

Office of the City Manager

WORKSESSION

December 7, 2017

To: Honorable Mayor and Members of the City Council

From: Dee Williams-Ridley, City Manager

Submitted by: Timothy Burroughs, Interim Director, Planning & Development

Subject: Climate Action Plan Update

SUMMARY

This report provides the City Council with an annual update on progress toward achieving the Berkeley Climate Action Plan (CAP) goals of reducing community-wide emissions 33% below 2000 levels by 2020 and 80% by 2050. According to the latest and best available data, Berkeley's 2015 community-wide greenhouse gas (GHG) emissions, including emissions from transportation, building energy use, and solid waste disposal, are approximately 12% below 2000 baseline levels, despite a population increase of approximately 18% in that same time period. Data for 2016 are not yet available.

While this achievement in community-wide GHG emissions reductions is significant, there is still more work to be done. Community emissions would need to be reduced by an additional 21% to meet the interim 2020 target. Achieving deeper GHG reductions requires accelerated action.

This report highlights key existing and planned efforts designed to accelerate reductions in local GHG emissions, and to advance preparedness for climate change impacts.

The core strategies of the City's current and planned work to accelerate GHG reductions are to:

- *Reduce building energy use* through a combination of technical assistance, incentives, and requirements that catalyze investment in energy efficiency
- *Increase access to clean, renewable electricity* by encouraging and removing barriers to local renewable energy, such as rooftop solar, as well as promoting 100% emissions-free electricity through East Bay Community Energy
- *Transition building energy sources from natural gas to clean electricity* by providing outreach, education and incentives for technologies that can be powered by clean electricity, such as heat pumps for space and water heating

- *Reduce vehicle miles traveled* by focusing growth along transit corridors, smart parking policies, and increasing access to less-polluting travel modes, such as biking, walking, and public transit
- *Transition cars from petroleum to clean electricity* by supporting the development of electric vehicle charging infrastructure
- *Divert solid waste from landfills* by maximizing recycling and composting and minimizing solid waste at its source, such as through promoting material reuse
- *Advance adaptation and resilience* by adapting to climate change, planning for reliable clean energy, creating buildings that can withstand disasters, improving infrastructure to help mitigate damage from the effects of climate change, and fostering resilience in the community through community engagement and regional collaboration

CURRENT SITUATION AND ITS EFFECTS

In order to understand the sources of community-wide GHG emissions, the Office of Energy & Sustainable Development conducts an annual greenhouse gas emission inventory. This inventory is based on data gathered from municipal operations as well as Pacific Gas and Electric Company (PG&E), East Bay Municipal Utility District, CalRecycle, the Metropolitan Transportation Commission, and others. Data are then converted to metric tons of carbon dioxide equivalent (mt CO₂e). The inventory utilizes the best available data, despite issues arising this year regarding access to accurate, consistent datasets, and follows a global protocol which allows the City to report consistently to the community and to other agencies, such as the Covenant of Mayors for Climate & Energy.

This inventory includes the following emissions sources: transportation modeled from traffic analysis, building electricity usage, building natural gas consumption, landfilled solid waste, as well as emissions from water consumption and wastewater treatment.

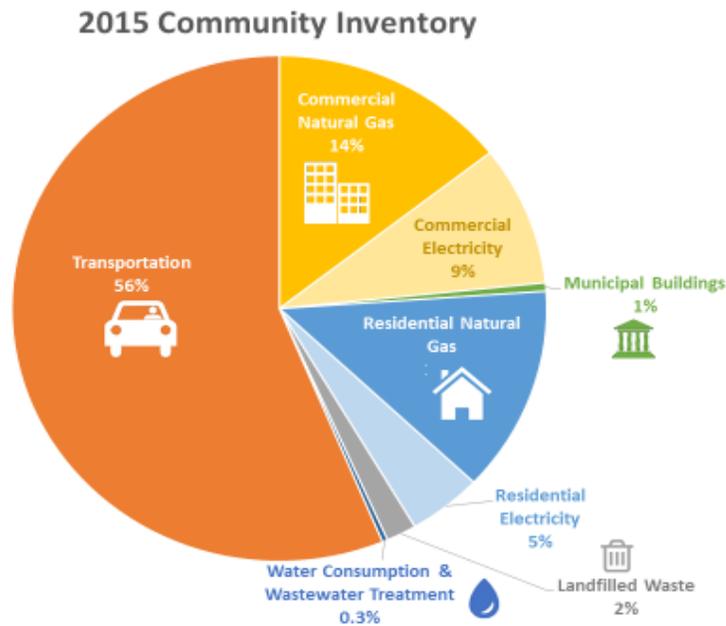


Figure 1: Pie chart of 2015 community-wide greenhouse gas emissions inventory, broken down by sector and fuel.

Figure 1 provides a breakdown by sector and fuel of Berkeley's 2015 community-wide greenhouse gas (GHG) emissions. This distribution is similar to past inventories, with over half of emissions coming from the transportation sector, and another 42% coming from buildings—both electricity use and natural gas combustion. In the building sector, 66% of emissions are from natural gas usage.

Current Community-Wide GHG Emission Trends

The most current community emissions are compared to the CAP baseline year of 2000, to identify reductions achieved thus far. A historic summary of Berkeley's annual emissions inventories from 2000 to 2015 is provided in Figure 2.

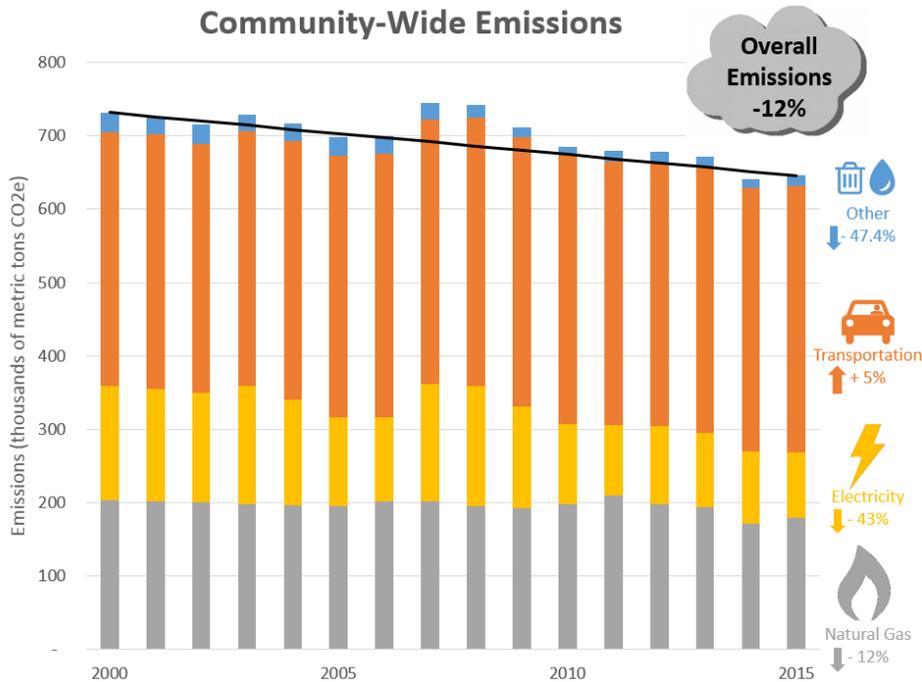


Figure 2: Showing historic Berkeley emissions inventories back to 2000, broken out into natural gas, electricity, transportation, and other (including water, wastewater treatment, and landfilled solid waste).

Community-wide emissions were 12% below 2000 levels in 2015, even though Berkeley’s population had increased approximately 18% during that same time period. This is an impressive feat, with reductions resulting from a combination of state, regional, and local efforts including:

- **Reduction in building energy use:** See Table 1 for a breakdown of electricity and natural gas reductions in each building sector since 2000. Energy efficiency measures contribute to these savings, including those reached through rebate programs such as Energy Upgrade California, more efficient lighting and appliances, and improved building envelopes. A total reduction of 20% in electricity usage and 11% in natural gas usage across all sectors was achieved, despite a 19% increase in natural gas in the commercial and industrial sector. Specifically, municipal buildings have decreased energy usage, resulting in a 28% reduction in emissions, despite an increase in overall square footage.

Table 1: Summary of 2015 trend in electricity and natural gas usage within each building sector—residential, commercial (including industrial buildings), municipal, and overall—compared to 2000 baseline year.

| | Residential | Commercial | Municipal | All Buildings |
|-------------------|-------------|------------|-----------|---------------|
| Electricity Usage | -19% | -21% | -8% | -20% |
| Natural Gas Usage | -31% | +19% | -12% | -11% |

- Increased rooftop solar: According to data from the California Solar Initiative, Berkeley businesses and residents collectively installed over 1,700 solar photovoltaic (PV) systems from 2000 to 2015, increasing solar capacity to approximately 7,100 kW, providing renewable energy to power buildings and adding any excess clean electricity back into the grid.
- Cleaner electricity mix: State laws like the Renewables Portfolio Standard (RPS) require PG&E to increase the amount of renewable energy on the grid, causing the GHG emissions produced per kilowatt-hour of electricity consumed to decrease. Therefore, with a 20% electricity usage reduction since 2000, emissions actually decreased by 43%. In 2015, 29% of PG&E's electricity mix was sourced from renewable energy, with approximately 70% considered emissions-free, coming from sources such as large hydropower and nuclear energy.
- Water consumption: The community reduced its water consumption in buildings by 29% below 2000 levels, and conservation continues to be critical as the Bay Area is expected to experience further drought in the coming years.
- Reduction of landfilled waste: The Berkeley community achieved a 39% reduction in tons of waste sent to landfills since 2000. This is an extremely impressive feat, considering the significant population increase. One factor leading to this success is the promotion of new laws requiring recycling and composting.
- Transportation: Transportation is the largest source of community-wide emissions, and modeled data shows a slight increase of 5% from 2000 to 2015 due mostly to population increase. The municipal vehicle fleet decreased emissions by 13% due to cleaner and more efficient vehicles. To achieve overall reductions in this sector, the City is focusing on increased mixed-use, transit-oriented development in combination with ongoing improvements to bicycle and pedestrian infrastructure and advancing electric vehicle infrastructure in order to meet our 2050 CAP goals.

Comparative GHG Emissions Trends

In 2015, statewide emissions decreased approximately 6% since 2000¹, compared to the 12% reduction achieved in Berkeley. Statewide emissions reductions are expected to accelerate with the recent passing of SB 350, which sets a goal for 50% of the electricity in California to come from renewable energy by 2030, and doubling the energy efficiency of buildings in the next 15 years. A Bay Area regional inventory completed by the Bay Area Air Quality Management District (BAAQMD) shows a 29% increase in emissions between 1990 and 2011, driven mainly by a 23% increase in the region's population during that time period.

Although the UC Berkeley and LBNL campuses are not included in the community greenhouse gas inventory, both UC Berkeley and LBNL are playing leadership roles in

¹ https://www.arb.ca.gov/cc/inventory/data/graph/bar/bar_2015_scopingplan.png. Please note methodologies between state, regional, and local emissions inventories may vary slightly.

reducing the carbon footprint of their operations. UC Berkeley reduced its emissions associated with building energy use, transportation, and solid waste disposal by 18.6% since 2007². LBNL has reduced emissions by 21% below 2008 levels³.

Clean Energy Strategies to Achieve 80% Reductions by 2050

The community is not currently on track to achieve the interim target of reducing community-wide emissions by 33% below 2000 levels by 2020. In addition to current programs, achieving deeper reductions will require additional and accelerated action. Actions identified in the CAP that have the greatest potential for emissions reductions are in the energy and transportation sectors. These include reducing the amount of fossil fuels to generate electricity, reducing natural gas from buildings, and reducing the use of petroleum from transportation. Figure 3 demonstrates the potential for these actions to close the gap.

This graph is not based on specific program outcomes, but rather is meant to illustrate the magnitude of change needed to meet the 2050 reduction goal. Each “wedge” of the graph is further described below.

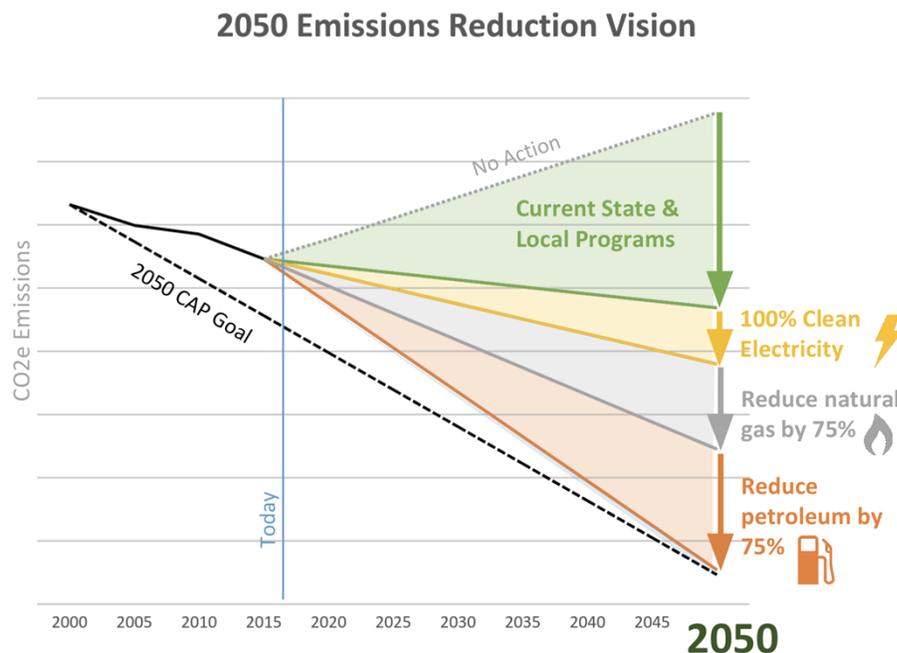


Figure 3: An illustration of the magnitude of each focus area it would take in order to reach the 2050 Climate Action Plan Target.

- **Current state and local programs.** The strategy to achieve 80% emissions reductions by 2050 includes the continued success of current programs

² <https://sustainability.berkeley.edu/carbon-neutrality/calcap-ghg-inventory>

³

<https://sbl.bime.io/dashboard/08E61756C86C771E3FD291A043CA9DD97A3B7CFFCBA067665C759E96468F7EB1>

across all sectors. Continuing current state and local programs would achieve approximately 42% of the required reductions by 2050. These include local initiatives, such as transportation demand management efforts, energy efficiency, and efforts to achieve zero waste.

- **100% clean electricity.** If the community were to achieve 100% clean electricity, this would contribute approximately a third of the emission reductions necessary to reach our 2050 goal. It is important to note that as more appliances and cars are powered with electricity, electrical usage would increase significantly, making emissions-free electricity even more important.
- **Reduce natural gas usage by 75%.** Approximately a third of the emissions reductions needed to reach our 2050 goal could be met by a 75% reduction in natural gas usage. All energy used in buildings needs to be reduced through efficiency, then the remaining natural gas uses —mainly heating and domestic hot water —need to be replaced with electric technology such as heat pumps. Many technical and regulatory barriers would have to be addressed, as would the cost of implementing these technologies.
- **Reduce petroleum usage by 75%.** Approximately a third of the emissions reductions needed to reach Berkeley's 2050 goal could be met by a 75% reduction in petroleum usage in cars. Getting people out of cars is the first priority, with programs focused on growth along transit corridors and increasing active modes of transportation like walking, biking, and public transit. Electric vehicles (EVs) offer the potential to transition the remaining trips to emissions-free cars. Transportation technology is rapidly changing. Improving EV charging infrastructure as well assuring adequate capacity of the transmission and distribution system will require thoughtful planning.

Current CAP Program Achievements & Next Steps

This section includes updates from some of the current program activities to date, including recent accomplishments and next steps. These achievements have been realized through the hard work and collaboration from many departments, including the Public Works Transportation Division, Health Housing & Community Services, Parks Recreation & Waterfront, Office of Emergency Services, and other divisions within the Planning & Development Department. Please note that while the GHG inventory data is current through 2015, this section includes the most recent programmatic outcomes available.

Reduce building energy use: 2015 emissions from buildings were 25% below 2000 levels, although they still account for 42% of community-wide emissions. Two key strategies for reducing emissions in this sector are increasing energy efficiency and the use of on-site renewables. Reducing energy consumption alleviates demand on the grid freeing up capacity to transition from natural gas appliances to clean electricity

technologies, such as heat pumps. Energy efficiency has other co-benefits including lower utility bills, improved comfort and health, and better indoor air quality within buildings. Berkeley has made many recent strides in strategically improving its existing building stock.

Recent program accomplishments

- *Building Energy Saving Ordinance (BESO)*, approved in 2015, requires all buildings to get an energy assessment. The program has resulted in over 1,000 energy assessments of buildings. In addition to the ongoing time of sale requirement, BESO will be phasing in commercial and multifamily buildings over 50,000 square feet by July 2018, requiring both energy assessments and annual benchmarking of energy usage. OESD staff will report back to Council in 2019 with an evaluation of the program's first three years.
- *Participation in energy efficiency incentive programs* - As of September 2017, a total of 286 single family homes have been upgraded through Energy Upgrade California and 612 multifamily units upgraded through Bay Area Multifamily Building Enhancements program.
- *Total of 70 verified Green Buildings - 51 LEED Certified Green buildings and 19 GreenPoint Rated Green buildings* with total of 958 housing units.
- *Center Street Garage* construction is underway, including designs for high-efficiency lighting, a rooftop solar system with the largest capacity of any City-installed system to date, a rainwater capture system, bike parking, and would provide solar power for an envisioned grant-funded microgrid design, described below. The garage is scheduled to be re-opened in spring 2018.

Next steps

- *Mental Health Clinic retrofit* designed to make the building highly efficient and improve occupant health and comfort
- *Zero Net Energy (ZNE) assessments* of additional municipal buildings including several care and shelter sites
- *BESO* program to develop and launch on-line registration and payment system, to support phase-in of large buildings beginning in 2018 and lessen administrative burden
- *Identify resources* for third-party evaluation of BESO program
- *Analysis of opportunities to develop efficiency reach codes* for new and remodeled buildings consistent with the Berkeley Deep Green Building Initiative program

Increase access to clean renewable electricity: As most local energy needs transition to electric technologies and Berkeley's population continues to increase, the electricity load will increase, despite reductions achieved from energy efficiency. Berkeley residents and businesses will need equitable access to local, clean electricity to reduce overall emissions from buildings and electric vehicles.

Recent program accomplishments

- *Rooftop solar* – 2260 projects (both residential and commercial) interconnected through July 2017, with 9,000 kW installed.
- *SunShares program participation* resulted in 11 solar installations within Berkeley in 2016, totaling 43.25 kW of local renewable electricity. This is a bulk purchasing program with vetted vendors for below-market rate turnkey solar installments and discounts on electric vehicles. The City is currently participating in the 2017 SunShares program.
- *Brighter Futures Berkeley* - This \$80,000 grant project increased equitable access to solar power by installing a 10 kW solar system on the Sankofa House, which provides shared housing for 10 formerly homeless families, and free solar systems for two low-income single-family homeowners. The project also provided hands-on green job training for low-income community members.

Next steps

- *East Bay Community Energy* program is planned to launch in 2018; staff will provide outreach to encourage participation in a “deep green” electricity mix option.

Transition building energy sources from natural gas to clean electricity: In 2015 natural gas accounted for 66% of emissions from Berkeley buildings, and about 75% of emissions from the residential sector. In order to achieve our emission reductions goal, natural gas must be phased-out of our existing building stock. This will include adoption of heat pump technology for heating, cooling, and hot water needs, which account for the majority of natural gas uses in California homes.

Recent program accomplishments

- *Hosted heat pump technology workshops* to expand contractor knowledge of efficient, electric technology ready for Berkeley homes to reduce emissions.
- *Online permit guidance* for homeowners interested in retrofitting natural gas water heaters to heat pumps.

Next steps

- *Further analysis* of regulatory, monetary and technical barriers to transition to clean electricity, including coordination with state and regional efforts and providing a pathway and support for early adopters.
- *Continued expansion of local expertise* on new technologies for contractors, building professionals, and staff.
- *Analysis of opportunities to develop reach codes* to encourage electrification of new and existing buildings consistent with Deep Green Building Initiative.
- *Identify resources* for incentivizing electrification measures such as heat pump water heaters.

Reduce vehicles miles traveled: In order to drive less, residents, employees and visitors also need access to a variety of less-polluting modes of transportation. Strategies in this area include expansion of car share services and increasing safe,

ubiquitous pedestrian and bicycle infrastructure through capital improvement projects. In addition, the City continues to focus new compact, mixed-use development along transit corridors with access to public transit in designated Priority Development Areas (PDAs), particularly in or near Downtown Berkeley. Together, these efforts have made many recent achievements, including:

Recent program accomplishments

- *Berkeley's bike-to-work rate* is ranked 2nd highest in all mid-sized US cities.
- *Round Trip and One-way Car-Sharing (Zipcar, GIG, Getaround)* launched.
- *High Priority Pedestrian Plan Projects* –nine of 34 have been substantially completed.
- *Ford GoBike bike share service for public implemented in 2017.*
- *Obtained funding and completed \$38 million of walking, biking, transit improvement projects* (including Hearst Complete Streets and Bancroft Bus Pilot and Bikeway) over the last five years.

Next steps

- *Implementation of Bike Plan Update*, adopted in 2017, including Milvia Bikeway and other grant-funded projects.
- *Completion of Pedestrian Master Plan* update and continued implementation.
- *Development of Downtown Transit Center Plan.*
- *Implementation of Berkeley Strategic Transportation (BeST) Plan*, including Shattuck Avenue Complete Streets, Southside Complete Streets, and other grant-funded projects.
- *Ford GoBike* available for City employee fleet usage.
- *GoBerkeley Parking Management Program* to continue.

Transition cars from petroleum:

In tandem with efforts to reduce vehicle miles traveled, the City is working to encourage the use of low-carbon vehicles and fuels. Transitioning a car from gasoline to electric now reduces GHGs associated with that vehicle by about 70%, and has potential for even further reductions with cleaner electricity. Charging infrastructure requires significant financial investment for installation and on-going maintenance and support; the technology is also relatively new and is continuing to evolve, but recent achievements include:

Recent program accomplishments

- *Fleet vehicles transitioned to renewable diesel*, phasing out petroleum diesel.
- *Over 1,150 electric vehicles registered* to Berkeley addresses in 2016.
- *Residential Curbside Electric Vehicle Charging Pilot Program* received 37 eligible applications, with seven completed projects to date.
- *EV Charging grants* totaling \$100,000 brought total public charging station ports to 14 city-wide, to complement the 21 ports provided by businesses within Berkeley, including three DC fast chargers.

- *West Branch Berkeley Library* features a public curbside EV charging station that utilizes excess solar electricity from the zero net energy library.

Next steps

- *Center Street Garage* will open with 20 EV charging ports and a capacity for expansion to 57.
- *Identify resources* for EV Strategic Plan.
- *Monitor grant opportunities for EV charging infrastructure* and promote to Berkeley employers and other eligible parties.
- *Analyze Municipal vehicle fleet* for further greening opportunities.

Solid waste: In 2015, solid waste disposal accounted for approximately 2% of community-wide GHG emissions. Although it is a small contributor of emissions compared to buildings and transportation, strategies such as recycling and composting reduce landfill waste and are consistent with the City's Zero Waste by 2020 goal. Reductions in landfilled waste also result in decreased upstream emissions and reduction of other harmful environmental impacts. Increased recycling and composting for all property types are critical to continuing and accelerating this trend.

Recent program accomplishments:

- Curbside compost collection increased by 51% since 2007 as of 2015.
- Construction and demolition debris diversion increased by 89% since 2009 as of 2015.

Next Steps

- *Zero Waste Strategic Plan* to inform further policy measures.
- *Transfer Station Redesign Master Plan* to create a state-of-the-art transfer station.
- *Commercial service expansion* planned for upcoming year.
- *Continued diversion from all City facilities* to lead the way as a role model for others to follow.

Climate adaptation and resilience: In addition to efforts to reduce GHG emissions, staff is also advancing work to better prepare for the impacts of climate change and other hazards. The main climate-related impacts in Berkeley are increased flooding due to sea-level rise, extreme storm events, and aging stormwater infrastructure, along with other risks such as drought, earthquakes and wildfire. These and other resilience efforts are articulated in Berkeley's "Resilience Strategy," approved in 2016.

Recent program accomplishments

- *Berkeley Energy Assurance Transformation Project* - Staff secured a \$1.5 million grant to design a microgrid for renewable back-up power for City buildings and critical facilities.
- *Continued implementation of Green infrastructure (GI)* projects to lessen stress on stormwater infrastructure during rain events, treat stormwater before it flows to the

bay or into underground aquifers. Trash capture devices were installed in 216 existing catch basins.

- *Expanded the urban forest* which reduces local air temperatures, helps to reduce stormwater runoff, and sequesters GHG emissions, among other benefits.

Next Steps

- *Solar plus storage microgrid project development* – In 2018 staff will pursue further grants for implementation of solar plus storage projects.
- *Green Infrastructure Plan* which will guide the inclusion of green infrastructure in future projects.
- *Complete GI projects* including a bio-swale at the intersection of Rose and Hopkins Streets, and permeable paver bus pad at the intersection of Shattuck and University Avenues, Woolsey Street Cistern, and the Kains Trash Rack.
- *Interdepartmental collaboration* on Local Hazard Mitigation Plan update, planned for 2019, will enable staff to advance climate adaptation efforts and analyses.
- *Coordination of equity work group* to advance racial equity in climate action programs.

BACKGROUND

Adopted by City Council on June 2, 2009, the CAP is the community's guide for reducing greenhouse gas (GHG) emissions to 80 percent below 2000 levels by 2050, with an interim goal of 30 percent by 2020. CAP strategies are designed to not only reduce GHG emissions, but also to achieve several other benefits, including improved public health due to less local air pollution and more active transportation modes; improved access to green jobs from increased demand for solar and energy efficiency upgrades; and cost savings for residents, businesses, and City government through reduced energy use.

ENVIRONMENTAL SUSTAINABILITY

The Climate Action Plan is designed to guide community-wide efforts to reduce global warming emissions and improve environmental performance. CAP policies and programs have contributed to reductions in energy use, solid waste disposal, and vehicle miles traveled in the Berkeley community.

POSSIBLE FUTURE ACTION

The purpose of this report and the associated work session is to provide City Council with an update on GHG emission trends to date, and to provide an opportunity for discussion on future policy and program options for closing the gap between current and targeted GHG emission levels.

FISCAL IMPACTS OF POSSIBLE FUTURE ACTION

Current climate action priorities are funded by existing grants, enterprise funds, and General Fund allocations. Staff continues to seek additional grants and other sources of funding to accelerate existing efforts. The fiscal impacts of accelerating CAP implementation are currently unknown and are dependent on Council's policy choices.

CONTACT PERSON

Billi Romain, Interim Manager, Office of Energy and Sustainable Development,
Department of Planning and Development, (510) 981-7432

