of it accomplished in the ten years since 2005—largely as a result of the leadership of Palo Alto Utilities and the City Council's 2013 commitment to carbon neutral electricity. Palo Alto's largest remaining sources of greenhouse gas emissions are road transportation (approximately 65%) followed by natural gas use (approximately 26%). **Figure 2** illustrates this trend, and **Figure 3** provides another view of the relative size of Palo Alto's emissions sources in 2015.

The estimated 36% GHG reductions to date were achieved through building efficiency measures and introduction of carbon neutral electricity (as well as societal trends such as more efficient appliances, not shown explicitly here). Over the next 15 years, a variety of external trends (designated in this Plan as “business as usual 1” or BAU1), including Federal and state policy (such as building efficiency and vehicle efficiency standards) and demographic changes, are expected to reduce Palo Alto emissions to an estimated 45% below 1990 emissions by 2030<sup>3</sup>—in line with the State of California's interim 2030 reduction target of 40%. Initiatives that the City has already approved or set in motion (such as existing CPAU efficiency incentive programs, Palo Alto's existing Green Building Ordinance and Reach Code, and the Bicycle and Pedestrian Plan), will bring emissions down to an estimated 52% of 1990 levels—provided Council maintains support for existing programs and approves these programs when they come before them. This reflects Palo Alto's longstanding commitment and initiatives already underway to drive deep carbon reductions ahead of the state or those being pursued by most other cities. Even though these Palo Alto plans are both aggressive and innovative, for the purpose of this report we categorize them as “business as usual”—since these efforts are already in the queue.

The additional GHG reduction between those already “in-the-pipeline” reductions and the 80% reduction target for 2030 is about 224,600 MT CO<sub>2</sub>e<sup>4</sup>, and is proposed by the S/CAP as Palo Alto's target “GHG reduction budget.” The Draft S/CAP projects that 117,900 MT CO<sub>2</sub>e, or more than half of the needed additional reductions, can come from mobility related measures, 97,200 MT CO<sub>2</sub>e, or just under half from efficiency and fuel switching measures (largely in buildings), and 9,500 MT CO<sub>2</sub>e, or 4% from continuation and extension of Palo Alto's zero waste initiatives. The Draft S/CAP also proposes other sustainability measure that don't have direct or easy to determine GHG impacts but that are important for other reasons, such as water sustainability, health of the natural environment and community resilience.

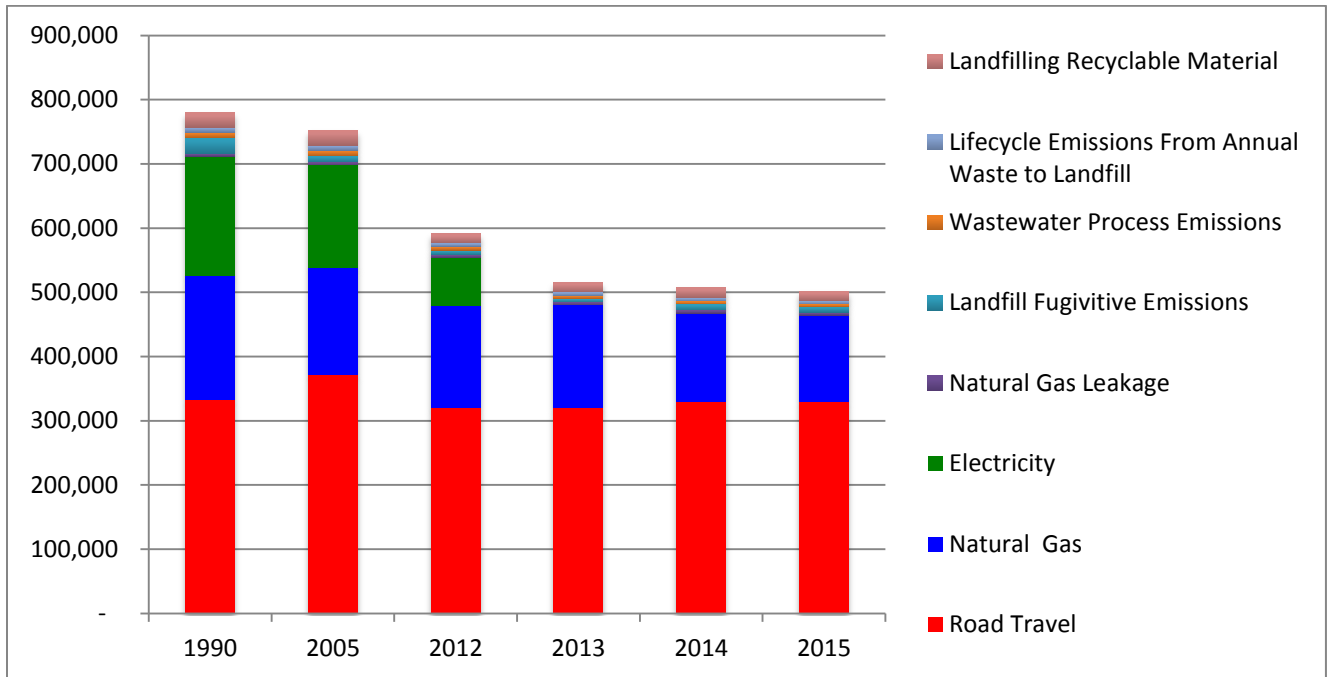
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<sup>2</sup> Palo Alto emissions in the 1990 baseline year are estimated at 780,119 MTCO<sub>2</sub>e, a restatement of prior estimates based on revised analyses using updated emissions models. Most emissions noted in this report as called “estimates,” since only utility consumption (electricity, natural gas and water) are measured. Transportation emissions are modeled every few years; solid waste related emissions are calculated using established EPA protocols. Solid waste related emissions were not included in the CompPlan DEIR.

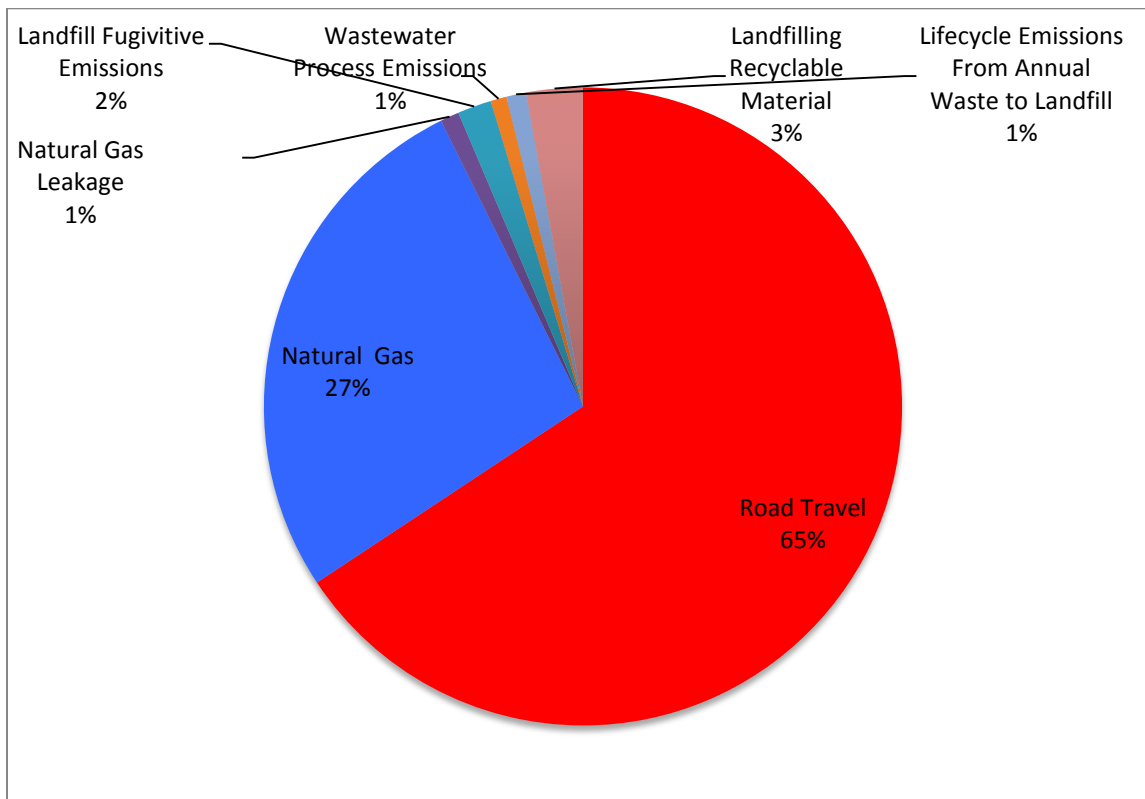
<sup>3</sup> Based on the “business as usual” analysis conducted for the CompPlan DEIR.

<sup>4</sup> MT CO<sub>2</sub>e = metric tons of CO<sub>2</sub> equivalent

**Figure 1. Palo Alto Community-wide GHG Emissions (MT CO2e)**

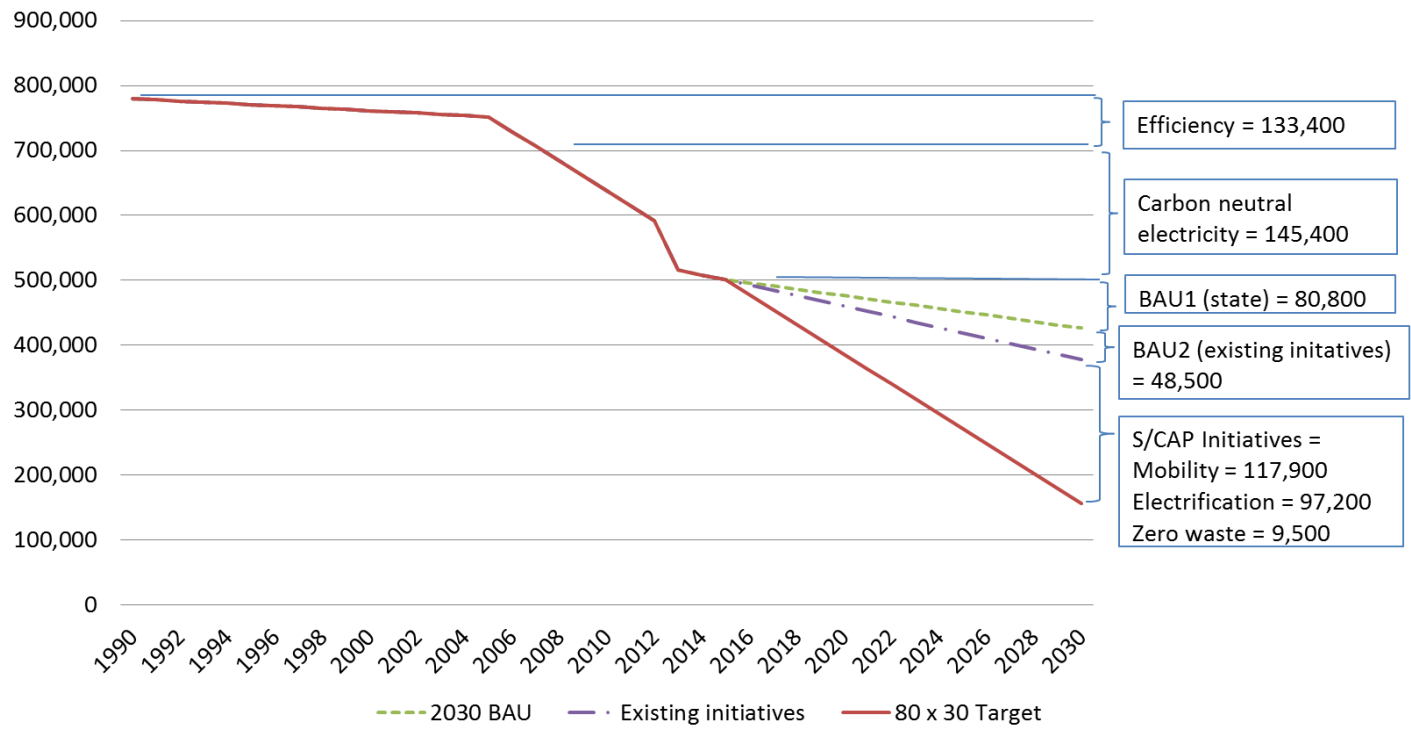


**Figure 2. Palo Alto 2015 Community-wide GHG Emissions Sectors**



A detailed emissions analysis can be found in Appendix X.

**Figure 3. Overview of Palo Alto GHG Reduction Target relative to Business-as-Usual (MT CO2e)**



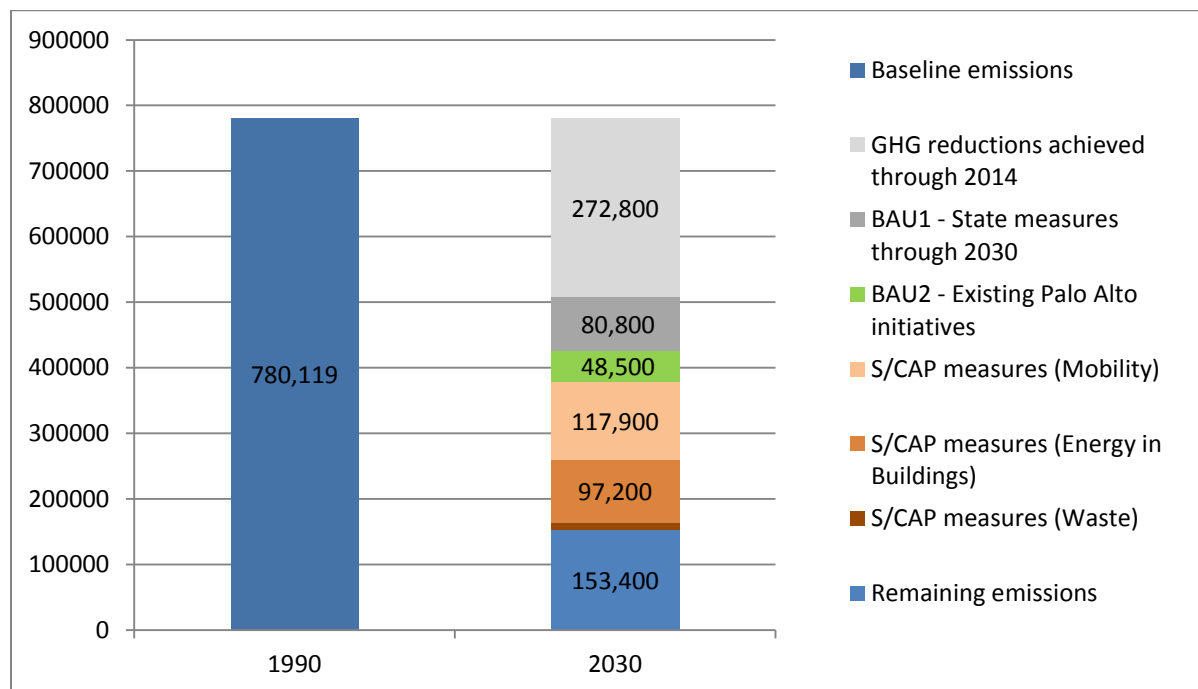


## A Roadmap for “80 x 30”?

Palo Alto has substantially exceeded the 20% reduction goals set by Council in 2007 Climate Protection Plan, and is positioned to establish new goals for Palo Alto to continue its global leadership, commit to a low- or zero-carbon future, and create a roadmap to that future.

This plan focuses on pathways to a low-carbon future, and initiatives addressing water, green infrastructure, adaptation and regeneration as part of a holistic framework for sustainability. Specifically, it explores a possible pathway for reducing Palo Alto’s GHG emissions by 2030 from the current level of 36% below 1990 levels to 80% below 1990 levels by 2030 (“80x30”), 20 years ahead of the State of California 80x50 target. This represents a GHG reduction “budget” of 260,000 tons (as shown in Figure 5 and detailed below), and will be possible only if Palo Alto continues its longstanding commitment to sustainability and if a number of assumptions that are outside the City’s control come to fruition.

**Figure 4: 80x30 GHG Reduction Budget (MT CO2e)**



Reducing greenhouse gas emissions in order to avoid potentially catastrophic climate change is a key driver for the S/CAP, but it is not the only indicator for sustainability. Therefore, the S/CAP is organized around ten overarching levers for sustainability, including some without direct quantifiable impacts on greenhouse gas emissions, but which are central to a holistic approach for sustainability in Palo Alto that protects and enhances our natural resources for generations to come. These are summarized in Figure 5, below, and described in more detail in the sections that follow.

### Key Levers for Sustainability and Climate Action

S/CAP’s main recommendation measures are summarized here, and presented with first level implementation detail in the draft plan.

- **Mobility:**
  - **Make it more convenient not to drive** by developing responsive, multimodal, service-focused transportation services
  - **Shift subsidies** from free parking to support non-SOV travel

- **Shift land use** patterns that reduce both congestion and climate impacts.
- Support policy changes that **promote EV charging infrastructure** in public and private development and that encourage EV use by residents and commuters
- **Efficiency & Electrification:**
  - **Pursue large gains in energy, water and materials efficiency** in buildings and operations
  - Pursue the adoption of an Energy Reach Code that **drives energy efficiency through our building codes**
  - Emphasize **integrative design** and **streamlined policy** approaches
  - Explore **building stock upgrades** to Zero Net Energy or Net Positive through design, efficiency, renewables and bundled services packages
  - **Encourage all-electric** new construction (if technically and legally feasible, cost effective and directed by City Council)
  - Rapidly upgrade the resource efficiency of existing building stock (residential and commercial)
  - Support a systematic **shift from natural gas to all-electric systems<sup>5</sup> and/or renewable natural gas** (if technically and legally feasible, cost-effective and directed by City Council)
- **Sustainable Water Management:**
  - Develop an **integrated, long-term strategy** that mitigates risks of long-term shift in water supply
  - Pursue policy changes that **promote water efficiency in buildings and landscaping**
  - **Balance** water importation, rainwater harvesting, groundwater management, recycled water use and onsite treatment options
- **Resilience, Adaptation and Sea Level Rise:**
  - **Build resilience** through risk mapping, mitigation, adaptation
  - Where necessary as a secondary response, consider strategic retreats.
- **Municipal Operations:**
  - **Embed sustainability** in city procurement, operations and management
  - **Set targets and track performance metrics** for City sustainability performance
  - **“Walk the talk”** by ensuring the City goes first on any sustainability actions requested or required of the community
  - **Include sustainability impacts** in staff reports, capital improvement project proposals and management reports.
- **Regeneration and the Natural Environment / Ecosystem and Human Systems Protection:**
  - Provide a **healthy, resilient environment** where all species can thrive and enjoy life.
- **Utility of the Future:**
  - **Adapt CPAU** offerings and business model to potentially disruptive challenges facing the utility industry, including distributed generation & storage, and “grid defection”
  - **Explore micro-grids, nano-grids** and other resilience strategies
- **Community Behavior and Culture Change**
  - Challenge community to **consider the impact on future generations** of choices in lifestyle, purchases and investment
  - Engage and support community through **neighborhood initiatives**, interactive tools, etc.
- **Information systems:**
  - **Advance “smart city” platforms** for transportation, utilities, buildings, operations, finance, etc.
  - Provide **transparent reporting and open data** to track performance, build knowledge and fuel innovation
- **Financing Strategies:**
  - **Finance cost-effective initiative** through multi-channel, non-general fund, local and external investment in support of these goals, to the extent permitted by existing legal and regulatory framework applicable to the City.

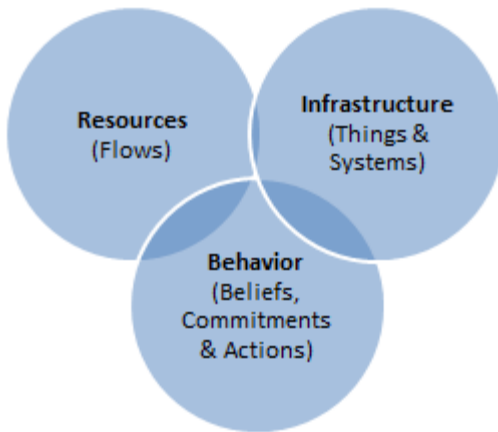
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<sup>5</sup> See analysis of electrification strategies, Staff Report 5971, August 2015

These measures will require strategies that address three domains of action (shown in **Figure 5**), all of which are critical to realizing the sustainability vision:

- institutions that form the structure of policies and programs,
- behavioral change to modify mindsets and personal actions, and
- financial considerations that drive markets.

**Figure 5. S/CAP Three Domains of Action**



### A few core moves

Palo Alto’s sustainability strategies ultimately rely on a few “core moves” for reducing impact on the environment and GHG emissions, and doing so in ways that improve the quality of life of our community:

- Reducing resource use, for example through energy efficiency measures;
- Shifting resource use impacts, for example by electrification;
- Transforming systems, for example by outcompeting single occupancy driving with mobility services.



#### **REDUCE**

- Energy efficiency
- Water conservation
- Walking/biking instead of driving
- Zero waste



#### **SHIFT**

- Convert to electric vehicles
- Electrify water and space heating
- Greywater or rainwater instead of potable water



#### **TRANSFORM**

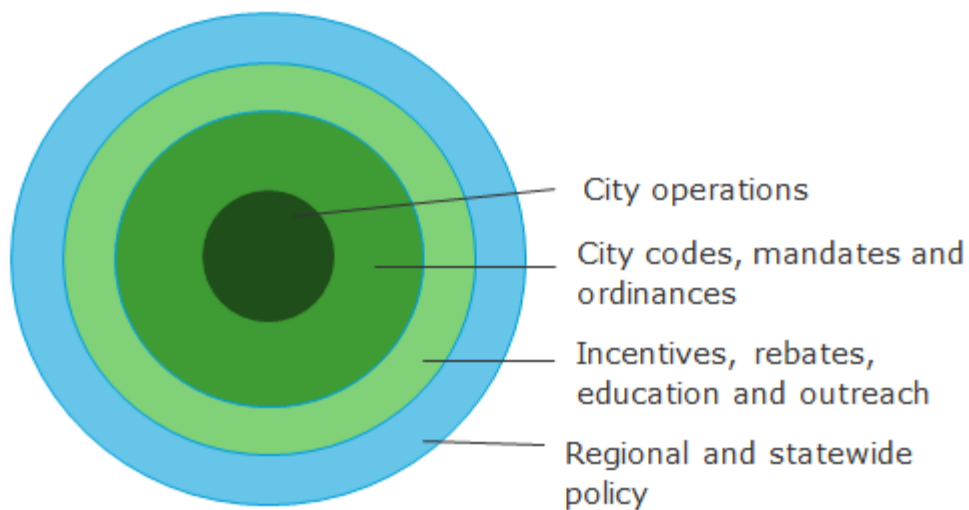
- Mobility as a Service instead of individual car ownership
- Transit-oriented development
- Utility of the Future

## Zones of Control and Influence

Palo Alto's ability to enact these core moves throughout the community is embedded within a regional, state and global context of regulatory and jurisdictional boundaries. **Figure 6** illustrates Palo Alto's levels of control and influence.

- City government has control over its own operations, including municipal buildings, fleet, procurement and service delivery—for example, environmentally preferable purchasing.
- It can establish policies, codes, mandates, regulations and standards that drive the GHG emissions reductions of our residents and workforce—for example, our PV readiness requirements for new construction and major renovations.
- It can influence community behavior through education, outreach and voluntary programs—such as CPAU's incentive programs.
- And it can work with neighboring jurisdictions and regional authorities to develop collaborative initiatives—such as regional transportation initiatives— and to influence regional, state and national policy.

**Figure 6. Palo Alto Jurisdictional Influence and Control**



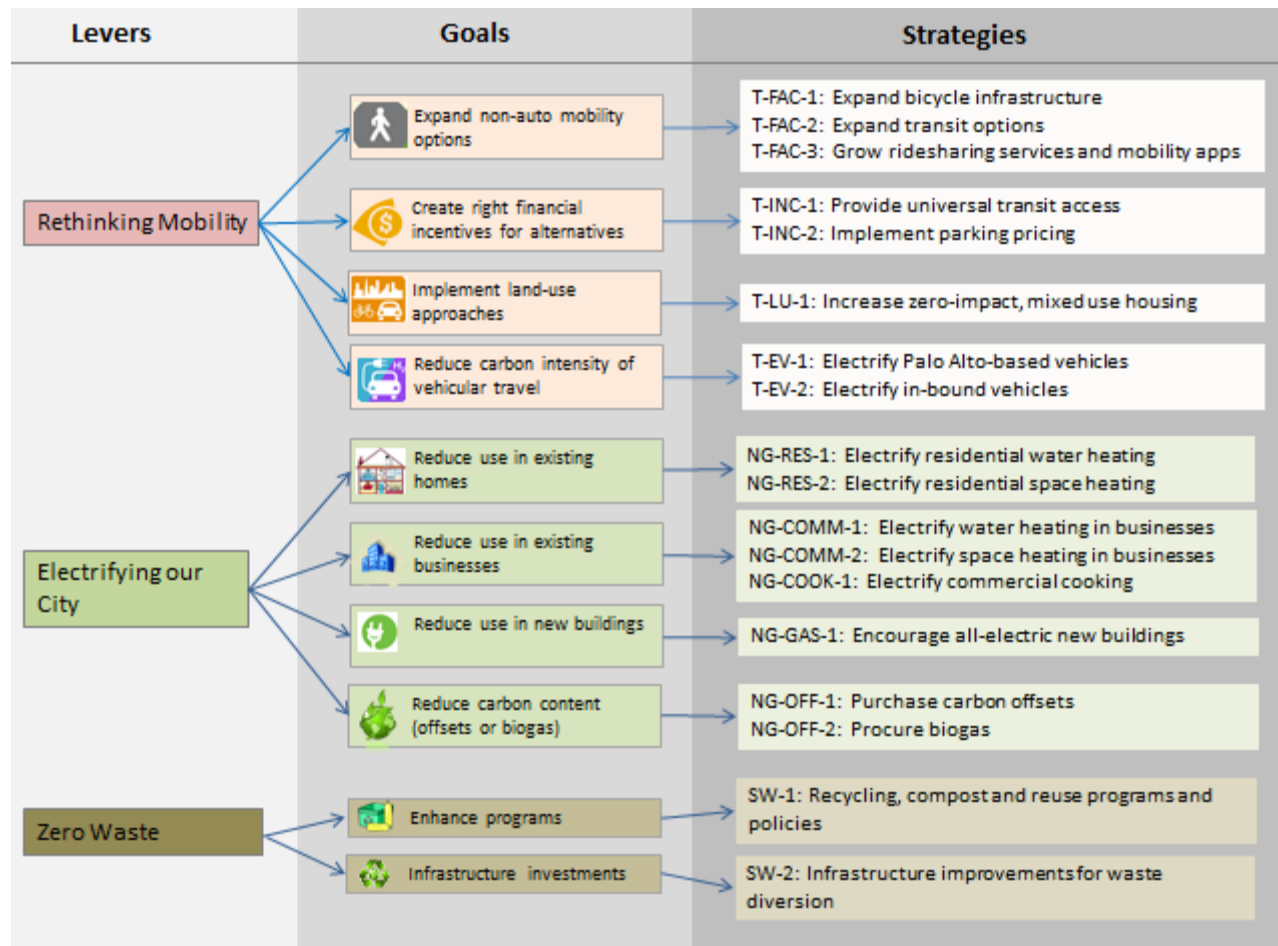
## Levers, Goals, Strategies and Actions

Figure 7 presents the key components of Palo Alto’s path to further GHG reductions:

- The primary levers with which we can shift emission trends
- The goals we will establish to activate those levers
- The strategies and actions by which we will achieve those goals

Figure 8 summarizes the emissions reduction potential of the proposed strategies, and the key players responsible for implementation, and Figure 9 shows this summary by goal. For several strategies, Palo Alto will need to work with regional and state entities to advocate for policies and programs to support Palo Alto efforts and initiatives. The levers, goals, strategies and actions are based on Palo Alto’s baseline emissions sources, existing and planned initiatives and a literature review of best practices for city climate action planning for effective new GHG reduction opportunities. (Note: Not all the strategies and actions in this Plan are summarized here, since some don’t have direct GHG reduction impacts, or those impacts are impossible to estimate at this time.)

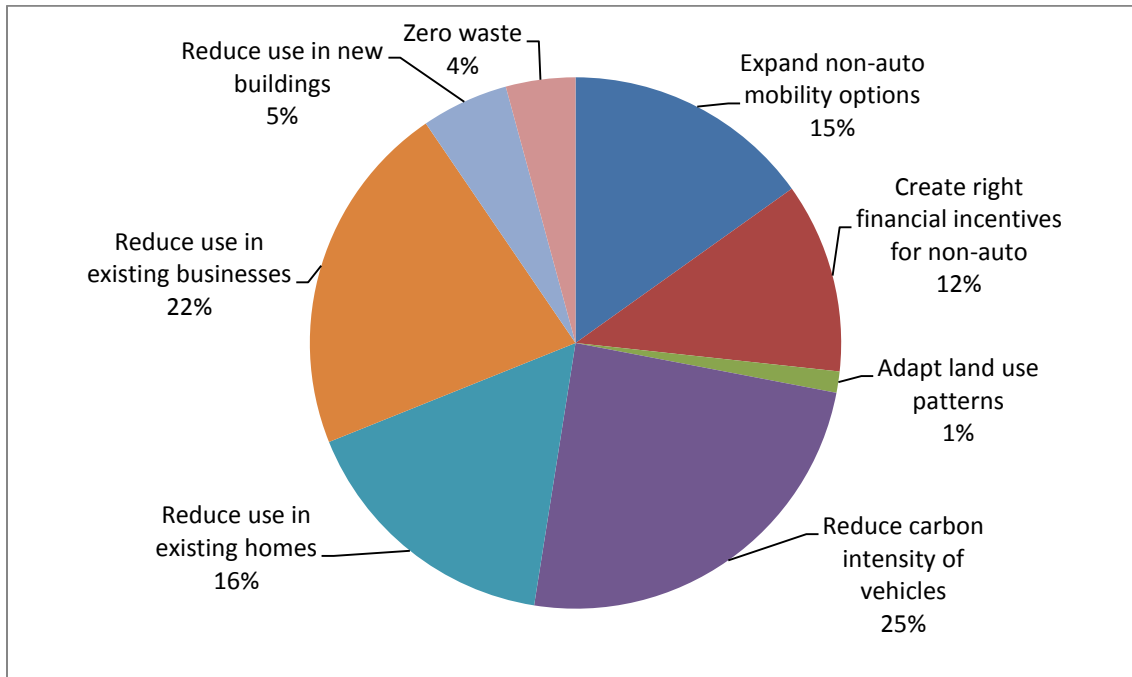
Figure 7. Overview of 3 Key Levers, Goals and Strategies for GHG Reductions



**Figure 8. S/CAP Strategies to Achieve 80 x 30 Goal**

Levers	Goals	Strategy	Jurisdiction PA = Palo Alto R = Regional S = State	GHG Avoided in 2030 (MT CO2e)	Percent of Total S/CAP Emissions Reductions	Percent of Reductions from 1990 Baseline
Rethinking Mobility	Expand non-auto mobility options	T-FAC-1. Expand bicycle infrastructure	PA	8,400	4%	1%
		T-FAC-2. Expand transit options	PA, R	19,200	9%	2%
		T-FAC-3. Grow ridesharing services and mobility apps	PA	6,400	3%	1%
	Create right financial incentives	T-INC-1. Provide universal transit passes	PA	7,600	3%	1%
		T-INC-2. Implement parking pricing and feebates	PA	18,400	8%	2%
	Adapt land use patterns	T-LU-1. Increase zero-impact, mixed use housing	PA	2,900	1%	0.5%
	Reduce carbon intensity of vehicles	T-EV-1. Electrify Palo Alto-based vehicles	PA	25,200	11%	3%
		T-EV-2. Electrify inbound vehicles	PA, R	29,800	13%	4%
Electrifying our City	Reduce use in existing businesses	NG-COMM-1. Electrify water heating in businesses	PA, S	21,200	9%	3%
		NG-COMM-2. Electrify space heating in businesses	PA, S	15,900	7%	2%
		NG-COOK-1. Electrify commercial cooking	PA, S	11,300	5%	1%
	Reduce use in existing homes	NG-RES-1. Electrify residential water heating	PA, S	13,600	6%	2%
		NG-RES-2. Electrify residential space heating	PA, S	23,300	10%	3%
	Reduce use in new buildings	NG-GAS-1. Encourage all-electric new buildings	PA, S	11,900	5%	2%
Zero Waste	Enhance programs and infrastructure	SW-1. Achieve zero waste	PA	9,500	4%	2%
TOTAL				224,600	100%	29%

**Figure 9. Summary of S/CAP Emissions Reductions by Goal**



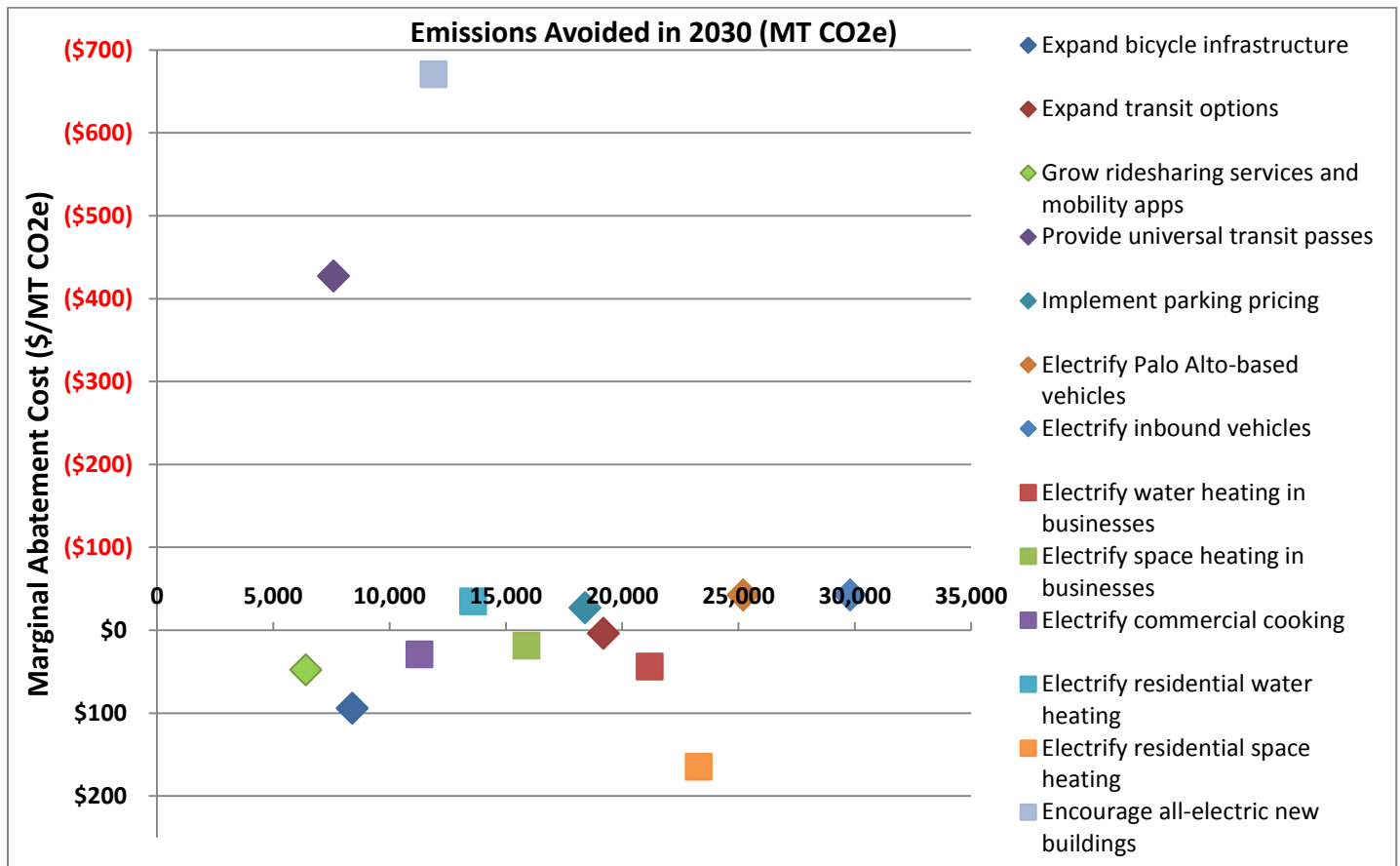
### Key assumptions

The key assumptions underlying the projections for the impacts of these initiatives are shown in Table XX. Some are controversial, but will hopefully provoke a grounded exploration of options and consequences.<sup>6</sup> Many are ambitious, and will require rapid rates of uptake of new technologies. For example, S/CAP projects that 90% of vehicles owned in Palo Alto will be EVs by 2030. Is that possible? We don't know, given that the State projects only 30%. More useful questions might be "What measures could we undertake to accelerate that change, or to take advantage of potential market changes that move more quickly than projected (as we have seen for years with PVs, EVs and other technologies)?" and "What policies could we pursue that might eliminate barriers that would otherwise hinder the rapid expansion and proliferation of Electric Vehicles in Palo Alto?"

The relative GHG reduction impacts (in metric Tons CO<sub>2</sub>e) and associated "mitigation costs" (in \$/mT) are shown in Figure 10. (The measures further to the right indicate greater impact; the measures higher on the chart indicate more favorable economics.)

<sup>6</sup> Note that in all these scenarios, reductions are partially driven by factors outside our control, including Federal and state policy, legal and regulatory constraints, cost-effectiveness of measures and technology, the pace of technology innovation, and behavioral changes by our population. In this way, the S/CAP may be similar to California Air Resources Board's (CARB's) update to the State's scoping plan, which suggests that near-term actions and targets need to be specific, quantifiable, and within an agency's control, while longer term actions and targets may require changes in technology and/or actions by others, and could be less precise. It should be noted, however, that the Draft S/CAP in some cases builds on the assumptions in the State's Scoping Plan, suggesting – for example – that the City seek to achieve a level of Electrical Vehicle (EV) ownership (for residents and commuters) three times what the CARB is targeting state-wide for 2030.

**Figure 10. Prioritizing Actions by GHG Impact & Mitigation Cost**



### The Power of “Unreasonable” Goals

The SCAP goals are ambitious, as called for by the Paris climate agreement. They also may be uniquely achievable by Palo Alto, because of the city’s significant head start, its carbon neutral electricity platform and its control of Palo Alto Utilities. They are in any event not certain to be successfully accomplished, since they depend on many variables, both within our control—such as the desirability of CPAU services and incentives and the effectiveness of City programs—and many factors outside our control—such as the pace of price/performance improvement of electric vehicles and the effectiveness of State climate programs.

Despite that uncertainty, stretch goals drive innovation better than safe ones. Setting a big goal and perhaps not fully reaching will likely get us farther than setting a safe goal and reaching it, especially in a time of rapid change. Our key question should not be “Are we confident we can achieve it?” No one knows if ambitious climate goals are achievable, based on today’s knowhow and experience; Johanna Partin, Director of the Carbon Neutral Cities Alliance, observes that “most of the CNCA cities...have a pretty good sense of how they’re going to get to somewhere between 25-70% of their target by 2020/25/30, but no one yet knows exactly how they’re going to get to 100% of their goal.” We only know that we must do our best to find ways to achieve them.

Better questions might be: Is the goal worthy? Is the strategic direction right? Are the first steps right? If so, then let’s get going, and re-evaluate goals and progress in five years; let’s support proposed goals with bottom up analyses, assessing “what combination of measures might make it possible to meet that specific goal?” As General (and later, President) Dwight D. Eisenhower observed, “Plans are useless. Planning is essential.”



## Guiding Principles

The Vision Statement for the 1998 Comprehensive Plan Governance Element declares that:

“Palo Alto will maintain a positive civic image and be a leader in the regional, state, and national policy discussions affecting the community. The City will work with neighboring communities to address common concerns and pursue common interests. The public will be actively and effectively involved in City affairs, both at the Citywide and neighborhood levels.”<sup>7</sup>

S/CAP builds on that vision with these guiding principles as a basis for effective and sustainable decision-making:

- Consider “sustainability” in its broadest dimensions, including quality of life, the natural environment and resilience, not just climate change and greenhouse gas emissions reductions.
- Address the sustainability issues most important to the community and select most cost-effective programs and policies—recognizing that this will entail moral and political, as well as economic, decision factors.
- Seek to improve quality of life as well as environmental quality, economic health and social equity.
- Foster a prosperous, robust and inclusive economy.
- Build resilience—both physical and cultural—throughout the community.
- Include diverse perspectives from all community stakeholders, residents, and businesses.
- Recognize Palo Alto’s role as a leader and linkages with regional, national and global community.

## Design Principles

In both evaluating this S/CAP, and in developing and evaluating future programs guided by it, Palo Alto is guided by these design principles:

- Focus on what’s feasible—recognizing that technology and costs are shifting rapidly.
- Prioritize actions that are in the City’s control – recognizing that we can urge others to join us, but leading by example is most effective
- Be specific about the actions and costs to achieve near-term goals, while accepting that longer-term goals can be more aspirational
- Use ambient resources: Maximize the efficient capture and use of the energy and water that fall on Palo Alto.
- Full cost accounting: Use total (life cycle) cost of ownership and consideration of externalities to guide financial decisions, while focusing on emission reductions that achievable at a point in time (i.e. not on life cycle emissions).
- Align incentives: Ensure that subsidies, if any, and other investment of public resources encourage what we want and discourage what we don’t want.
- Flexible platforms: Take practical near term steps that expand rather than restrict capacity for future actions and pivots.

## Decision Criteria

In selecting specific programs and policies to pursue, and in allocating public resources to support them, Palo Alto will be guided by these decision criteria:

- Greenhouse gas impact
- Quality of life impact

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<sup>7</sup> <http://www.paloaltocompplan.org/plan-contents/governance-element/>

- Mitigation cost
- Return on investment (ROI)
- Ecosystem health
- Resilience
- Impact on future generations

## **Overarching Policies and Legal Issues**

The proposals set forth in the draft S/CAP will need to be specifically analyzed in the context of applicable local, state and federal legal requirements, policy tradeoffs, budget and cost considerations, technological feasibility and economic impacts to the City prior to any adoption. Implementation of any of the new policies and programs described in the draft S/CAP will also be subject to the same considerations, as determined periodically by the Palo Alto City Council, and will continue to take into account existing local, state, and federal laws, regulations, and programs to avoid unnecessary duplication, minimize uncertainty, and maximize predictability.

Measures presented here constitute a preliminary menu of options for Council to consider as potential methods for achieving greenhouse gas reduction goals adopted by Council; the proposals set forth in the draft S/CAP are for discussion and the City of Palo Alto.

# RETHINKING MOBILITY

Road transportation represents about 61% of Palo Alto’s carbon footprint—and a congestion headache for everyone. Palo Alto’s existing Comprehensive Plan calls for reducing reliance on the automobile, and we’ve made some progress, with reductions in commute trips by Single Occupant Vehicles (SOV) from 75% to 62% between 2000 and 2014 and to 55% for commuters to Downtown.

We’ve also dramatically reduced car trips to Palo Alto schools, with 44% of high school students commuting by bicycle. Beyond our borders, federal CAFE standards have reduced the carbon intensity of the US vehicle fleet. But congestion continues unabated, and the majority of Palo Altans, and commuters to Palo Alto still make Single Occupancy Vehicle (SOV) trips in fossil fuel powered vehicles.



GHGs from road travel are a function of two factors: Vehicle Miles Travelled (VMT), and the carbon intensity of that travel (GHG/VMT). Reducing GHG/VMT is largely a function of vehicle technology, driven for example by Federal CAFE standards, state policy, improved fuel efficiency, electrification and customer adoption. Most of these factors are outside the purview of cities, but Palo Alto has some ways to influence VMT, by developing attractive alternatives to SOV trips, and GHG/VMT, largely by encouraging electrification of City, resident and commuter fleets.

Traditional approaches to transportation—adding capacity by building roads and parking—send the wrong signals, encourage SOV travel and add pain. But what if we asked a different question: **How could we make it more convenient for anyone, anywhere, anytime to not have to get into a car and drive?**

The key tools the City has for doing so include:

- Optimizing transit
- Electrifying Vehicles
- Incentivizing People to change their travel modes
- Integrating Transportation Network Companies (TNCs) and Autonomous Vehicles
- Implementing land use policies that support these shifts.

## Goal: Expand non-auto mobility options

This goal focuses on improving alternative modes of transportation to support non-automobile based mobility. The key: making it more convenient for anyone, anywhere, at any time, not *have* to drive by

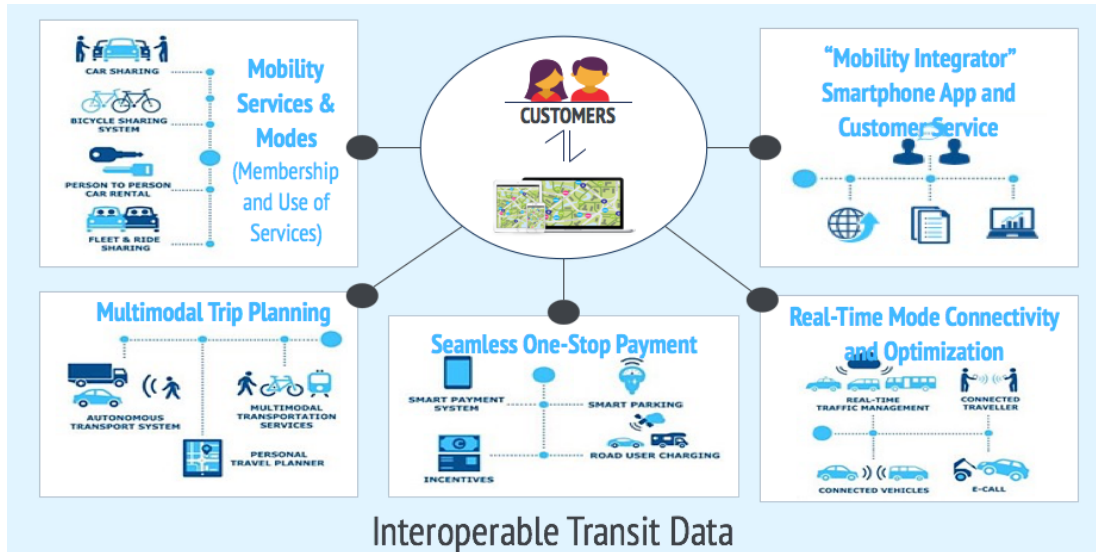
- Expanding existing initiatives (such as bike infrastructure)
- Targeting specific populations with relevant non-SOV services that they can afford
- Developing advanced, software-based solutions (MaaS)
- Continually tracking performance of these programs overtime

“Mobility as a Service” (MaaS) is an integrative approach that proposes to shift the traditional focus from fixed transportation to flexible, responsive transportation services designed to meet people’s diverse and changing needs by providing seamless regional multi-modal mobility services, including improved transit, and bike share; dynamic, on-demand shuttles; flexible first &

TDM/TMA: The City supports a number of emerging transportation demand management (TDM) initiatives including its first Transportation Management Association (TMA)<sup>1</sup>, which will develop, manage, and market transportation programs to reduce single occupancy vehicle trips in the Downtown Core area. The Comprehensive Plan Update also provides an opportunity to establish policies that outline when TDM should be applied and programs that specify how compliance will be periodically measured and enforced. TDM plans for individual development projects can establish TDM requirements and set enforceable SOV mode-share targets. TDM plans would establish a list of acceptable TDM measures that include transit use, prepaid transit passes, commuter checks, car sharing, carpooling, parking cash-out, bicycling, walking, and education and outreach to support the use of these modes. They should provide a system for incorporating alternative measures as new ideas for TDM are developed.

last mile solutions; walkable/bikeable communities; and smart apps that provide convenient access to all of these.

**Figure 11. Mobility as a Service (MaaS) Schematic**



*Source: Finland Ministry of Transport and Communications & Rocky Mountain Institute*

Strategy	2030 Target	2030 GHG Emissions Reduction
T-FAC-1. Expand bicycle infrastructure	Increase bike boulevard miles to 26 miles Increase bike mode share, including work commute trips, from 7% to 25%	8,400 MTCO <sub>2</sub> e
T-FAC-2. Expand transit options	Increase transit ridership by 60%	19,200 MTCO <sub>2</sub> e
T-FAC-3. Grow ridesharing services and mobility apps	Increase in rideshare mode	6,400 MTCO <sub>2</sub> e

## **Strategy: Expand bicycle infrastructure (T-FAC-1)**

### **Upgrade and integrate bicycle network (T-FAC-1.1)**

- Continue to integrate bicycle boulevards with separated bikeways on arterial street and off-street paths and trails to create an integrated network of internal and inter-city routes that are safe and comfortable for use by cyclists of all ages and abilities, and accessible to all major destinations in the City.
- Ensure bikeway networks are represented on online mapping
- Install bicycle and pedestrian sensors on utility poles to track transportation mode shares
- Convert 40% of bike lanes to protected bike lanes by 2030.
- Evaluate what would be required to achieve bicycle mode share levels being targeted by other cities, ranging from Portland and Copenhagen and LA.
- Develop bike routes that link effectively with adjacent jurisdictions.
- Reduce gaps in bikeways by creating a stress map to identify gaps
- Institute additional car-free streets through extending days that University Avenue is car-free
- Replace parking lanes in specific areas with separated bike lanes

### **Increase bike boulevard mileage within Palo Alto (T-FAC-1.2)**

- Implement 2012 Bicycle and Pedestrian Transportation Plan proposals for new additions to the bicycle boulevard network, and a design toolbox that emphasizes integrated wayfinding, speed limit reductions, actuated arterial crossings, and greater use of traffic circles as a replacement for stop signs.
- Increase bicycle boulevards network to increase bicycle mode share, safety, and mobility.

### **Reestablish and expand Palo Alto bike share program (T-FAC-1.3)**

- Work with neighboring cities to establish a program to continue a bike share program, and expand the number of bikes from the 37 bikes at five stations to more than 20 stations by 2020.
- Update the City's Bicycle and Pedestrian Transportation Plan every 5 years.
- Integrate bike share into regional transit payment media, commuter wallet and Clipper 2.0
- Incentivize e-bikes through rebates
- Incentivize e-bikes through charging infrastructure in bike racks

## **Strategy: Expand transit options (T-FAC-2)**

### **Expand ridership on SamTrans, VTA, Dumbarton Express and Palo Alto shuttles. (T-FAC-2.1)**

- Complete shuttle study to determine what is needed to increase ridership
- Increase marketing, information, and education about transit service and how to use different transit options
- Decrease shuttle headways to 10 minutes or less during commute hours and 15 minutes or less at other times.
- Contract low-carbon or zero-carbon shuttle fleet
- Add transit service to high demand routes and upgrade service on other routes to expand the network of routes achieving frequent service standards.
- Institute queue jump lanes for high ridership and regional transit lines (e.g., Dumbarton Express, 522 ECR, high ridership shuttles)
- Support and enhance inclusion of public and private school commute patterns in the local transit system, including schedule and route coordination.
- Provide real time, "next bus" scheduling information at shelter stops, on smart phones and integrate into "commuter wallet" as part of MaaS.

- Provide (or invite) dynamically responsive shuttles.

### **Achieve target levels of ridership of Caltrain Modernization. (T-FAC-2.2)**

- Provide real-time arrival information at shelters, stops and on phones, integrated into the "commuter wallet"
- Ensure inter-operable, real time data across all transit agencies, and support efforts to integrate train, bus, and shuttle schedules
- Continue to encourage the provision of amenities such as seating, lighting, and signage including real-time arrival information, at bus and shuttle stops and train stations to increase rider comfort, safety, and convenience.
- Support continued development and improvement of the Caltrain Stations as important transportation nodes for the City.
- Develop and improve Caltrain stations as transit hubs with amenities such as bike share, showers, bike parking, car share, and designated areas for transportation network companies
- Improve access to Caltrain stations, including better connections to Stanford Research Park through new shuttles
- Focus new development near Caltrain stations, particularly within ¼ mile.
- Work with Peninsula Corridor partners to upgrade the Caltrain corridor to provide reliable, frequent, all day high capacity transit service to/from destinations along the US101 corridor from San Francisco to San Jose (and on to Gilroy).
- Decrease wait times for intercity transit to 10 minutes or less during commute hours and 15 minutes or less at other times.
- Ultimately, support development, as needed, of additional tracks and stations, and potentially grade separation of all or a part of the Caltrain corridor.

### **Strategy: Grow ridesharing services and mobility apps (T-FAC-3)**

#### **Increase shared transportation ridership rates (T-FAC-3.1)**

- Facilitate casual carpool, and use of Transportation Network Companies (TNCs; eg, Uber, Lyft, and others) for dynamic commute ridesharing and for first mile/last-mile travel options.
- Provide financial assistance and driver opportunities to low-income TNC riders

#### **Support infrastructure for ridesharing (T-FAC-3.2)**

- Adopt carpool matching app/service with City employees serving as initial pilot
- Designate curb space for rideshare/carpool pick-up and drop-off downtown, and at Caltrain Station, and near stations.
- Install kiosks with information for TNCs

#### **Promote and facilitate smart phone applications for seamless mobility payment and booking options (T-FAC-3.3)**

- Develop or procure MaaS smart phone app to provide seamless plan/book/ride/pay service, either through a Palo Alto "commuter wallet" or a regional collaboration
- Work with regional partners to develop regional MaaS solutions
- Require ride-sharing transportation network companies to share data to support integrated services.
- Embed specific requirements in requests for proposals (RFPs) to encourage utilization of common technology platforms and expand services to diverse neighborhoods and populations
- Provide real-time reporting/dashboard on city travel/corridors

### Provide additional incentives for carpooling and vanpooling (T-FAC-3.4)

- Expand the availability and utilization of vanpools, especially targeting shared transportation to dispersed employment sites in Palo Alto from parts of the SF Bay Area (and adjacent counties in the Central Valley and Monterey Bay Areas) that are not especially transit accessible.
- Designate carpool and vanpool parking spaces in City garages.
- Provide discounted parking for carpools, paid parking refund for vehicles parked in public lots or on-street.
- Optimize parking signal timing for GHG reduction
- Model/Pilot having neighborhoods compete to have greatest non-SOV ridership

## Goal: Create the right incentives for mobility

Despite the goal in Palo Alto’s 1998 Comprehensive Plan to reduce dependence on the private automobile, the City provides free parking in public lots and garages—thus incentivizing driving to the tune for \$3600/year<sup>8</sup>—and has plans to build additional parking capacity. Instead, Palo Alto will identify ways (starting with a paid parking study this spring) to phase out automobile subsidies by charging for parking—ideally in coordination with neighboring jurisdictions—and investing the proceeds (as Stanford has successfully done<sup>9</sup>) in alternatives like transit, bicycle infrastructure, ride sharing, walkable neighborhoods, etc.

Strategy	2030 Target	2030 GHG Emissions Reduction
T-INC-1. Provide universal transit passes	75% of residents and employees have universal transit passes	7,600 MTCO <sub>2</sub> e
T-INC-2. Implement parking pricing	100% of City sites and 50% of private sites have parking pricing	18,400 MTCO <sub>2</sub> e

<sup>8</sup> Amortized cost of providing parking spaces at investment of ~\$60,000 per space.

<sup>9</sup> Stanford’s program has reduced SOV rates from 72% to 42%, and avoided \$107 in capital expenditures for parking structures that were no longer needed. See, for example, <http://bit.ly/1RCmSS2>

## **Strategy: Provide universal transit access (T-INC-1)**

### **Expand universal transit pass program for all residents and employees (T-INC-1.1)**

- Expand TDM policies to include requirements for the provision of Go-Passes, as well as Eco-Passes (a similar universal transit pass offered by the Santa Clara Valley Transportation Authority) to all residents of existing and new multi-unit buildings in the City, as well as all employees of Palo Alto employers with ten or more employees.
- This strategy is complementary to several other transportation strategies including T-FAC-3 Expand transit facility and services, T-INC-2 parking pricing and management approaches, and T-LU-1 balanced community.

## **Strategy: Implement parking pricing (T-INC-2)**

### **Have all City employment sites and 50% of private employment sites to institute parking pricing programs and policies (T-INC-2.1)**

- Complete and evaluate Paid Parking Study to identify primary recommendations and phasing for reducing or eliminating parking subsidies.
- Pilot voluntary parking cash-out with non-union City employees and change memorandum of understanding with City union employees to allow parking cash-out
- Reduce or eliminate requirements for off-street parking for new commercial/residential development
- Require unbundling parking costs from lease or sale of commercial and residential units
- Use meters/permits or time limits to manage parking demand in congested areas.

### **Expand paid parking strategies in specific areas (T-INC-2.2)**

- Evaluate the use of paid or meter parking strategies for on-street and off-street parking to facilitate parking availability and maximize parking utilization.
- Institute a “free parking surcharge” in select areas, and apply revenues to non-SOV alternatives
- Consider comparable programs for the California Avenue business district, the Stanford Research Park and potentially other districts.

### **Assess off-street parking requirements (T-INC-2.3)**

- Review off street minimum vehicle parking requirements
- Determine whether they can be reduced in situations where building location or design could reduce the demand for parking spaces and where reductions are acceptable in exchange for desired uses such as car-share spaces or alternative fuel vehicle infrastructure.
- Explore “parking maximum” and trip cap requirements

### **Apply parking revenues to travel and parking demand (T-INC-2.4)**

- Evaluate use of parking revenues and the development of a new in-lieu fee program for transportation programs
- Support the downtown transportation management association (TMA) to reduce single-occupancy driving
- Consider using parking revenues to pay for streetscape improvements that make biking, walking and transit more appealing

## **Goal: Seek balanced development**

Palo Alto can potentially reduce commute-related VMT through development patterns that support shorter commutes and complete neighborhoods, by enabling people to live closer to where they work. This is a sensitive



and controversial topic, but its impact is so significant that it must be included here, and discussed and resolved in the community.

Palo Alto has long had an imbalance between jobs and housing, with almost three times as many jobs and employed residents in 2014. This imbalance between jobs and employed residents contributes to local and regional traffic, greenhouse gas emissions, and other impacts, as some workers travel long distances between their residence and workplace. The imbalance is projected to grow if the City does not take affirmative steps to address the issue through the Comprehensive Plan Update. These steps could include:

- Increased housing densities
- Increased areas under existing maximum zoning rules
- Additional regulation of employment densities
- Additional commercial downzoning

This strategy would include adopting a land use and transportation scenario to enable additional growth and development in transit accessible areas, *provided that all such development was designed for low traffic/energy/carbon/water impact* and would be approved only with an integral plan resulting in no net increase in vehicle trips to/from Palo Alto. (Mitigation Measure Trans1a in the Comprehensive Plan EIR would provide this type of requirement.)

Strategy	2030 Target	2030 GHG Emissions Reduction
T-LU-1. Develop zero-impact, mixed-use housing	Target 2.95 jobs-housing ratio <sup>10</sup>	2,900 MTCO <sub>2</sub> e

## Strategy: Increase zero-impact, mixed-use housing (T-LU-1)

### Explore “zero impact” standards in residential and commercial development (T-LU-1.1)

- Use sustainable neighborhood development criteria to enhance connectivity, walkability, access to amenities, and support housing diversity
- Accelerate transit-oriented development (TOD) of infill and redevelopment that creates no additional vehicle trips, traffic/energy/carbon/water impact.

### Support additional mixed use development (T-LU-1.2)

- Identify and implement strategies to increase housing density and diversity, including mixed-use development near a range of types new community services, through amending the zoning code to allow high-density residential in commercial areas near transit

#### Vehicle Trip Cap:

Mountain View sets *maximum* parking requirements and eliminates minimum off-street requirements, and targets 30-45% single-occupancy vehicle mode share, depending on the density of employment within buildings. One employer faces penalties of \$100K for each 1% over the cap. Similar caps are in place in Sunnyvale, Menlo Park and Cupertino.

A mitigation measure in the Comp Plan Draft EIR suggests a similar approach, requiring aggressive TDM plans, with quantitative performance measures and enforcement, as well as requirements to off-set any new trips that cannot be reduced through TDM.

<sup>10</sup>This jobs-housing ratio is expressed as the ratio between jobs and employed residents.

**Identify, as part of long-range planning, potential sites for transit-oriented development with higher allowed density (T-LU-1.4)**

- Plan for additional—zero impact—housing units beyond current levels under consideration.
- Areas for potential growth include Stanford Research Park, downtown core, Stanford Shopping Center, as well as additional infill through “backyard cottages” and other accessory dwelling units.

**Expand housing options consistent with zero-impact goals (T-LU-1.3)**

- Consider creating an amnesty program to legalize existing illegal second units, where consistent with compliance with code standards, and character of existing neighborhoods.
- Emphasize and encourage the development of affordable housing to support Palo Alto’s share of regional housing needs.

**Prioritize street infrastructure improvements to prioritize GHG emissions reductions (T-LU-1.5)**

- Redevelop existing streets to open up street space to prioritize shared modes.
- Embrace “tactical urbanism” to rapidly experiment with different alternatives and learn what works.
- Prioritize traffic signal timing to reduce GHG emissions instead of amount of delay in car travel.

**Goal: Reduce the carbon intensity of vehicular travel**

Expanding the percentage of trips taken in EVs would have the largest impact on emissions from road transportation, which is in turn the largest category of Palo Alto emissions. Since the city’s electricity is 100% from renewable resources, taking steps to encourage all new vehicles purchased to be EVs or other zero emissions technology would significantly reduce emissions associated with on-road vehicles.

Palo Alto already has one of the highest rates of EV ownership in the country (estimated by staff at 3-4% of registered vehicles), but several factors limit EV adoption, including price (which is dropping rapidly), total cost of ownership (often poorly understood), and vehicle performance— especially “range anxiety.”

Initiatives to overcome these barriers, and keep Palo Alto’s EV adoption well ahead of the State’s aggressive goals, could include: public education, target incentives and charging infrastructure development.

Based on the ratio of jobs to employed residents and an analysis of VMT, approximately 93% of Palo Alto’s transportation-related emissions are estimated to be related to trips into or out of Palo Alto for work, shopping and other purposes (i.e. the VMT is not associated with trips that are internal to Palo Alto). An estimated 78% of the total vehicle trips have origins or destinations external to Palo Alto.<sup>11</sup>

Strategy	2030 Target	2030 GHG Emissions Reduction
T-EV-1. Electrify Palo Alto-based vehicles	90% of vehicles in Palo Alto are zero emission	22,900 MTCO2e

<sup>11</sup> Estimated 95,742 jobs and 34,428 employed residents. (Source: 2016 Official City Data Set.) Estimates of Internal, Internal-External, and External-Internal VMT and vehicle trips are from the Comp Plan Draft EIR p. 4.13-45. S/CAP allocates road emissions differently than the CompPlan analysis, where emissions from all trips, which are assumed to be round trips, are equally split between inbound and outbound. Since potential strategies available to Palo Alto to affect those trips are different for inbound vehicles than for those based in Palo Alto, the S/CAP allocates these emissions based on trip origination.

T-EV-2. Electrify inbound vehicles	50% of inbound vehicles (non-Palo Alto based) are zero emission	27,000 MTCO2e
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**Strategy: Explore ways to expand charging infrastructure across Palo Alto (T-EV-0)**

**Reconvene the electric vehicle supply equipment (EVSE) task force**

- Examine how to promote prewiring of EV infrastructure in existing building to remove barriers for future electric vehicle owners

**Develop strategies for expanding city-wide EV charging infrastructure.**

**Develop pricing policies and CPAU rate structures (consistent with legal requirements) for electric vehicle charging at home, in places of business and shopping, as well as in the public right-of-way and parking structures.**

**Develop an EV promotion roadmap that identifies all policy and technical issues, barriers and opportunities to focus on over the next 3 to 5 years.**

**Identify grant opportunities, rebates, incentives, and other promotional programs to stimulate electric vehicle ownership and support EV infrastructure, and coordination opportunities related to electric vehicle ownership and infrastructure.**

**Explore opportunities to partner with major manufacturers like Tesla and Google to identify policy roadblocks and collaboration opportunities.**

## **Strategy: Electrify and decarbonize Palo Alto-based vehicles (T-EV-1)**

### **Explore time-of-use (TOU) electric rate options for residential customers, including EV customers, residential customers, including EV customers, for residential charging. (T-EV-1.1)**

- Develop policies to permit installation of on street electric vehicle charging for private use, including for multi-family dwelling units

### **Consider rebates or financial incentives for Palo Alto residents (T-EV-1.2)**

- Identify grant opportunities, rebates, incentives, and other promotional programs to stimulate electric vehicle ownership and support EV infrastructure, and coordination opportunities related to electric vehicle ownership and infrastructure.
- Develop an EV promotion roadmap that identifies all policy and technical issues, barriers and opportunities to focus on over the next 3 to 5 years.
- Explore providing rebates to Palo Alto residents and employees for electric vehicle and/or EVSE purchases, using Low Carbon Fuel Standard funds, or other funding sources .
- Explore new models for financing EVs in Palo Alto

### **Seek to convert public transportation vehicles to EVs. (T-EV-1.3)**

- Accelerate the electrification of City fleet
- Specify and provide bidding preference for electric or zero emission options for Palo Alto shuttles.
- Work with SamTrans and VTA to encourage the adoption of electric, fuel cell or other zero emission vehicles
- Provide more information about electric vehicles including considerations related to charging infrastructure/programs/policies, vehicle range, lifecycle costs of ownership compared with conventional vehicles

### **Increase education and outreach related to electric vehicles (T-EV-1.4)**

- Provide more information about electric vehicles including considerations related to charging infrastructure/programs/policies, vehicle range, lifecycle costs of ownership compared with conventional vehicles

## **Strategy: Electrify and decarbonize inbound vehicles (T-EV-2)**

### **Prioritize workplace and retail charging requirements (T-EV-2.1)**

- Require and/or incentivize employers to provide workplace charging through reduced parking requirements, or other financial incentives.
- Provide preferential parking for electric vehicles at employment sites and retail/shopping areas

### **Make it easier to find public charging stations (T-EV-2.2)**

- Develop (or encourage private sector firms to develop) smartphone app to show real-time charging information and predictive analytics to indicate likely availability of chargers

### **Create incentives for high-mileage vehicles to convert to electric or other zero emission vehicle (T-EV-2.3)**

- Explore policies and incentives for transportation network companies and car-sharing programs.

# BUILDING AN EFFICIENT ELECTRIC CITY



Palo Alto has made remarkable progress in advancing energy efficiency, through CPAU's incentive programs and the City's nation-leading Green Building Ordinances and Energy Reach Codes, and in decarbonizing its electricity sector, through CPAU's carbon neutral electricity (CNE) initiative, which is largely responsible for Palo Alto's remarkable 36% GHG emissions reduction to date. The CNE Resource Plan, adopted in 2013, directed CPAU to eliminate fossil-generated electricity by (1) expanding purchases of long-term renewable energy contracts to about half of Palo Alto's electricity needs by 2017, (2) relying on existing carbon-free hydroelectric resources for the other half of electric supply needs, and (3) purchasing short-term renewable resources and/or renewable energy credits (RECs) to counterbalance emissions from remaining "brown" or "market power purchases until those long-term renewable energy contracts are in the place.

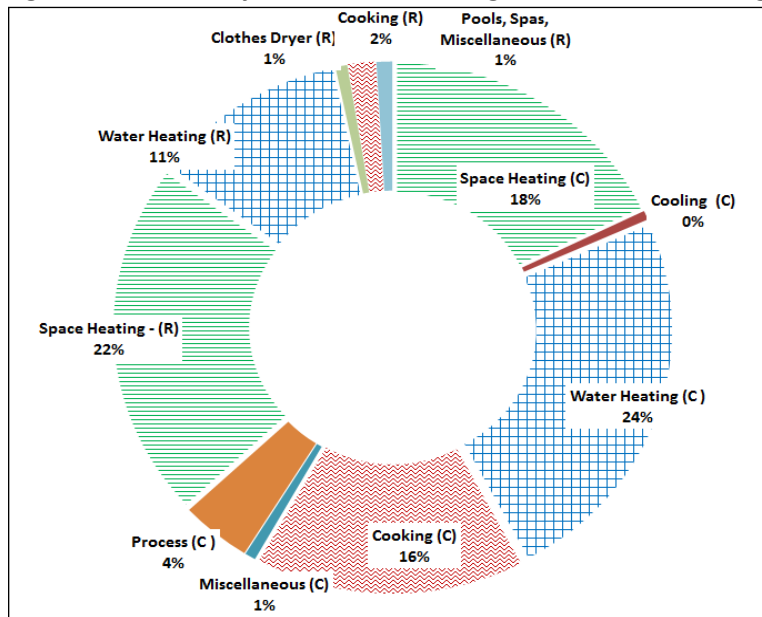
Emissions from natural gas use currently represent ~25% of Palo Alto's remaining carbon footprint.<sup>12</sup> CNE opens to opportunity reduce natural gas use through electrification—"fuel switching" various natural gas uses to electricity—in addition to continued efficiency measures.

The vast majority of natural gas usage is related to today's building stock (existing buildings), with commercial and industrial buildings accounting for 63% of natural gas usage in the City. Palo Alto will first seek to reduce natural gas usage through energy efficiency and conservation, followed by electrification of water heating, space heating and cooking where cost effective. Figure 12 illustrates the estimated distribution of natural gas usage in Palo Alto.

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<sup>12</sup> Natural Gas (i.e., methane, is a potent greenhouse gas, with a global warming potential (GWP) at least 23 times that of CO<sub>2</sub>. Recent research suggests that the climate impacts may be 80-100% higher.

**Figure 13: Summary of Natural Gas Usage in Palo Alto Buildings**



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The S/CAP roadmap is based on six leverage points:

- *Tenant improvement pathway*: energy efficiency upgrades, and electrification requirements
- *Voluntary retrofit pathway*: Palo Alto Utilities incentive programs (point-of-sale/distributors and contractors), education/outreach
- *Predictive failure analysis*: to anticipate
- *Replace-on-burnout*: develop programs to quickly retrofit with efficient electric equipment, particularly for small businesses.
- *Time-of-sale pathway*: energy efficiency upgrades and electrification requirements
- *Institutional pathway*: removing barriers by streamlining permitting, advocating at the state level to address CEC requirements for cost-effectiveness (so we can require electric equipment), making it easier to “do the right thing” (service and convenience)

## Goal: Efficiency and electrification

Efficiency comes first. More efficient buildings require less electricity, natural gas and water, reducing demand on CPAU and saving customers money. Reduced electrical demand from efficiency—even of Palo Alto’s already carbon neutral electricity—provides more capacity to meet electricity needs generated by the EV growth and the fuel switching initiatives described below.

**Strategy: Encourage advanced efficiency and integrative design, ultimately for Net Zero (or Net Positive) buildings that exceed state minimum requirements for energy efficiency (NG-EE-1)**

**Develop energy reach code to exceed state minimum for energy efficiency in all new buildings, and all existing buildings doing work that requires a building permit. (NG-EE-1.1)**

- Develop energy reach code every 3 years in coordination with building code update; focus efficiency first with carbon as component of policy
- Provide alternate building code pathways for all-electric homes
- Evaluate feasibility of Heat Pump technology in buildings from an electrical as well as cost efficiency perspective.
- Partner with other jurisdictions and NRDC to align energy efficiency and carbon reduction goals in California Energy Commission (CEC) regulations and state policy.
- Increase education and outreach to promote the policy, and to improve ease of implementation and predictability for project applicants

**Explore new or expanded programs and policies for energy efficiency in existing buildings (NG-EE-1.2)**

- Assess opportunities for residential energy use disclosure requirements
- Explore potential incentives or requirements for energy audits to be completed every 5 years for existing buildings
- Consider time-of-sale requirements for energy upgrades (e.g., Residential/Commercial Energy Conservation Ordinance)
- Continue to expand energy efficiency incentive and technical assistance programs through Palo Alto Utilities to exceed current goals

**Goal: Reduce natural gas usage in existing businesses**

Reduce natural gas usage through energy efficiency and conservation, followed by electrification of water heating, space heating and cooking where cost effective.

Strategy	2030 Target	2030 GHG Emissions Reduction
NG-COMM-1. Electrify water heating in businesses	50% of commercial water heating is electric	21,200 MTCO2e
NG-COMM-2. Electrify space heating in businesses	50% of commercial space heating is electric	15,900 MTCO2e
NG-COOK-1. Electrify commercial cooking	40% of commercial cooking is electric	11,300 MTCO2e

## **Strategy: Electrify water heating in businesses (NG-COMM-1)**

### **Determine monthly costs associated with hot water fuel switching (NG-COMM-1.1)**

- Using the residential analysis as a template, evaluate the monthly energy costs to consumers associated with switching from natural gas to electric hot water systems. Study should include buildings with both low and high hot water demand.

### **Assess requirements for major renovations and retrofits (NG-COMM-1.2)**

- Study feasibility of including heat pump water heater (HPWH) installations as part of CalGreen Tier 1 and Tier 2 standard

### **Pilot electric hot water in a high-profile building (NG-COMM-1.3)**

- Leverage a high profile City building – such as City Hall – to demonstrate the ability of an entirely electric system to supply all the domestic hot water needs of a large commercial building.

### **Investigate changes to building code to encourage or if possible require hot water fuel switching for existing buildings (NG-COMM-1.4)**

- Explore building code requirements for existing buildings to switch from gas to electric hot water systems upon the end of life of existing gas hot water systems.
- Explore regulatory barriers associated with California Energy Commission cost-effectiveness requirements for ordinances that would require electrification of water heating

## **Strategy: Electrify space heating in businesses (NG-COMM-2)**

### **Determine monthly costs associated with space heating fuel switching (NG-COMM-2.1)**

- Evaluate the monthly energy costs to consumers associated with switching from natural gas to electric space heating systems. Study should include building with both low and high space heating demand.

### **Pilot electric space heating in a high-profile building (NG-COMM-2.2)**

- Leverage a high profile City building – such as City Hall – to demonstrate the ability of an entirely electric system to supply all the space heating needs of a large commercial building.

### **Investigate changes to building code to encourage or if possible require space heating fuel switching for existing buildings (NG-COMM-2.3)**

- Explore building code requirements for existing buildings to switch from gas to electric space heating systems upon the end of life of existing gas space heating systems.
- Study feasibility of including heat pump or resistive space heating installations as part of CalGreen Tier 1 and Tier 2 standard.
- Key leverage points for retrofitting with electric equipment include tenant improvement projects, time-of-sale, replace-on-burnout, voluntary programs and removing institutional barriers such as permitting, etc.

## **Strategy: Electrify commercial cooking (NG-COOK-1)**

### **Encourage restaurants to switch from gas to electric cooking equipment (NG-COOK-1.1)**

- Encourage restaurant owners—through education, hands-on demonstrations and potentially utility incentives—to replace natural gas cooking equipment at end of life and in new restaurants with electric cooking equipment through the provision of incentives.



**Host “hands-on” demo events for electric cooking equipment tailored to the restaurant industry (NG-COMM-2.2)**

- City hosts events showcasing electric cooking equipment and restaurant owners/chefs who have installed electric equipment to educate the restaurant community on the advantages of these technologies. (Modeled on successful “ride and drive” events for EVs.)

**Goal: Reduce natural gas usage in existing homes**

Reduce natural gas usage through energy efficiency and conservation, followed by electrification of water heating, space heating and cooking where cost effective.

Strategy	2030 Target	2030 GHG Emissions Reduction
NG-RES-1. Electrify residential water heating	70% of water heaters are electric	13,600 MTCO <sub>2</sub> e
NG-RES-2. Electrify residential space heating	60% of residential space heating is electric	23,300 MTCO <sub>2</sub> e

## **Strategy: Electrify residential water heating (NG-RES-1)**

### **Education and outreach on heat pump water heaters for homeowners. (NG-RES-1.1)**

- Provide customers with information on options and cost-effectiveness of heat pump water heaters, including web-based calculator tools

### **Educate contractor and installer workforce (NG-RES-1.2)**

- Inform and educate water heater installers about heat pump technologies. Explore options for trainings or advertise trainings available.
- NG-RES-1.3. Funding and incentives for heat pump water heaters
- Explore funding sources for heat pump water heater rebates for customers, as well as funding sources to incentivize installers to offer heat pump water heaters as a default option.

### **Explore a 24-hour emergency hot water heater replacement program (NG-RES-1.4)**

- Explore developing a streamlined process to assist Palo Alto residents with replacing water heaters upon—or before—failure.

### **Utilize building data to target programs. (NG-RES-1.5)**

- Explore development of an analytic process that would enable staff to predict the life expectancy of older water heaters based on past building permit data and use these predictions to target promotion and installation of heat pump water heaters before natural gas water heaters reach end of life.

## **Strategy: Electrify residential space heating (NG-RES-2)**

### **Explore feasibility and economics of retrofitting multi-family buildings (NG-RES-2.1)**

- Target multi-family buildings that presently have electric baseboard heating to approach with heat pump space heating technologies.

### **Provide resources to homeowners to convert existing homes to all-electric (NG-RES-2.2)**

- Compile list of qualified architects, develop case studies, set up communication channels for homeowners to share ideas and host workshops on electrifying existing homes.

### **Provide funding sources for electrifying existing homes (NG-RES-2.3)**

- Explore feasibility of new funding sources and incentives to electrify existing homes on a pilot scale.

### **Develop retail electric rate schedules for homes that electrify (NG-RES-2.4)**

- Evaluate all-electric rate schedule for residential customers as part of the upcoming electric cost of service analysis; if feasible, recommend such retail rates for Council consideration and approval.

## **Goal: Reduce natural gas in new buildings**

New construction offers a unique opportunity to build zero net energy buildings with low incremental costs. With the new California energy code requirements and the plummeting price of LED bulbs, the only real cost to a homeowner is the cost of a solar PV system, which is also dropping rapidly.

California is requiring “net zero energy” for all new residential construction by 2020, and all new commercial construction by 2030. Palo Alto is currently considering whether and how to accelerate those deadlines in the next Green Building Ordinance.

## Strategy: Encourage all-electric new buildings (NG-GAS-1)

Strategy	2030 Target	2030 GHG Emissions Reduction
NG-GAS-1. Encourage all-electric new buildings	New buildings are zero net energy ahead of state targets	11,900 MTCO <sub>2</sub> e

### Expand programs for incentives for zero net energy new buildings (NG-GAS-1.1)

- Continue to develop energy efficiency programs targeted at new buildings that meet specified energy use intensity targets appropriate for the Palo Alto climate zone.

### Provide technical assistance and educational resources for all-electric zero net energy buildings (NG-GAS-1.2)

- Provide additional educational and outreach programs related to all-electric building design strategies and technologies for architects, design teams and contractors.

### Require new homes to be zero net energy ahead of state goals (NG-GAS-1.3)

- Explore legal/regulatory ramifications of all-electric buildings without natural gas hookups.
- Explore additional residential and commercial building code changes for new construction and remodeling projects to expedite electrification.

### Explore requirements for all-electric new construction. (NG-GAS-1.4)

- Explore building code requirements for electric water and space heating in all new commercial buildings.
- Explore feasibility of requiring all-electric construction in new buildings and/or major renovations

## Goal: Reduce the carbon intensity of natural gas

Similar to the approach utilized for carbon neutral electric supply, Palo Alto will continue to explore opportunities to procure biogas and/or carbon offsets in the short term in order to “green the gas” while we work towards reduced natural gas consumption and infrastructure. Carbon offsets and biogas supplies should be evaluated and monitored in parallel with electrification and progress on reductions in natural gas consumption in Palo Alto to ensure that the City meets its 2030 targets.

## Strategy: Eliminate natural gas emissions with carbon offsets or biogas (NG-OFF-1)

### Make PaloAltoGreen Gas program opt-out (NG-OFF-1.1)

- PaloAltoGreen Gas program is currently an opt-in program, which limits participation. The program should be modified as an opt-out program, providing flexibility to customers who truly do not want to participate.

### Consider carbon offsets to offset remaining GHG emissions. (NG-OFF-1.1)

- After all feasible measures are taken to reduce natural gas consumption, utilize carbon offsets – either by making the PaloAltoGreen Gas an “opt-out” program or the purchase of carbon offsets by the City.

### Procure biogas supply. (NG-OFF-1.2)

- Palo Alto will continue to assess opportunities to incorporate biogas (Renewable Natural Gas) supply into the natural gas mix.

# ZERO WASTE AND THE CIRCULAR ECONOMY



Reducing the amount of waste discarded in landfills is an important strategy for both greenhouse gas reductions and overall sustainability. Diverting waste from landfills occurs through product changes, material use reduction, reuse, recycling and composting. Equally important, these diversion strategies will create a “circular economy” where materials, water and energy do not create waste or pollute, but rather contribute their value back into a sustainable, circular cycle of human and ecosystem activity.

Achieving a “zero waste” will require reducing the overall amount of waste generated within the City—through purchasing decisions and material use reduction (and ultimately product design), as well as more effective sorting, recovery and recycling.

In 2007, the City completed a Zero Waste Operational Plan established a goal of 73% diversion by 2011 and 90% by 2021— well beyond state requirements<sup>13</sup>. This new S/CAP sets a new goal of 95% Diversion by 2030.

## Goal: Achieve 95% landfill diversion by 2030, and ultimately zero waste

Strategy	2030 Target	2030 GHG Emissions Reduction
SW-1. Achieve zero waste	Achieve 95% diversion rate	9,500 MTCO2

<sup>13</sup> California Assembly Bill 939 was passed in 1989, and mandated local jurisdictions to meet a solid waste diversion goal of 50% by 2000. Furthermore, each jurisdiction was required to create an Integrated Waste Management Plan that looked at recycling programs, purchasing of recycled products and waste minimization.

**Strategy: Enhance policies and programs for recycling, composting and reuse (SW-1)**

**Increase education and outreach for existing waste diversion programs (SW-1.1)**

- Promote existing programs, including City’s Household Hazardous Waste Program, through aggressive outreach, initiatives and extended producer responsibility (EPR) initiatives.

**Reduce the number of non-recyclable or non-compostable materials in the community (SW-1.2)**

- To the maximum extent practical, utilize the municipal code to restrict non-recyclable or non-compostable products sold in the City
- Work with partner agencies and the business community to develop producer-funded take-back programs.
- Engage local businesses to increase the number of companies participating in the program and adopting best practices related to food waste, landscape waste and recycling.

**Partner with local agencies to promote recycling and reuse (SW-1.3)**

- Partner with local non-profits (e.g., Goodwill) to boost efforts in material reuse and exchange
- Support Bay Area Green Business Certification program that requires adoption of waste reduction practices

**Revise and implement new more stringent C&D ordinance recovery measures (SW-1.4)**

- Work with stakeholders and regional waste recovery facility management to increase the City’s existing C&D recovery percentage requirements.
- Emphasize on site reuse or off site salvaged to provide a higher and better use for the materials than recycling or disposal.

Strategy	2030 Target	2030 GHG Emissions Reduction
SW-2. Implement an energy savings and pollutant reduction strategy for waste collection vehicles	100% electric (or low-carbon fuel) waste collection vehicle fleet	Zero GHG emissions (if electric vehicles available )

## **Strategy: Implement an energy savings and pollutant reduction strategy for waste collection vehicles (SW-2)**

### **Utilize electric or alternative fueled waste collection vehicles as soon as possible (SW-2.1)**

- Change to a 100% CNG fleet in the next (2021) waste collector agreement.
- Monitor the availability of electric collection vehicles, and introduce them as rapidly as feasible.

### **Eliminate the separate collection of garbage (SW-2.2)**

- As the City moves closer to zero waste, more of the waste materials collected should be recoverable (recyclable or compostable), evaluate eliminating separate collection of garbage, and moving to a two-cart collection scheme.

### **Minimize transportation and manage the City's waste as locally as possible (SW-2.3)**

- Track developments in processing technology to identify options that could be implemented at local or regional locations.

# GETTING SMART ABOUT WATER

Palo Alto has done an outstanding job of meeting annual water use reduction requirements of the current “drought.” But both potable water supplies and hydroelectric needs could be challenged by long-term shifts in California’s precipitation regime.

With shifting climate patterns<sup>14</sup>, significant uncertainty exists about whether drought conditions are the “new normal” for California, with a possible “new normal” of less (and less reliable) precipitation. Moreover, most climate projections show increases in average temperatures and reduced snowpack where Palo Alto sources much of its water—which could impact Palo Alto’s hydroelectric power and thus its carbon neutral electricity strategy.

Given current climatic projections, long-term increases in water supplies from San Francisco Public Utilities Commission (SFPUC) appear highly unlikely. It would be prudent to reduce water consumption while exploring ways to increase the availability and use of recycled water.

## Goal: Reduce consumption of potable water

CPAU water demand management measures (DMMs) have supported customers in reducing water use 27% between 2000 and 2010. CPAU’s drought response programs have enabled the City to reduce water use by 24% in 2015 compared with 2013 levels, far ahead of the State’s mandated reduction requirements. Long-term water reduction strategies should focus not only on implementing these procedures during times of drought, but rather using the incentives and policy drivers listed in the water management plan to drive sustained water consumption reduction.



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<sup>14</sup> The California Department of Water Resources (<http://www.sei-international.org/news-and-media/3252>), the Association of California Water Agencies (<http://www.acwa.com/events/2016-executive-briefing-defining-new-normal>) and others are examining the potential impacts of Climate Change on Hydrologic Trends and Water Management.

## **Strategy: Strengthen policies for community-wide water conservation and water efficiency (W-1)**

### **Provide increased funding for landscape conservation rebate program to drive participation in program (W-1.1)**

- Supplement existing funding for the landscape conservation rebate program in order to offer additional rebates for Palo Alto residents and businesses beyond the \$2.00 per square foot offered by SCVWD. Increasing rebates to \$3.00 - \$4.00 per square foot will drive increased participation in the program.

### **Develop landscape water budgets and link to block rates to discourage excessive water consumption (W-1.2)**

- Develop landscape water budgets for high-use customers based on landscape area, plant materials and climate condition.
- To the extent feasible, link landscape water budgets to tailored block rate schedules to encourage conservation.

### **Develop long-term efficiency goals, and aggressively market toward them (W-1.3)**

- Set long-term, strategic targets for increased installation rates of water efficient fixtures and appliances and use a variety of marketing techniques – hardware swaps, replacement programs, rebates and incentives – to achieve these targets.
- Develop and implement water efficient landscape and indoor water regulations

### **Incorporate net zero water standards in future Green Building Ordinances (W-1.4)**

- Build net zero water standards into future Green Building Ordinances.
- Achieve that goal through a combination of rainfall harvesting, aggressive conservation, and water recycling, and buildings that can achieve self-sufficiency from the water “grid”.

### **Evolve Palo Alto landscapes to adapt to changing precipitation trends, and allocate water resources to protect our urban canopy (W-1.5)**

- Emphasize incorporation of drought-tolerant and drought-resistant plants and landscape design into publically owned land – including parks, school yards and medians.
- Educate and incent CPAU customers to adapt and evolve their landscapes.

## **Goal: Supplement existing water supplies**

In addition to reducing potable water consumption, Palo Alto will seek to supplement existing SFPUC water supplies with “new” sources, to provide redundant supplies that strengthen resilience and water security, including: 1) increasing local water capture, 2) maximizing the potential for water recycling and 3) exploration of decentralized, on-site waste water treatment.

#### **Net Positive Water**

What if Palo Alto, or specific buildings, could capture more water than it used? What would it take? What would it look like?



## **Strategy: Supplement SFPUC water supply with other sources of potable and non-potable water (W-2)**

### **Create and implement a Green Infrastructure Plan that prioritizes green streets infrastructure (W-2.1)**

- Create policies that integrate the design of green infrastructure into City and private sector projects to store, infiltrate, cleanse and evapotranspire stormwater.
- Expand permeable paving and reduce impermeable paving.
- Increase rainfall infiltration, replenish groundwater, utilize soil to filter pollutants, increase habitat, retain and detain stormwater and meet State and Federal permit requirements
- Utilize: bioswales, raingardens, infiltration basins, retention basins, rain barrels cisterns, green roofs, vegetation, and permeable blocks, pavement and systems.

### **Incentivize water harvesting and downspout disconnections (W-2.2)**

- *Provide education, support and incentives to promote the capture of rainwater and greywater to be utilized for landscape and other water needs.*
- *Require and/or incentivize the disconnection of downspouts to redirect water to landscapes, rain barrels, cisterns, or permeable areas – instead of the storm drain.*

### **Expand recycled water capacity and uses (W-2.3)**

- Continue to investigate methods for expanding water recycling from the RWQCP, including: facility upgrade at the Plant, increased delivery to Mountain View, new delivery to East Palo Alto and other RWQCP partners, and interties to the North and South of the RWQCP service area
- Continue to explore expansion of purple pipe infrastructure within Palo Alto
- Explore new uses for recycled water including the production of purified (potable) water groundwater storage/recharge, and ultimately direct potable reuse.

### **Explore and pilot advanced technology water recycling technologies, including onsite treatment, and energy, water and materials harvesting from wastewater (W-2.4)**

- Investigate the potential of onsite wastewater treatments systems that enable property owners to treat and reuse wastewater on site.
- Investigate NASA, Stanford and other onsite water treatment technologies for possible pilot at City Hall
- Explore beneficial use of wastewater biosolids, including anaerobic digestion, gasification, and pyrolysis, including various uses for the energy produced, such as microbial fuel cells and hydrogen production
- Phase out incineration of biosolids by 2019.
- Evaluate potential for large scale water storage beneath parks, schools, parking lots, etc.
- Study the feasibility of large-scale underground water storage that enables rapid storage of water during large precipitation events that would otherwise be destined for storm drains.

### **Beneficially Reuse 100 % of the treated wastewater from the RWQCP (W-2.5)**

- Evaluate minimum flows and maximum nutrient/pollutant loadings for Bay Discharge
- Evaluate benefits and amounts of discharge to local marsh systems, creek augmentation, sea level rise mitigation and groundwater infiltration/injection
- Combine results with W-2.3 explorations to insure that 100% of the wastewater is ultimately used to benefit human and ecosystem needs

# MUNICIPAL OPERATIONS – LEADING THE WAY



The City of Palo Alto has long demonstrated its commitment to sustainability and reductions of greenhouse gas emissions through its municipal operations. Palo Alto City government’s environmental footprint is small—3.1% of citywide electricity use, 2.9% of natural gas use and 5.3% of water use in FY 2014. But resource efficiency, low carbon and other sustainability initiatives can save money, improve operating performance, reduce emissions, and provide leadership for the community. And the City has an important role in leading by example has a powerful impact, both by providing a governing framework that supports sustainability throughout the community and inspiring within our community and to neighboring communities. The city government’s commitment: “We walk the talk, and we go first.”

## Goal: Efficient City Buildings

The City spends approximately \$6 million annually on utilities; “typical” 10-20% potential efficiency savings could result in more than \$600,000 saved per year. The City requires LEED certification for all new City buildings over 10,000 square feet, and assessment of “green building” potential for substantial renovations and additions over 5,000 square feet. These requirements may not have captured all opportunities, and advances in green building design and technology continually open new ones.

## Strategy: Use City Buildings as Demonstration Projects for Advanced Building Technologies

- Explore opportunities to electrify existing and new City buildings, including utilizing heat pump water heaters and heat pump space heating technologies.
- Require LEED™ Gold or Platinum certification for new City buildings, and at least LEED certification for retrofits.<sup>15</sup>

## Strategy: Develop a Facilities Master Plan for City buildings

- Analyze resource consumption in City buildings to identify priority opportunities for efficiency gains and management improvements.
- Identify capital improvement goals, and methods for ensuring sustainability and efficiency goals are embedded in the capital improvement process.
- Provide criteria for Facilities, Engineering and the Sustainability Office to use to guide inter-division coordination and collaboration, and evaluate City performance, and will include:
  - *A Long-term energy management plan*
  - *Energy efficiency standards*
  - *Processes for retro-commissioning and performance benchmarking to incentivize and ensure high performance that matches design*

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<sup>15</sup> Palo Alto currently requires LEED silver for new construction (as do many cities). San Francisco and Vancouver require LEED goal.

- *Long-range capital improvement plan*
- *Budgetary goals*

## Goal: Efficient City Fleet

### Strategy: Continue to electrify city fleet vehicles where possible

- Develop protocols to systematically shift City fleet vehicles to electric where appropriate
- Continue to explore third-party providers of EV charging infrastructure, as a potential way to expand that infrastructure at minimal cost to the City.

### Strategy: Explore new models for City fleet vehicle operations

- Explore partnership opportunities between City fleet and car-sharing companies (e.g., performance contracts, and/or making fleet available for public rental after business hours)<sup>16</sup>
- Consider piloting use of self-driving vehicles as part of City vehicle fleet

## Goal: Procurement—“Default to Green”

In 2007, the City authorized the implementation of a green purchasing program, and subsequently adopted a Green Purchasing Policy (GPP) in 2008, which supports existing environmental policies and Council direction to reduce GHG, pesticides and mercury, and achieve Zero Waste and pollution prevention goals. In 2015, the City Manager established a “default to green” strategy that makes the greener product the norm rather than the exception. Staff will always have the option to purchase alternative products, wherever cost or performance requirements make the green product inappropriate, but by making the greener purchase easier, and supported by tools that assist staff in choosing the best option, the City hopes to embed greener purchasing into City processes. (This has been accomplished for paper and toner purchases, and is underway for fleet purchases.)

[A 2014 OSS analysis showed that the Scope 3 GHG impacts of City purchases would add an estimated 25% to City government emissions.]

### Strategy: Continue to update and expand GPP awareness

- Establish additional GPP criteria in all priority procurement categories
- Work with vendors and allies to develop clear support material for City staff
- Provide green procurement training and tools to City procurement staff

### Strategy: Optimize allocation of funds to support GPP implementation

- Allocate funds to develop or acquire “green purchasing” management and tracking software
- Allocate funds and/or staff for at least 30% FTE to implement current green purchasing plan (from ASD, CMO, or PWD) which includes annual reporting and tracking
- Allocate 25% FTE of ASD Purchasing Staff to assist with program implementation
- Report progress at least annually.

## Goal: Embed Sustainability in Management Systems and Processes

Wherever possible, the City will embed sustainability criteria in City management systems, to ensure that the concerns identified in this Plan are addressed early, as part of standard operating procedure rather than special “sustainability add-ons.”

<sup>16</sup> As, for example, ZipCar has done with New York, Houston and other cities

## **Strategy: Infuse sustainability throughout City operations**

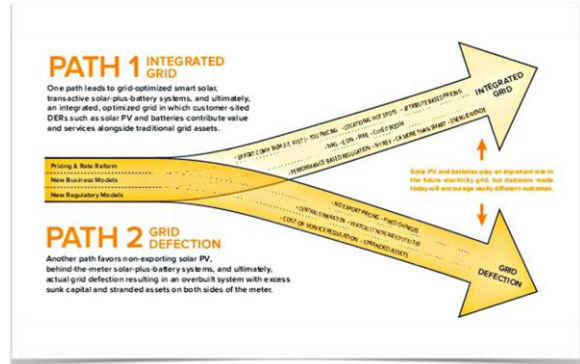
- Embed sustainability commitments and criteria into CIP process, and specification and management of building construction, renovation and operation
- Incorporate a “sustainability impacts” section into standard staff report templates.
- Establish internal carbon targets, pricing and trading to increase GHG-reduction<sup>17</sup>
- Provide relevant sustainability training modules through the City’s training systems.

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<sup>17</sup> According to the World Bank, more than 150 companies, 40 countries and 20 cities have instituted carbon pricing. <http://www.worldbank.org/en/programs/pricing-carbon>

# PALO ALTO'S UTILITY OF THE FUTURE

The utility industry is changing. Rapidly dropping costs of renewable and distributed power sources, energy storage, electric vehicles and energy-related telecommunications are combining to challenge the traditional utility framework and business. CPAU is tracking these trends, has begun piloting residential “smart meters” in a few hundred locations and begun assessing the load and storage impacts of electric vehicles on the grid. These trends intersect sustainability and climate action concerns, and raise both significant challenges and opportunities for CPAU.



CPAU will explore and evaluate the “Utility of the Future” concept—including potentially moving from a centralized utility provisioning model to a more agile one of greater embracing distributed energy generation and storage, and an increased focus on energy services in addition to energy generation and distribution.

## Goal: Implement innovative efficiency strategies

As discussed above, efficiency comes first. CPAU has successfully delivered a suite of efficiency products and services for years; new approaches to delivering efficiency may be needed to both meet carbon goals and ensure capacity to meet future needs.

## Strategy: Continue to incorporate energy efficiency as the highest priority resource

- Procure energy efficiency as a resource (e.g. negawatts)—and a tradable commodity—to access funds based on levelized marginal cost rather than total resource cost (TRC).
- Promote—and monetize—radical resource efficiency
  - *Apply retro-commissioning and performance benchmarking to incentivize and ensure high performance that matches design*
  - *Develop integrated utility service offerings (including electric vehicles, solar and energy efficiency), with predictive analytics and on-bill financing*

- Promote energy efficiency and conservation through both outreach and financial incentives and repayment programs (education, outreach, on-bill financing/repayment, incentives, etc.)

### **Strategy: Evaluate and advance appropriate electrification strategies**

- To the extent feasible, adopt electric and natural gas rates and tariffs that support fuel switching, and that provide the right incentives for where we want to go now.
- Maintain integrity of natural gas infrastructure as natural gas revenues decline.

### **Strategy: Evaluate and advance appropriate distributed generation strategies**

- Develop a long-term plan for Integration of high levels of distributed resources into the system to promote low carbon energy and reliable and cost effective delivery.
- Address the potential challenge of “grid defection,” for example through rate policy (feed in tariffs), service offerings (provide/manage/finance local generation and storage), etc.
- Improve and maintain the resilience of the power grid, as well as natural gas, water, and wastewater distribution systems.

## **Goal: Advance smart grid strategies**

Smart grid strategies connect to Palo Alto’s existing, smart city and open data strategies, and offer the promise of more responsive and efficient energy systems, and more connected and satisfied customers.

### **Strategy: Deploy Smart Grid as key part of “smart and connected city”**

- Implement real-time metering for all customers to match costs with power pricing
  - *Conclude smart meter pilot and roll out smart meters city-wide by 202X.*
  - *Provide customers easy, real-time access to their utility data through Green Button and other APIs*
- Provide incentives for—or provision and manage—localized or neighborhood storage
- Develop smart micro-grid and nano-grid strategies to integrate electric vehicles, energy storage, renewable generation and islanding protection from blackouts.

## **Goal: Evaluate and adapt the CPAU business model**

The utility industry faces a potentially disruptive future—driven by changing technology, economics and customer expectations, as well as policy changes—that could include the challenge of “grid defection” as customers become their own providers, and of new regulatory models and new competitors that shift revenues from utilities to other participants in the energy system. Few utilities have begun to consider how to adapt to the creative destruction in the proliferation of distributed generation and energy efficiency; many are actively resisting the transition. CPAU, small and locally controlled, has the capabilities to rapidly evolve the business models these trends are demanding.

### **Strategy: Consider long-term CPAU strategy in light of rapidly changing technology**

- Carefully consider and decide what fundamental value CPAU will deliver to its customers:
  - *Buy, broker and distribute energy*
  - *Sell benefits, not resources*
  - *Deliver efficiency services*
  - *Own and manage distributed generation & storage capacity*
  - *Sell management, services, financing & data*

- Develop options to adapt business model to changing industry dynamics and proactively explore “utility of the future” strategies to take advantage of potential disruptive change facing the industry.
- Develop an agile, service-focused (rather than commodity-focused) business model, including
- Develop long-range plans to meet Palo Alto’s goals for sustainability, economic prosperity, and continued quality of life in the face of changing market conditions and customer expectations
- Evaluate the potential regulatory barriers and possible implications of electrification strategies, including impacts of potential decline in natural gas use on CPAU revenues

### **Strategy: Leverage the resiliency and potential cost benefits of distributed energy resources (e.g., solar, storage, microgrids )**

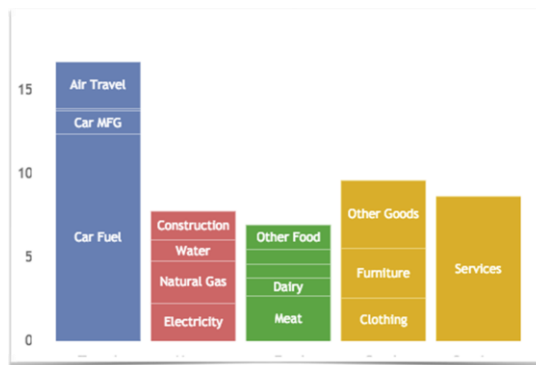
- Maximize local solar+storage as resilient complement to grid solar.
- Explore microgrid and district energy strategies in key districts

### **Goal: Continue to advance carbon neutrality**

CPAU will continue to play a central role in Palo Alto’s carbon neutrality trajectory.

- Continue to support electrification programs and requirements identified in the S/CAP to effectively draw down the use of natural gas, including:
  - *Restructure rates to not penalize increased electrical demand*
  - *Prepare to upgrade grid to meet rising demand from electrification.*
- Develop hydroelectric power contingency plans
  - *Ensure maintenance of carbon neutral electricity in face of potential reduced reliability of hydroelectric power*
  - *Increase renewables power procurement to hedge hydro uncertainty, subject to the City’s Risk Management Policies and Procedures*

# COMMUNITY BEHAVIOR, CULTURE & INNOVATION



Ultimately the way individuals and businesses act dictates our consumption patterns and thus our impact on natural resources. To truly address the challenges of climate change and sustainability, individual behavior will have to continue to change. In fact, the GHG impact of individual purchasing decisions—not reflected in Palo Alto’s GHG inventory, above—is significant. (See Figure 14, below.) Achieving that change will require broad community engagement, participation, guidance— and individual initiative. To support that, the City will actively inform & convene stakeholders, support individual & collaborative action, and disclose and report impacts of both City and community-wide initiatives and impacts.

## Goal: Provide a platform for community change in culture, behavior and innovation

### Strategy: Changing Cultural Norms

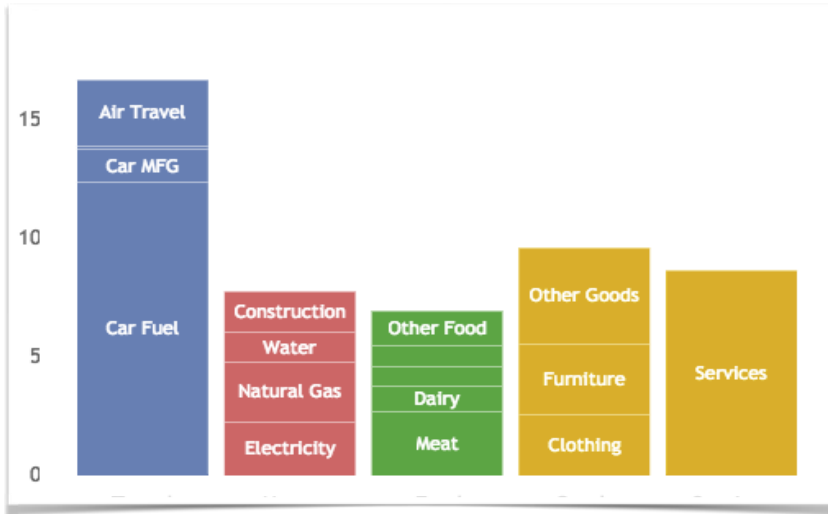
- Inform & convene stakeholders, support individual & collaborative action, and disclose and report impacts of both City and community-wide initiatives and impacts.
- Develop awareness and understanding community-wide to the relevance of actions to reduce energy consumption, switch to cleaner sources of energy, embrace non-auto based mobility options, and reduce both water and solid waste.
- Foster experimentation, alliances, design competitions, hackathons and big leaps led by our local residents, businesses and community stakeholders.

### Strategy: Facilitate personal and neighborhood action

- Pilot “CoolBlock” collaborations to support neighborhood cooperation toward sustainability and resilience goals
- Pilot neighborhood competitions to reduce single-occupancy vehicle travel, with opportunities for City of Palo Alto to pilot street improvements to facilitate walking/biking/transit
- Deploy/encourage performance dashboards and “fitbit for sustainability” apps
- Estimate/report “scope 3” emissions, to seed conversations about consumption



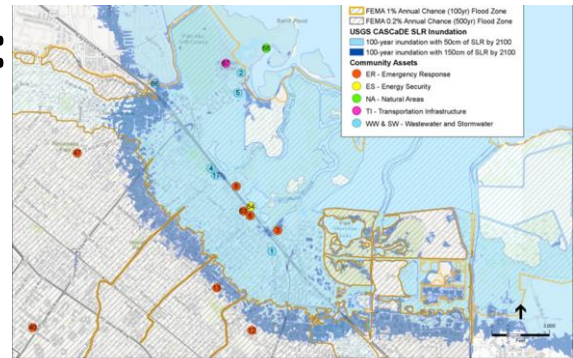
**Figure 15: Palo Alto Per Capita GHG emissions, including "Scope 3" Impact of Purchases**



**Strategy: Develop Smart City and Power of Open Data**

- Extend open data initiatives to include mobility, utility, operations & environmental quality
- Provide visual performance dashboards that simplify tracking and benchmarking sustainability performance—and support effective action
- Provide real-time reporting/dashboard information on key city arterials and corridors providing information on real-time mode share of driving, biking, pedestrian activity
- Accelerate smart grid deployment.
- Enable customer and 3rd party access to accurate, timely data.
- In all these, ensure reliable protection of privacy.

# CLIMATE ADAPTATION: PREPARING FOR CHANGE



The first imperative of climate change planning is mitigation, the reduction in the emissions of greenhouse gases so that the impacts can be kept as small as possible. However, even if all carbon emissions were stopped today, some of these effects are likely to continue for decades into the future. Palo Alto's greatest climate change risks are a product of the City's bayside setting, the inherent sensitivities of its Mediterranean climate, and its dependence on imported water from the distant Sierra Nevada mountains as its primary water and hydro- electric supply.

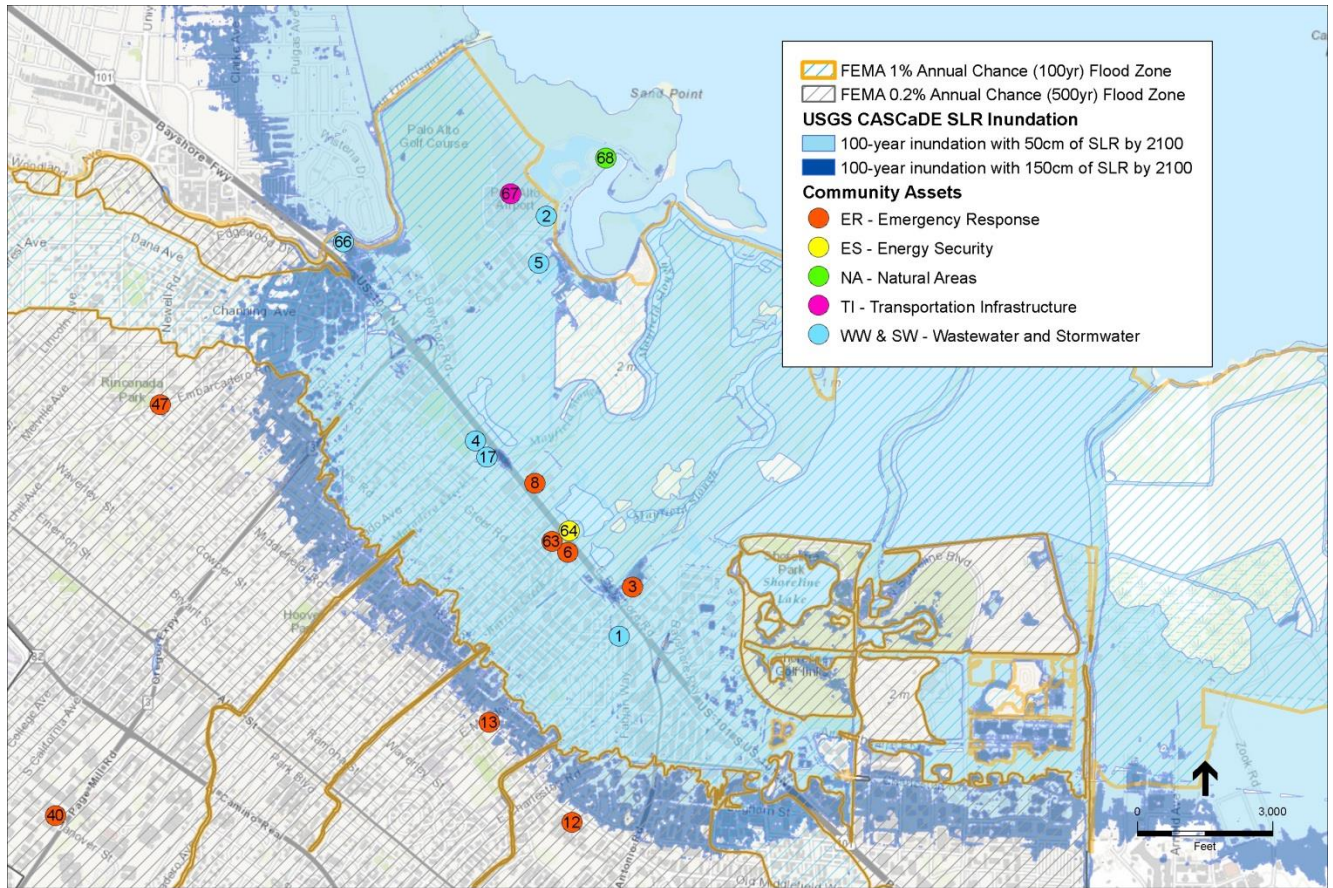
Sea-level rise is expected to affect low-lying areas of Palo Alto surrounding the San Francisco Bay with more frequent and severe flooding. The State of California has adopted guidance and planning sea level rise projections for the San Francisco Bay region from the National Research Council (NRC, 2012<sup>18</sup>) of projected 11 inches of sea level rise by 2050 (with a range of 5 to 24 inches) and 36 inches by 2100 (with a range of 17 to 66 inches by 2100.<sup>19</sup>

<sup>18</sup> National Research Council (NRC), 2012. *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*. [http://www.nap.edu/catalog.php?record\\_id=13389](http://www.nap.edu/catalog.php?record_id=13389)

<sup>19</sup> California, via the Ocean Protection Council, (OPC, 2013<sup>19</sup>), has adopted the San Francisco Bay region sea level rise projections from the National Research Council (NRC, 2012<sup>19</sup>), which includes an allowance for vertical land motion.

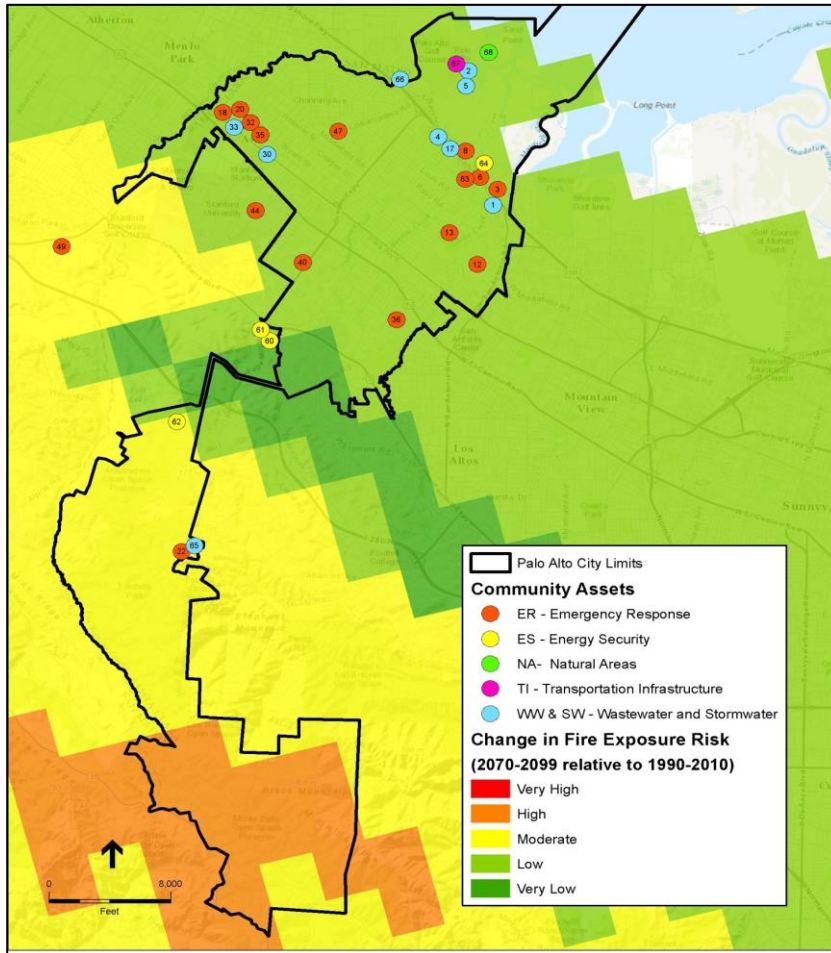
**Figure 16** and **Figure 17** provide an overview (leveraging Silicon Valley 2.0, a regional planning effort to minimize the anticipated impacts of climate change) of community assets identified at risk of sea level rise/flooding and fire risk. (See detailed assessment of risks and potential responses in Appendix XX.) City staff have several related work streams underway.

**Figure 16. Palo Alto Community Assets at Risk from Sea Level Rise and Associated Flooding**



SOURCE: USGS (SLR inundation), FEMA (flood zones), City of Palo Alto (City Limits, asset locations), ESRI (basemap background) City of Palo Alto SCAP . D140455.00  
**Palo Alto Flood Risk and Community Assets Map**

Figure 17. Change in Fire Exposure Risk, Showing Community Asset Locations



## Guiding Principles for Sea Level Rise Response

Recognizing the most immediate risks related to sea level, particularly for critical facilities along the San Francisco Bay Shoreline, Palo Alto has identified six guiding principles<sup>1</sup>:

- (1) For city of Palo Alto capital projects, use sea level rise assumptions consistent with the State of California adopted guidance, with a minimum of 55 inches based on Bay Conservation Development Corporation (BCDC) numbers.
- (2) Continue to monitor latest climate change and sea level rise science and adapt as needed if sea level rise occurs at a more rapid pace and/or higher levels than projected
- (3) Ensure engineering solutions are adaptable to changing climate predictions
- (4) Consider tools to protect, adapt and retreat as appropriate and cost-effective
- (5) For areas that are to be protected, consider additional tools in case severity and speed of sea level rise increase, such as designing structure that can get wet and locating sensitive equipment higher in a building
- (6) Continue to collaborate with regional planning efforts on studies of climate impacts and strategies to respond to sea level rise

## Goal: Protect, Adapt, Retreat

### Strategy: Protect Municipal Services Center, Utility Control Center and Utility Control Center

- Review long-term plans to protect these assets, including potential relocation, or establish additional redundant operational capabilities in case these facilities become incapacitated during a flooding event.
- Assess foothills communication towers in the foothills for vulnerability to wildfire. Update emergency preparedness plans accordingly.

### Strategy: Enhance Energy Security and Infrastructure

- Action: Develop an energy resiliency plan focusing on building in resiliency and lessening the impact of statewide and regional energy events.
  - Adaptation measures would include islanding, smart grid, local generation, energy storage and redundant transmission lines.

### Strategy: Water Supply

- Action: Continue aggressive water conservation programs
- Action: Set higher conservation goals in the 2015 update to the Palo Alto Urban Water Management Plan
- Action: Participate in regional planning efforts by the Bay Area Water Supply and Conservation Agency, Santa Clara Valley Water District and San Francisco Public Utilities Commission.
- Action: Investigate potential alternative supplies, including recycled water and use of local groundwater sources.

### Strategy: Wastewater Management

The greatest risk to the City's wastewater management is potential failure of existing levees that protect the RWQCP from coastal flooding associated with sea level rise by 2100.

- Action: Evaluate feasibility of "horizontal levees," and opportunities to incorporate treated wastewater effluent in their creation.
- Action: Develop a flood proofing plan for the RWQCP that minimizes impacts to the site in the event of local inundation.

### Strategy: Stormwater Management

- Action: Coordinate creek flood management planning with the SAFER coastal flood management project that is just getting underway.
- Action: Assess opportunities to integrate stormwater into the wetlands rather than segregating it in stormwater channels and detaining it in flood basins, in order to create a more resilient shoreline.

### Strategy: Transportation Infrastructure

Highway 101 (Bayshore Freeway), the Palo Alto Airport, and surface streets in the Palo Alto floodplain are all at significant risk from sea level rise by the year 2100. Current levees are not likely to adequately protect these assets from sea level rise; the SAFER Bay project is planning improvements to these levees.

- Action: Assess the vulnerability of Highway 101 (Bayshore Freeway), the Palo Alto Airport, and surface streets in the Palo Alto floodplain to sea level rise by the year 2100.
- Action: Better define adequacy of current levees to protect these assets from sea level rise, along with consequences of failure and contingency plans in the event they become damaged or inaccessible.
- Action: Assess the vulnerability of roads and highways in the foothills for wildfires by the year 2100.

### **Strategy: Public Health**

The City's most vulnerable populations (elderly, low-income and health-compromised residents) face significant risk from extreme heat events by 2100, and higher risk of health problems from worsening air quality and new disease vectors.

- Action: Engage the public and promote community involvement in actions to reduce climate change risks, using linguistically and culturally appropriate approaches that are effective for diverse populations.
- Action: Reduce urban heat islands (also has energy conservation/GHG co-benefit).
- Action: Partner with organization like Cal-BRACE (Building Resilience Against Climate Effects) to forecast climate impacts and assess public health vulnerabilities, educate and engage more effectively with the community, assess current strategies, and identify effective responses.
- Action: Engage with and seek support from Association of Bay Area Government's (ABAG) community resilience programs; in particular their multiple hazard risk assessment and study of housing resilience in the face of natural disasters.

### **Strategy: Continue to work with regional partners to implement integrated resiliency approaches**

- Promote and participate in cooperative planning with other public agencies and regional and adjacent jurisdictions, especially regarding issues related to climate change, such as water supply, sea level rise, fire protection services, emergency medical services, and emergency response planning.
- Develop new requirements for shoreline development to ensure that new development is designed and located to provide protection from potential impacts of flooding resulting from sea level rise and significant flood events.
  - Requirements could include: new setbacks to ensure structures are set back far enough inland that they will not be endangered by erosion; limits on subdivisions and lot line adjustments in areas vulnerable to sea level rise to avoid the creation of new shoreline lots; incentive or transfer of development rights (TDR) programs to relocate existing development away from high risk areas; and/or triggers for relocation or removal of existing structures based on changing site conditions and other factors.

### **Strategy: Build resilience considerations into City planning and capital projects, especially near the San Francisco Bay shoreline.**

- Prioritize the Municipal Service Center (MSC), which is located in a potential future inundation zone, to determine the best approach to protect the emergency response capabilities and other services that the MSC provides.
- Pursue "green infrastructure" as required by the Regional Water Quality Control Board and as warranted by staff analysis; include supporting policies in the Comp Plan Update aimed at increasing storm water capture and infiltration.
- Evaluate and strengthen SLR and flooding concerns in planning, zoning, permitting and insurance requirements

# REGENERATION AND THE NATURAL ENVIRONMENT



Sustainability is not only about mitigation and resiliency to change, but also about regeneration and identifying opportunities for renewal, restoration, and growth of our natural resources and environment. Green infrastructure management provides one of the rare opportunities to enhance ecosystem positives such as sequestration of carbon, recharge of groundwater reserves, local food, walk-ability and bike-ability, and improved human health rather than solely reduction of negative impacts such as pollution and waste.

Palo Alto will continue to build the natural resources, “common wealth” and biocapacity that sustains it: soils, vegetation, tree canopy, biodiversity, water and many other critical components. Green infrastructure refers to natural areas and systems to provide habitat, flood protection, storm water management, cleaner air and cleaner water.

## Goal: Renew, restore and enhance resilience of our natural environment

### Strategy: Adapt canopy, parklands, biodiversity, soil health to changing climatic regimes

- Implement the Urban Forest Master Plan
  - *Analyze and estimate potential tree canopy impacts due to changes in water application*
  - *Work closely with Utilities Department to evaluate current information, education programs and incentives to determine the most appropriate best practices for both urban forestry and water conservation goals.*
  - *Continue to develop and distribute information about preferred and restricted tree species, adapting trees to lower water needs, building greater drought resilience into tree planting sites through soil enhancements and selecting native or site appropriate trees of the proper size and characteristics.*
  - *Further explore and emphasize the importance of local foods, including smaller, fruiting trees and concepts related to local “food forests” that foster low-maintenance sustainable plant-based food production.*
- Develop and implement the Parks, Trails, Open Space & Recreation Master Plan
  - *Provide clear guidance and recommendations on how to meet the demands for future recreational, programming, environmental, and maintenance needs, as well as establish priorities for future park renovations and facility improvements.*
  - *Identify opportunities to increase sustainable and resource-saving practices associated the operation and management of parks and open space, as well as recreational facilities within the City.*



## **Strategy: Value and enhance the common wealth for future generations.**

- Action 1. Prepare an audit of the commonwealth and common health under that government's jurisdiction.
  - *This audit would provide an inventory of parks, water and air quality, and infrastructure necessary for community wellbeing—all of the commons that are essential for the health and well-being of present and future generations. The audit could be reported as a qualitative, non-monetized set of assets.*
- Action 2. Draft a legacy plan for the commons.
  - *What is needed to improve, restore, and expand the commons to leave them in good shape for future generations? Some threats are particularly important to consider in plans. It is difficult to flourish in the face of floods, drought and fire. The legacy plan could become the basis of governmental sustainability goals.*
- Action 3. Review all regulations and land use plans for their impact on future generations.
  - *Designate a “guardian of future generations” empowered to recommend modifications to regulations and land uses that would protect future generations.*
  - *Evaluate incorporation of “ecosystem functionality” layers into planning GIS to ensure no diminution of ecosystem functionality by development processes*

## **Strategy: Deploy Green Infrastructure.**

- Develop a green infrastructure policy
  - Require consideration of green infrastructure strategies whenever street or open space improvements may be made, including construction, landscaping and traffic calming projects.
  - Coordinate strategies across departments to leverage benefits. For example, reduced roadway and parking demand resulting from SOV-reducing transportation strategies would enable more permeable surfaces and water capture; Include such economic benefits in analysis of those transportation projects.
- Map city water flows and soil types to evaluate which types of green infrastructure investments and locations could provide greatest benefits
- Incent Green Roof Installation. Address through building policy or utility incentive the promotion of green roofs.
- Establish City policy on Green Streets and Green Parking Design.
  - Include Green Streets, alleys and curb cuts in street work, parking strips, planter areas of sidewalks, curb extensions, and street medians.
  - Establish City design policies to include green parking infrastructure in all new parking facilities
  - Incorporate additional green infrastructure elements into parking lot designs including permeable pavements installed in sections of a lot and rain gardens and bioswales included in medians and along a parking lot perimeter.

# FINANCING, FUNDING AND INVESTMENTS



The total financial impact of the goals and strategies identified in this plan is estimated to result in a net present value of \$400 million generated by estimated City investments of \$10 million combined with investments across the Palo Alto economy of approximately \$760 million over the next 14 years. (These are best estimates in the face of rapidly evolving technologies and rapidly improving price/performance ratios in energy, mobility and other sectors; they should be revised regularly.)

This return on investment may seem surprising that reducing GHG emissions are estimated to provide a net positive economic benefit, since most people have long thought that environmental quality costs money. But efficiency has long delivered good return on investment, and renewable energy is becoming increasingly competitive compared to fossil fuels. This makes carbon neutrality a good investment seen in the light of alternative costs if Palo Alto were to continue to source its energy from fossil fuels. Additionally, the levers and strategies identified in this plan also contribute to improving the health and quality of life for Palo Alto residents and businesses by reducing congestion, noise and local pollution.

## Financing these pathways

Staff has identified a variety of potential sources of funds to finance the S/CAP; all of these sources (including private financial vehicles) need a more complete assessment of applicable legal and regulatory requirements and the risks and obligations associated with the various approaches.<sup>20</sup> These include operating savings, parking feebates, utility rates, revolving loan funds, local offsets, carbon tax or fee, voluntary contributions, green bonds, transfer taxes, public/private partnerships and private financial vehicles.<sup>21</sup> There is evidence that market demand exceeds supply for well-constructed sustainability and climate related investment opportunities; as a result some initiatives discussed here may be financeable through private investors.

## Capital formation

People—and companies—sometimes resist environmental improvements for fear they are too expensive, or say we'll do as much as we can afford. But as the late Ray Anderson, founder and CEO of Interface, would say, "If you think sustainability is expensive, you're doing it wrong."

Analysis shows that sustainability can be a good investment. But it is an investment—and like any other can be structured in many ways

Many funding options are available and new forms are continually emerging. In most cases, innovation comes from combining instruments in creative ways to achieve specific goals rather than creating entirely new mechanisms.

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<sup>20</sup> The City of Palo Alto has just been award an \$85k grant from USDN for a multi-city exploration of potential sustainability financing strategies

<sup>21</sup> This despite a common misperception: Most people who have not been deeply engaged in sustainability work assume that low-carbon and other sustainability initiatives will necessarily require financial, performance or quality of life sacrifices, because "better usually costs more." As we've seen in the world's product innovation, green building, and corporate eco-efficiency, this is not necessarily the case; in fact a growing body of evidence documents that attractive returns on investment are possible from well-designed and well-executed sustainability initiatives.

The “best” choice of funding vehicle for a particular entity is one that compliments the current political and cultural context of a region by allocating costs and benefits equitably. Figure 18 summarizes key financing options and their estimated scale.

**Figure 19: Potential Financing Sources and Amounts**

STRATEGIES	DESCRIPTION	POTENTIAL FUNDS	COMMENTS
Utility Costs Operating Savings	Allocate 50% of cost savings from retrofit of City buildings	\$0.6m/yr	Current spend ~\$6m/year; estimated 10% savings
Parking Feebates	Phase out free parking; apply revenues to commute alternatives as MaaS*	\$10-20m/yr	(Modeled on the Stanford engine)
Utility Reserve	Apply 10% of Utility Reserve to finance low-carbon initiatives	\$5m/yr	
Revolving Loan Fund	Establish bond-funded low-interest revolving loan fund for on-bill financing of efficiency projects	TBD	
Green Bonds	Issue green bonds to finance green infrastructure and low carbon initiatives	TBD	Beneficial interest rates since demand exceeds supply
Local Offsets	Switch GreenGas to opt-out; use portion of funds to finance qualified local projects (5% first year)	\$1.6m/year	
Carbon Tax	Explore and pilot local carbon tax or fee	\$5-15m/yr	See Boulder, for example. Would likely require ballot measure.
<b>Total</b>		<b>\$22.2-32.2m/yr</b>	

## Goal: Utilize diverse financial pathways to drive S/CAP implementation

- Evaluate the economic and legal feasibility of the financing measures identified in Figure 19.
- Utilize the general fund to incentivize investments to promote appliance switching, which may not be possible for the Enterprise funds to finance due to legal restrictions.
- Establish internal carbon pricing for all City departments and financial activities.
- To the extent feasible, include carbon pricing into the gas rates to fund efficiencies and fuel switching.
- Identify a neighborhood or commercial district as a special district to carry out innovative pilot projects around GHG reduction, electric transportation development, or other approaches.

# IMPLEMENTATION: TURNING VISION INTO ACTION

Achieving the emissions reductions detailed in this plan requires that the strategies and actions are implemented in a timely, coordinated, and a sustained way. Partial or poorly coordinated implementation will reduce the emissions reduction potential of the S/CAP.

## Monitoring and Tracking Progress

The Office of Sustainability will be responsible for monitoring and reporting on the progress of the S/CAP on the following schedule:

- Community greenhouse gas inventory: Annually.
- S/CAP Strategy Indicators: Annually

Below, we summarize the key performance indicators associated with each Strategy:

**Table 1. Summary of S/CAP Strategy Indicators for Monitoring Progress**

Levers	Goals	Strategy	2030 Performance Target	2030 GHG Emissions Reduction (MTCO <sub>2e</sub> )
Rethinking Mobility	Expand non-auto mobility options	T-FAC-1. Expand bicycle infrastructure	Increase bike boulevard miles to 26 miles Increase in bike mode share to 30%	8,400
		T-FAC-2. Expand transit options	Increase transit ridership by 60%	19,200
		T-FAC-3. Grow ridesharing services	Increase in rideshare mode	6,400
	Create right financial incentives	T-INC-1. Provide universal transit passes	75% of residents and employees have universal transit passes	7,600
		T-INC-2. Implement parking pricing	50% of sites have parking pricing	18,400
	Implement land use approaches	T-LU-1. Increase zero-impact housing	Target 2.95 jobs-housing ratio	2,900
	Reduce carbon intensity of vehicles	T-EV-1. Electrify Palo Alto-based vehicles	90% of vehicles based in Palo Alto are zero emission	25,200
T-EV-2. Electrify inbound vehicles		50% of inbound (not based in Palo Alto) vehicles are zero emission	29,800	
Electrifying our City	Reduce use in existing businesses	NG-COMM-1. Electrify water heating in businesses	85% of commercial water heating is electric	21,200
		NG-COMM-2. Electrify space heating in businesses	85% of commercial space heating is electric	15,900
		NG-COOK-1. Electrify commercial cooking	50% of commercial cooking is electric	11,300
	Reduce use in	NG-RES-1. Electrify residential	Close to 100% of water heaters are	

	existing homes	water heating	electric	13,600
		NG-RES-2. Electrify residential space heating	70% of residential space heating is electric	23,300
	Reduce use in new buildings	NG-GAS-1. Encourage all-electric new buildings	New buildings are zero net energy ahead of state targets	11,900
Zero Waste	Enhance programs and infrastructure	SW-1. Achieve zero waste	Achieve 95% diversion rate	9,500

# CONCLUSION

Climate change is a global problem and only through local solutions designed to meet the needs of our community can we mitigate and adapt to its impacts and protect the environment. While the challenge of climate change is unprecedented, local-level solutions can reduce emissions, increase efficiency, promote economic development, and improve quality of life for residents.

Together, we can continue to foster a vibrant economy, increase our resiliency and support Palo Alto's vision for a livable and sustainable community for generations to come. The City of Palo Alto has taken a significant step toward a more sustainable future with this climate action plan. This Plan has identified areas and opportunities to reduce GHG emissions within the community and City operations that along with statewide efforts can achieve our environmental goals.

While an important first step, this plan will remain a living document, to be updated as technology and policies progress, to support the City's efforts to manage GHG emissions for a sustainable future for all.

# GLOSSARY

BAU: Business as Usual. Measures, initiatives or impacts that do not depend on new City of Palo Alto action

BAU 1: BAU resulting from demographic projections, external (State and Federal) policy choices. Based on CompPlan analysis, modified by S/CAP consultants to distinguish certain elements. (See BAU2)

BAU 2: BAU resulting from existing (enacted and/or in progress)

Palo Alto: The entire Palo Alto community, including COPA, residents and businesses

CPAU: City of Palo Alto Utilities

COPA or The City: City of Palo Alto municipal government, including City of Palo Alto Utilities

GHG: Greenhouse gas emissions