The City of Emeryville Climate Action Plan 2.0 Implementation Plan

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EXCEUTIVE SUMMARY

Climate change continues to be a serious and significant issue for the City of Emeryville to address. The City of Emeryville's Climate Action Plan (CAP) 2.0 was written to build on the progress made by the first CAP for the City of Emeryville in 2008 and to incorporate the new state mitigation targets and rapidly-evolving technology. In accordance to the State of California targets, the City of Emeryville aims to reduce greenhouse gas (GHG) emissions to 40% below baseline levels by 2030 and 80% below baseline levels by 2050.

The City of Emeryville CAP 2.0 meets the compliance for the Global Covenant of Mayors, a platform for standardizing climate action planning for local city governments and demonstrating local commitment to climate change mitigation and adaptation. As per the Covenant of Mayors' requirements, the CAP 2.0 contains a vision for the City's overall climate ambitions and objectives, updated community and municipal GHG inventories , a business-as-usual GHG emissions forecast, emissions reduction targets, a climate change vulnerability assessment, mitigation and adaptation implementation plans, and a monitoring plan.

With 17 mitigation goals, 5 adaptation goals, and over 100 combined initiatives for 2030, and 5 long-term strategies for 2050, this CAP 2.0 represents a strong step in reducing emissions and building climate resilience. Details about the initiatives and the GHG inventories can be found in the accompanying City of Emeryville Climate Action Plan 2.0 Implementation Plan.

Article I. MITIGATION ACTION PLAN FOR 2030

These actions were compiled based on research on best practices across the nation and feedback from community workshops. As more effective programs, technology, and opportunities arise, Emeryville will shift its strategies and actions as necessary to meet the interim 2030 goal and stay on target for the 2050 reduction goal. All reduction targets are comparing to the earliest data available as a baseline.

The 2030 objectives and associated actions are grouped into one of the following categories: Transportation, Buildings, Energy, Consumption and Solid Waste, Water Use, Urban Space, and Local Government Operations.

The carbon-reduction potential of the action has been noted qualitatively on a scale of Low-High. These estimates represent the approximate magnitude of the carbon reduction if fully implemented. Other co-benefits such as equity, environmental quality, jobs/economy, and health are noted where the action supports these factors. Potential partner organizations (both private and public-sector partners) and department leads for relevant actions are also listed.

OBJECTIVES:

TRANSPORTATION

1. Create vibrant neighborhoods where residents can easily walk to their basic daily needs.
2. Reduce the total vehicle miles traveled on local roads by 30%.
3. Reduce the carbon intensity of vehicles by 30%.

BUILDINGS

4. Reduce the total energy use of buildings built in 2016 or before by 15%.
5. Achieve zero net carbon emissions for 50% of new construction.

ENERGY

6. Increase local renewable energy capacity in Emeryville by 30%.
7. Develop or support green jobs training program around increasing local renewable energy capacity and energy efficiency.

CONSUMPTION AND WASTE

8. Reduce food scraps sent to landfills.
9. Achieve zero waste to landfills.

10. Reduce consumption-related emissions by encouraging sustainable consumption and minimization of the carbon intensity of business supply chains.

WATER USE

11. Reduce water use in the community by 30%.

URBAN SPACE

12. Expand the urban forest with a minimum canopy cover of 50% in the Triangle and Doyle medium density residential neighborhoods and 25% in other city areas.

13. Expand access to healthy and local food.

LOCAL GOVERNMENT OPERATIONS

14. Reduce energy use in city facilities by 30%.

15. Reduce water use in city facilities by 30%.

16. Reduce emissions in the city fleet and employee commute by 30%.

17. Achieve zero waste to landfill from city facilities.

Section 1.01 Transportation

1. **Objective**: Create vibrant neighborhoods where residents can easily walk to their basic daily needs.

Objective 1: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
1A	Implement, maintain, and improve the pedestrian zones and facilities as noted in the General Plan. Examples include cross walks and signal timing.	GHG – High Health Equity Environment	Planning, Public Works	Ongoing
1B	Finish the north-south Emeryville Greenway for biking and walking.	GHG – High Health Equity Environment	Planning, Public Works	Ongoing
1C	Finish the east-west Temescal Creek Greenway for biking	GHG – High	Planning, Public Works	10-15 years

	and walking.	Health Equity Environment		
1D	Plan new housing complexes within walking access to transit and other essential goods and services.	GHG – Low Health Equity	Planning	Ongoing
1E	Continue implement traffic calming to reduce vehicle speeds in residential neighborhoods.	GHG – Low Health Equity	Planning	Ongoing

2. **Objective**: Reduce the total vehicle miles traveled of local traffic by 30%.

Objective 2: Actions to be completed by 2030

Number	Action	Impact	Potential Partners	Timeframe
2A	Build integrated transit centers with connections between different transportation modes such as Amtrak Transit Center and 40th/San Pablo Bus Hub.	GHG – High Health Equity Environment	AC Transit, Amtrak, Planning, Public Works	Ongoing, 5-10 years
2B	Expand the regional Bike Share program.	GHG – Med Health Equity Environment	BikeShare, Environmental Services	1-5 years
2C	Increase and improve bike and pedestrian infrastructure. Examples include bike lockers, repair stations, racks, and sensors for cross-walks.	GHG – High Health Equity Environment	Public Works, Planning	Ongoing
2D	Renovate street for separate bus lanes on 40th Street, Shellmound Street, and San Pablo Avenue.	GHG – High Health Equity Environment	AC Transit, Alameda County Transportation Commission, Public Works	10-15 years
2E	Extend protected bike lanes on 40th Street.	GHG – Med Health Equity	AC Transit, Alameda County Transportation Commission, Public	10-15 years

		Environment	Works	
2F	Implement parking pricing in the city. Examples include installing parking meters in the north Hollis area.	GHG – Med Equity Health Environment	Public Works, Economic Development & Housing, Police	1-5 years
2G	Promote programs that reduce vehicle miles traveled during new development planning. Examples include employee alternative commute plans and community-based social marketing plans.	GHG – Med Equity	Planning	Ongoing
2H	Reduce the maximum number of allowable parking spaces for new developments.	GHG – Med	Planning	Ongoing
2I	Expand Emery-Go-Round hours and coordinate service to match hours of regional transportation services (BART, trans-bay bus, ferries, etc.)	GHG – High Health Equity Environment	Emery-Go-Round, Economic Development & Housing	Ongoing, 5-10 years
2J	Develop an alternative transportation incentive program for shoppers. Examples include Walk to Shop, a rolling shopping cart discount, or a poster photo campaign.	GHG – Low Economy Health	Bay Street Mall, Public Market, Economic Development & Housing	1-5 years
2K	Develop a community-based social marketing outreach campaign to incentivize public transit for residents and workers in Emeryville. Examples include stickers for using public transit or posters with resident photos.	GHG – Med Health	Environmental Services	1-5 years
2L	Provide concierge service for public transit options, particularly at the Senior Center and Public Market. This can be combined with improved way finding signage and transit information.	GHG – Low Economy	Public Market, Community Services	5-10 years
2M	Increase opportunities for car-sharing and car-pooling via a city transportation demand management program, expanded casual carpool sites, and incentives for car sharing. Examples include Peninsula carpool parking and a program for designating on-street parking spaces for car share programs.	GHG – Low Equity Health Environment	Carma, Zipcar, Environmental Services	1-5 years

2N	Complete South Bayfront bicycle/pedestrian bridge.	GHG – Med Health	Public Works	5-10 years
2O	Investigate the feasibility of roundabout replacements at intersections with controlled intersections. Roundabouts with yield signs may be more energy efficient than stop signs and may reduce head-on collisions.	GHG – Low Health	Public Works	5-10 years

3. **Objective**: Reduce the carbon intensity of vehicles by 30%.

Objective 3: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
3A	Expand electric vehicle (EV) charging infrastructure by incentivizing developers and building owners, building city-owned public stations, and/or installing chargers integrated into streetlights	GHG – Med Economy Health Environment	PG&E, Planning, Public Works	Ongoing, 1-5 years
3B	Create EV parking in public lots.	GHG – Med Economy	Planning, Public Works	1-5 years
3C	Advocate for low carbon fuel standards at regional level when opportunity arises.	GHG – High	Environmental Services	5-10 years
3D	Advocate for use of EV in car sharing programs when working with companies such as Carma and Zipcar.	GHG – Med	Carma, Zipcar, Environmental Services	Ongoing, 1-5 years
3E	Plan appropriate charging spaces for electric bikes, buses, and trucks.	GHG – Med	Public Works	Ongoing, 5-10 years
3F	Promote Idle Free campaign for cars idling at intersections.	GHG – Med Environment	Environmental Services	1-5 years
3G	Transition Emery Go Round to less carbon intensive fuels such as hydrogen or electric.	GHG – Med Environment	Emery Go Round, Environmental Services	5-10 years
3H	Implement measure to prohibit the sale of fossil fueled vehicles at car dealerships.	GHG – Med Environment	Economic Development	5-10 years

Section 1.02 Buildings

4. **Objective**: Reduce the total energy use of buildings built before 2016 by 15%.

Objective 4: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
4A	Develop a commercial energy performance benchmarking & audit ordinance. Existing examples include City of Berkeley's Building Energy Savings Ordinance (BESO).	GHG – Med Economy	Environmental Services	1-5 years
4B	Develop a residential/multifamily energy performance rating ordinance. Existing examples include City of Berkeley's Building Energy Savings Ordinance (BESO).	GHG – Med Economy Health	Environmental Services	1-5 years
4C	Develop a voluntary business audit/upgrade program for commercial energy audits and upgrades.	GHG – Med Economy	ABM, Environmental Services	Ongoing
4D	Promote improving existing building efficiency via building retro-commissioning using available regional resources.	GHG – Med Economy Equity Health	Environmental Services, Planning	1-5 years
4E	Promote Property Assessed Clean Energy (PACE) financing programs for residential and commercial buildings.	GHG – Med	StopWaste, Environmental Services	Ongoing, 1-5 years
4F	Work with PG&E to offer technical assistance to electricity & gas consumers. When working with businesses, priority assistance should be allotted to minority-owned businesses.	GHG – Med Economy Equity	PG&E, Environmental Services	1-5 years
4G	Promote green tenant and leasing practices for commercial businesses. Examples include the Green Tenant Toolkit developed by the Business Council on Climate Change and San Francisco Environment.	GHG – Med Economy	Economic Development & Housing	Ongoing, 1-5 years

5. **Objective**: Achieve zero net carbon emissions for 50% of new construction.

Objective 5: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
5A	Incentivize and remove barriers for passive buildings, zero	GHG – Med	Planning	1-5 years

	net energy, LEED, or Living Building Challenge designs.	Economy		
5B	Educate planners, architects, and contractors on passive buildings, zero net energy, LEED, and Living Building Challenge designs.	GHG – Med	Planning, Building, Environmental Services	5-10 years
5C	Encourage lighter building colors and cool roofs.	GHG – Low	Planning	Ongoing
5D	Pave streets with lighter colored slurry or asphalt.	GHG – Low	Public Works	1-5 years
5E	Maximize opportunities for renewable energy in new affordable housing developments.	GHG – High	Planning, Economic Development & Housing	5-10 years
5F	Develop ordinance banning hydrofluorocarbons (HFCs) for uses including but not limited to refrigeration and air-conditioning equipment, fire protection systems, solvents, foam products, and aerosols.	GHG - High	Planning, Building, Environmental Services	5-10 years

Section 1.03 Energy

6. **Objective**: Increase local renewable energy capacity in Emeryville by 30%.

Objective 6: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
6A	Increase outreach for direct solar installation programs and incentives. Examples can include a community-based social marketing campaign, public workshops, and social media blasts.	GHG – Med Economy Equity	East Bay Energy Watch (EBEW), Environmental Services	Ongoing
6B	Join the East Bay Community Choice Energy (CCE) program for the highest affordable percentage of local renewable energy.	GHG – High Economy Equity	Alameda County	Ongoing, 1-5 years
6C	Explore options for micro solar grid pilot projects.	GHG – Med Equity	Environmental Services	10-15 years
6D	Install solar/wind trees or other community renewable energy infrastructure. Community solar infrastructure can include community membership for shares in centrally	GHG – Med Equity	Public Works	5-10 years

	located solar panels.			
6E	Explore options for a carbon pricing mechanism. This can include a carbon tax or cap to generate new funding for carbon reduction while alleviating regressive impacts.	GHG – Med	Environmental Services, Economic Development & Housing	5-10 years
6F	Support micro finance loan programs for solar and other renewables.	GHG – Low Economy	Environmental Services	5-10 years
6G	Develop an ordinance requiring solar panels or green roofs on new buildings. Existing examples include the San Francisco solar panel ordinance.	GHG – Med	Environmental Services	5-10 years

7. **Objective**: Develop or support green jobs training program around increasing local renewable energy capacity and energy efficiency.

Objective 7: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
7A	Partner with organizations such as Oakland Green Jobs Corp and GRID Alternatives to develop a formalized green jobs training program for youth in the energy efficiency or green building field. The program can be modeled after the Oakland Green Jobs Corps.	GHG – Med Economy Equity	Oakland Green Jobs Corps, Economic Development & Housing	1-5 years
7B	Outreach to youth and community groups on entering the green jobs market, particularly in low-income or people of color communities.	GHG – Med Economy Equity	Oakland Green Jobs Corps, Environmental Services, Economic Development & Housing	1-5 years

Section 1.04 Consumption and Solid Waste

8. **Objective**: Reduce food scraps sent to landfills.

Objective 8: Actions to be completed by 2030

Number	Action	Impact	Potential Partners &	Timeframe

			Leads	
8A	Educate residents and businesses on ways to minimize food waste and save money.	GHG – Med Environment	StopWaste, Environmental Services	1-5 years
8B	Develop or promote existing food recovery programs to utilize food waste for consumption.	GHG – High Equity Environment	Imperfect Produce, Feeding Forward, Environmental Services	1-5 years
8C	Educate residents and businesses on low-carbon food options that also benefit public health, such as minimally processed foods, fruits, grains, and vegetables.	GHG – Med Environment Health	StopWaste, Environmental Services	1-5 years
8D	Educate residents and businesses on composting food scraps and using compost and mulch in their home gardens, which reduces the need for chemical amendments and their associated GHG emissions.	GHG – Med Environment	StopWaste, Environmental Services	1-5 years

9. **Objective**: Achieve zero waste to landfills.

Objective 9: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
9A	Increase education and outreach programs for residents and businesses to divert more from the landfill.	GHG – Med Environment	StopWaste, Environmental Services	1-5 years
9B	Provide financial incentives to builders or property owners for using deconstruction instead of demolition.	GHG – Low Economy Environment	Environmental Services	5-10 years
9C	Increase outreach on preventing waste and promoting existing alternatives.	GHG – Med Environment	StopWaste, Environmental Services	1-5 years
9D	Add more street recycling/trash bins in high traffic areas such as Hollis, Horton, and the Greenway.	GHG – Med Environment	Environmental Services	1-5 years

10. **Objective**: Reduce consumption-related emissions by encouraging sustainable consumption and minimization of the carbon intensity of business supply chains.

Objective 10: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
10A	Promote durable, reusable, pre-owned, recycled content and locally made goods, which reduce excessive manufacturing and enhance local production and resale economies, via a community-based social marketing campaign.	GHG – High Environment Economy	StopWaste, Environmental Services	5-10 years
10B	Promote local arts, entertainment, and local low-carbon industries, which typically have a lower emissions per dollar spent than goods on average.	GHG – High Economy Equity	StopWaste, Economic Development & Housing	5-10 years
10C	Adopt policies and develop partnerships that enable clean local manufacturing of goods that are designed to minimize wasted resources.	GHG – High Economy Equity Environment	StopWaste, Economic Development & Housing	5-10 years
10D	Promote the purchase of recycled content products.	GHG – Med Economy	StopWaste, Environmental Services	5-10 years
10E	Work with StopWaste to provide resources for building remodels, highlighting low-carbon product options.	GHG – Med Economy	StopWaste, Environmental Services	5-10 years
10F	Promote the local hospitality sector and staycations, which reduce transportation emissions.	GHG – Med Economy	StopWaste, Economic Development & Housing	5-10 years

Section 1.05 Water Use

11. Objective: Reduce water use in the community by 30%

Objective 11: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
11A	Promote and incentivize water efficient landscaping through the Water Efficient Landscaping Ordinance.	GHG – Med Environment	StopWaste, Environmental Services	Ongoing
11B	Promote smart water metering.	GHG – Med Environment	EBMUD, Environmental Services	10-15 years
11C	Encourage use of reclaimed/recycled water.	GHG – Med	EBMUD,	1-5 years

		Environment	Environmental Services	
11D	Promote EBMUD's rebates and water efficiency programs.	GHG – Med Environment	EBMUD, Environmental Services	Ongoing
11E	Conduct an education campaign on drought and need for reduced water use.	GHG – Med Environment	EBMUD, Environmental Services	1-5 years
11F	Promote rainwater capture. Campaigns could include demonstration workshops or garden tours.	GHG – Med Environment	EBMUD, Environmental Services	1-5 years

Section 1.06 Urban Space

12. Objective: Expand the urban forest with a minimum canopy cover of 50% in the Triangle and Doyle medium density residential neighborhoods and 25% in other city areas.

Objective 12: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
12A	Identify areas for risk of urban heat island effect.	Environment Health	Environmental Services	1-5 years
12B	Expand street tree planting program to plant more trees, focusing on areas at risk of urban heat island effect.	GHG – Med Environment Health Equity	Environmental Services	1-5 years
12C	Explore options for public/private partnerships to reduce cost of tree planting and other green infrastructure, outreach to greater community, and protecting natural resources.	GHG – Med Environment Health Equity	Environmental Services	5-10 years
12D	Improve street plant selection and maintenance by encouraging native and climate resilient trees, preservation of healthy trees, and increasing canopy in tree-deficient areas.	GHG – Med Environment Health Equity	Environmental Services	Ongoing, 5-10 years

13. Objective: Expand access to healthy and local food.

Objective 13: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
13A	Offer affordable gardening/cooking community classes at Emeryville Center for Community Life (ECCL).	GHG – Med Environment Equity Health	Community Services	Ongoing
13B	Promote local urban agriculture and community food groups. Examples include Emeryville Organic Community Garden, Food First, Planting Justice, and others.	GHG – Med Environment Equity Health	Environmental Services	Ongoing
13C	Develop a fruit tree grafting program.	GHG – Med Environment Equity Health	Environmental Services	5-10 years
13D	Establish a year-round Emeryville farmers market.	GHG – Med Environment Equity Health	Bay Street Mall, Environmental Services	Ongoing
13E	Encourage the sale of fresh fruits and vegetables in small grocery and convenience stores.	GHG – Low Equity Health	Economic Development	5-10 years

Section 1.07 Local Government Operations

14. Objective: Reduce energy use in city facilities by 30%.

Objective 14: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
14A	Install a centralized environmental management control system at City Hall.	GHG – Med Environment	Public Works	5-10 years
14B	Install solar panels on Fire Station 35, Child Development	GHG – Med	Public Works	5-10 years

	Center, city hall carport, and all new city buildings as feasible.	Environment		
14C	Put window film and/or storm windows on City Hall for energy efficiency and earthquake shatter prevention.	GHG – Med Environment Health	Public Works	Ongoing, 1-5 years
14D	Install timer or schedule turn off for electronic appliances in city facilities.	GHG – Med Environment	Public Works	5-10 years
14E	Achieve at least one zero net energy project for city facilities when retrofitting.	GHG – Med Economy	Public Works	10-15 years
14F	Achieve at least one zero net energy project for new city facilities.	GHG – Med Economy	Public Works	10-15 years

15. Objective: Reduce water use in city facilities by 30%.

Objective 15: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
15A	Audit and fully implement water efficient irrigation.	GHG – Med Environment	Public Works	5-10 years
15B	Audit and fully implement Bay Friendly landscaping/plants where feasible.	GHG – Med Environment	Public Works	5-10 years
15C	Audit and implement reclaimed and recycled water opportunities in all facilities.	GHG – Med Environment	Public Works	Ongoing, 1-5 years
15D	Audit water usage in facilities and ensure regular maintenance.	GHG – Med Environment Health	Public Works	1-5 years

16. Objective: Reduce emissions in the city fleet and employee commute by 30%.

Objective 16: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
16A	Install EV chargers at City Hall and other key locations.	GHG – Med	Public Works	5-10 years

		Environment Equity		
16B	Implement Clipper Card check out system for employees taking public transit for work trips or meetings.	GHG – Med Environment Equity Health	Human Resources	Ongoing
16C	Provide an employee subsidy for carpooling, biking, and walking.	GHG – Med Environment Equity Health	Human Resources	Ongoing, 1-5 years
16D	Charge for parking at City Hall.	GHG – Med Environment Equity Health	Human Resources	5-10 years
16E	Develop a fleet fuel purchasing policy.	GHG – Med Environment Health	Finance, Public Works	1-5 years
16F	Offer Easy Passes/Clipper Direct cards for employees for commuting by public transit to the office.	GHG – Med Environment Equity Health	Clipper Direct, Human Resources	Ongoing, 1-5 years
16G	Promote Guaranteed Ride Home program for employee commuters.	GHG – Med Environment Equity Health	Human Resources	Ongoing
16H	Investigate feasibility of partnering with car share companies in lieu of replacing City vehicles.	GHG – Med Environment Health	Public Works	5-10 years

17. Objective: Achieve zero waste from city facilities.

Objective 17: Actions to be completed by 2030

Number	**Action**	**Impact**	**Potential Partners &**	**Timeframe**

			Leads	
17A	Develop and implement Environmental Preferable Purchasing Plan for all department purchases.	GHG – Med Environment	Alameda County, Environmental Services	5-10 years
17B	Develop and implement 'best value' bidding administrative instruction for Public Works contracts.	GHG – Med Environment	Alameda County, Public Works	5-10 years
17C	Audit current waste generation and develop targeted waste reduction campaign.	GHG – Med Environment	Alameda County, StopWaste, Environmental Services	Ongoing, 1-5 years
17D	Audit consumption/purchasing and develop campaign to reduce consumption of unnecessary materials and to promote reusables.	GHG – Med Environment	Alameda County, StopWaste, Environmental Services	5-10 years

Article II. ADAPTATION ACTION PLAN FOR 2030

These actions were compiled based on research on best practices across the nation and feedback from community workshops. As more effective programs, technology, and opportunities arise, Emeryville will shift its strategies and actions as necessary to reduce climate risks.

The objectives and associated actions are grouped into the following categories: Extreme Weather, Sea Level Rise, Community Engagement, Businesses, and City Coordination.

Benefits such as equity, environmental quality, jobs/economy, and health are noted where the action supports these factors. Potential partner organizations (both private and public-sector partners) and department leads for relevant actions are also listed.

Objectives

18. Reduce risk and impacts of heat and drought by preparing for hotter, drier summers with increased incidence of extreme heat days.
19. Reduce risk and impacts of flooding by preparing for more intense rain events.
20. Reduce risk and impacts from sea level rise.
21. Build community capacity for responding to climate change.
22. Engage businesses on climate resilience and behavior change.

Section 2.01 Extreme Weather

18. Objective: Reduce risk and impacts of heat and drought by preparing for hotter, drier summers with increased incidence of extreme heat days.

Objective 18: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
18A	Decrease urban heat islands through revegetation and tree planting/maintenance.	Equity Environment Economy Health	Public Works	5-10 years
18B	Coordinate facilities to be cooling centers.	Equity		1-5 years

		Health		
18C	Develop early warning and response systems to alert community members of extreme heat days.	Equity Health		1-5 years
18D	Establish preparation and response protocols with partners such as Carleton College and Stanford Health for managing health impacts from extreme heat days.	Equity Health	Carleton College, Stanford Health, Human Resources	1-5 years
18E	Work with EBMUD to identify strategies to protect water supply from drought.	Health	EBMUD	1-5 years
18F	Reduce water use.	Environment	EBMUD	1-5 years

19. Objective: Reduce risk and impacts of flooding by preparing for more intense rain events.

Objective 19: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
19A	Manage stormwater naturally through green infrastructure.	Environment	Public Works	Ongoing
19B	Investigate and establish best practices for mosquito/vector management for disease prevention.	Equity Environment Health		5-10 years
19C	Implement Flood Plains management plan.	Environment	Public Works	Ongoing
19E	Establish preparation and response protocols with partners such as Carleton College and Stanford Health for managing health impacts from floods and extreme storm conditions.	Equity Economy Health	Carleton College, Stanford Health	1-5 years

Section 2.02 Sea Level Rise

20. Objective: Reduce risk and impacts from sea level rise.

Objective 20: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
20A	Build bioswales and other vegetative stormwater treatment features for stormwater filtration and flood prevention.	Equity Economy	Public Works	In Progress, 10-15 years

		Environment Health		
20B	Do community outreach on sea level rise causes, risks, and adaptation strategies.	Economy Health	Environmental Services	5-10 years
20C	Establish preparation and response protocols with partners such as Carleton College and Stanford Health for managing health impacts and moving residents from high risk zones in storm weather.	Equity Economy Health	Carleton College, Stanford Health	1-5 years
20D	Build living levee or other protective measures in the Emeryville Crescent Marsh.	Equity Economy Health	Public Works, Planning	5-10 years
20E	Collaborate with regional efforts with Adapting to Rising Tides on sea level rise.	Equity Economy Health	Bay Conservation Development Commission (BCDC), Adapting to Rising Tides, Bay Area Regional Collaborative (BARC)	1-5 years
20F	Develop adaptation strategies for areas where sea level rise is expected to lead to flooding or wind waves during this century.	Environment Economy Health	Public Works, Planning	5-10 years

Section 2.03 Community Engagement

21. Objective: Build community capacity for responding to climate change.

Objective 21: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
21A	Establish a tool lending library.	Equity	Environmental Services	1-5 years
21B	Conduct climate and environmental programming at ECCL and senior center.	Equity	Emery School District, Community Services	1-5 years
21C	Build partnerships to support community projects, campaigns, and events to engage residents around climate	Equity Economy	Environmental Services	1-5 years

	resilience and sustainability.			
21D	Continue to facilitate and promote Fix-It clinics to engage underserved residents on home, food, materials, and transportation.	Equity	Environmental Services	1-5 years
21E	Support development of neighborhood climate action networks via toolkit and funds.	Equity	Environmental Services	1-5 years
21F	Establish Green Teams at ECCL.	Equity	Emery School District, Community Services	1-5 years
21G	Target outreach to vulnerable communities such as low income, the disabled, and seniors.	Equity	Environmental Services	1-5 years
21H	Expand the community emergency response team (CERT) training.	Equity Health	Alameda County	1-5 years
21I	Support climate adaptive building demonstration projects.	Economy	Public Works	5-10 years
21J	Establish community resilience center at ECCL and Senior Center as service distribution points, particularly targeting vulnerable neighborhoods.	Equity Health	Emery School District, Community Services Department	5-10 years
21K	Standardize community benefits in procurement of bids/contracts and prioritizing working with local businesses.	Equity Economy	City Manager	1-5 years

Section 2.04 Businesses

22. Objective: Engage businesses on climate resilience and behavior change.

Objective 22: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
22A	Target technical resources and outreach to small business owners.	Economy Equity	Environmental Services	1-5 years
22B	Promote green business certification.	Economy	Economic Development & Housing, Environmental Services	On-going
22C	Work with unions and businesses to protect outdoor and manual laborers in extreme weather. This can include	Economy Health	Economic Development & Housing	1-5 years

	establishing best practices guidelines or an ordinance.	Equity		
22D	Work with property owners to develop building preparedness priorities.	Economy	Economic Development & Housing	1-5 years
22E	Work with Economic Development Advisory Committee for better business outreach and support their related programs.	Economy	Economic Development Advisory Committee	1-5 years
22F	Develop educational campaign around integrating climate risk with business asset management.	Economy	Economic Development & Housing	1-5 years
22G	Host a 'Best For Emeryville' program to promote the B Impact Assessment for businesses as well as expend business recruitment and retention. This free online assessment tool is the standard behind B Corps and allows businesses to measure their social and environmental impact.	Economy	Economic Development & Housing	1-5 years
22H	Provide technical assistance to cooperative startups for business planning and succession planning for business owners who may be interested in passing their business on to employees after retirement.	Economy Equity	StopWaste, Economic Development & Housing	5-10 years

Section 2.05 City Coordination

23. Objective: Coordinate climate adaptation efforts internally, regionally, and with state and federal governments.

Objective 23: Actions to be completed by 2030

Number	Action	Impact	Potential Partners & Leads	Timeframe
23A	Coordinate and prioritize citywide adaption efforts across different departments			1-5 years
23B	Develop city-university research partnerships with UC Berkeley or other institutions.		UC Berkeley	1-5 years
23C	Integrate climate adaptation initiatives with Local Hazard Mitigation Plan (LHMP) and coordinate with other cities on LHMP best practices	Health	StopWaste, Energy TAG Council	Ongoing
23D	Coordinate with other cities on best adaptation practices		StopWaste, Energy TAG Council	Ongoing

Article III. 2014 COMMUNITY GHG INVENTORY

Section 3.01 Key Findings

The total community inventory with state highway emissions was calculated to be 172,182 metric tons CO_2 (Table A). In the absence of state highway emissions, the total community emissions were 120,194 metric tons CO_2. Transportation and commercial building energy are the two biggest contributors to the inventory while water-related emissions are the smallest.

Table A: Community GHG Emissions by Sector in 2014

All Traffic						
	Residential	**Commercial**	**Transportation**	**Waste**	**Water**	**TOTAL**
CO_2e (metric tons)	9,357	62,772	96,270	3,165	617	**172,182**
Percent of Total CO_2e	5.43%	36.46%	55.91%	1.83%	0.36%	**100.0%**
Local Traffic Only						
	Residential	**Commercial**	**Transportation**	**Waste**	**Water**	**TOTAL**
CO_2e (metric tons)	9,357	62,772	44,282	3,165	617	**120,194**
Percent of Total CO_2e	7.78%	52.22%	36.84%	2.63%	0.51%	**100.0%**

Section 3.02 Methods Summary

This is the third GHG community inventory completed for Emeryville and the first by a CivicSpark AmeriCorps Fellow. The inventory follows the protocols outlined by the Compact of Mayors. Emeryville signed on to the Compact of Mayors in November 2015, which required a community GHG inventory completed with the Global Protocol for Community-Scale GHG Inventories (GPC), a global standard for GHG reporting developed by the World Resources Institute, ICLEI, and C40 Cities Climate Leadership Group. This global protocol replaces the International Local Government GHG Emissions Analysis Protocol (IEAP), developed by ICLEI in 2009, which was utilized in the previous inventories. As with the prior inventory, 2004 was selected as the base inventory year and Emeryville's city jurisdiction was selected as the inventory boundary. A more detailed methodology for these protocols can be found at the links included above.

The inventory included emissions from activities occurring within the city boundary as well as outside the city boundary. The GPC groups emissions into three categories based on where they occur: Scope 1, Scope 2, or Scope 3.

- **Scope 1**: GHG emissions from sources located within the city boundary.
- **Scope 2**: GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam, and/or cooling within the city boundary.
- **Scope 3**: All other GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary.

Under the GPC, the emission sources were categorized into these six sectors: stationary energy (buildings, manufacturing industries and construction, energy industries, fugitive emissions); transportation; waste; industrial processes and product use (IPPU) ; agriculture, forestry, and land use (AFOLU); and other scope 3 emissions. Since Emeryville was using ClearPath software

developed by ICLEI to calculate the emissions, it was simplest to categorize emissions by the categories available in the ClearPath software: residential buildings, commercial buildings, industrial buildings, transportation, solid waste, water and wastewater, agriculture, and fugitive emissions (Table B). When the results of the inventory were reported to the CDP and carbon*n* Climate Registry platforms for the Compact of Mayors, the results were entered under the corresponding GPC emissions source category.

To fulfill the Compact of Mayors reporting, the inventory required either BASIC or BASIC+ reporting levels. The BASIC reporting covers Scope 1 and Scope 2 emissions from stationary energy and transportation, as well as Scope 1 and Scope 3 emissions from waste. BASIC+ involves more challenging data collection and calculation processes, and additionally includes emissions from IPPU, AFOLU, and transboundary transportation. Emeryville fulfilled the BASIC reporting level with additional Scope 3 emissions for potable water services, the regional BART rail system, and a portion of the transboundary on-road emissions. Emissions from industrial processes were included under commercial buildings. No agricultural or land use emissions were included since that sector is marginal in Emeryville.

Table B: Emission Sources and Scopes Covered by Emeryville Community GHG Inventory

Sector	Scope 1	Scope 2	Scope 3
Residential Buildings			
Emissions from fuel combustion within city boundary	BASIC		
Emissions from grid-supplied energy consumed within city boundary		BASIC	
Commercial and Institutional Buildings			
Emissions from fuel combustion within city boundary	BASIC		
Emissions from grid-supplied energy consumed within city boundary		BASIC	
Transportation			
Emissions from on-road fuel combustion within city boundary	BASIC		BASIC+
Emissions from rail trains fuel combustion within city boundary	BASIC		BASIC+
Emissions from off-road fuel combustion within city boundary	BASIC		
Waste			
Emissions from solid waste generated in the city and disposed of outside of city boundary			BASIC
Emissions from wastewater generated in the city and treated outside of city boundary			BASIC
Water			
Emissions from grid-supplied energy consumed outside of city boundary for potable water services within city boundary			BASIC+

Emissions were quantified primarily using calculations based on activity data and emission factors. Activity data and emissions factors were compiled from sources such as PG&E, EBMUD, AC Transit, MTC, and CalRecycle. A more detailed breakdown of the data sources and calculation methods can be found under the Emeryville CivicSpark CAP Methodology 2016 and the Emeryville 2014 Community Master Data Workbook files.

In-boundary waterborne navigation emissions were not included in the analysis because the fuel data required was confidential for vehicle owners and the city could not access the data. Aviation emissions were also excluded since there are no in-boundary airports within Emeryville and regional Scope 3 emissions were not required by the Compact of Mayors. Although off-road vehicle and equipment emissions were included here, current data could not be located for

calculation and thus outdated data from the 2010 inventory was utilized under the assumption that the sector was unlikely to experience significant changes in fuel consumption. Emissions from wastewater collection and treatment energy use were excluded because the anaerobic digester used by EBMUD facilities for wastewater treatment produces all the energy used on site and feeds extra energy back to the grid.

Section 3.03 Emissions by Scope

Table C shows the breakdown of the total community emissions in 2014 by sector and scope. Scope 1 emissions (fuel combustion within city boundaries) makes up the majority of the emissions for Emeryville (73.88%). The fuels include natural gas use in buildings and gasoline or diesel in vehicles. Almost a quarter of the total community emissions come from Scope 2 grid electricity usage (23.59%), largely from the commercial building sector. The remaining emissions are Scope 3 and comprise of the regional BART usage, solid waste disposal, and potable water/wastewater services.

Table C: Community GHG Emissions per Sector and Scope (metric tons CO_2e)

Sector	Scope 1	Scope 2	Scope 3	TOTAL
Residential Energy	5,028	4,328	-	9,357
Commercial Energy	26,493	36,278	-	62,772
Transportation	95,700	-	570	96,270
Waste	-	-	3,165	3,165
Water/Wastewater	-	-	617	617
TOTAL	127,221	40,606	4,352	**172,182**
Percentage of Total CO_{2e}	73.89%	23.58%	2.53%	**100%**

Section 3.04 Emissions by Sector

(a) Residential and Commercial Buildings

Cumulatively, the building sector contributed 72,062 metric tons of CO_2 in 2014 (Table D). Of these, 9,357 metric tons came from residential buildings and 62,706 metric tons came from commercial buildings. Over 56% of the total building emissions came from grid electricity usage as provided by PG&E. The remaining emissions come from natural gas usage for home heating, water heating, and cooking for residential buildings as well as industrial processes for commercial buildings. Compared to the 2004 baseline, both the residential and commercial building sectors have seen reductions in emissions of 6.63% and 17.53% respectively. This may be due to improved energy efficiency or decarbonization of PG&E's electricity grid with increased emphasis on renewable energy.

Table D: Building Energy Emissions by Source

Emissions Source	Electricity	Natural Gas	Total
Residential Energy	4,328	5,028	9,357
Commercial Energy	36,278	26,494	62,772
Total $MTCO_{2e}$	40,589	31,473	**72,063**
Percentage of Total Building CO_{2e}	56.32%	43.67%	**100%**

(b) Transportation

As shown in Table E, the total transportation sector including state highway emissions accounted for 96,270 metric tons CO_2. These emissions come from passenger vehicles, trucks, buses, motorcycles, motorhomes, the Emery Go Round, BART, Amtrak, and off-road vehicles. The majority of these emissions come from gasoline vehicles (58.44%), rather than diesel. Additionally, 55.88% of the vehicles miles traveled came from passenger vehicles (including motorcycles, light and medium trucks, and motorhomes) while 37.00% came from commercial vehicles. When considered with state highway traffic, the public transit options made up less than 7% together in emissions. Transportation emissions have grown significantly since 2004. Even considering local traffic only without the state highways, there has been a 10.17% increase in transportation emissions since 2004; the proportion jumps to 40.19% with state highway traffic.

Table E: Transportation Emissions by Source Including State Highways

Transportation Vehicle Types	Passenger Vehicles	Commercial Vehicles	AC Transit Buses	Emery Go Round	BART	Amtrak	Off Road	TOTAL
Gasoline	50,286	3,476.8	8.33	-	-	-	-	53,771.13
Diesel	3,490.8	32,150	221.79	871	570	935.23	-	38,238.83
Total $MTCO_{2e}$	53,776.8	35,626.8	230.12	871	570	935.23	4,260	**96,270**
Percentage of Sector Emissions	55.86%	37.00%	0.24%	0.90%	0.59%	0.97%	4.43%	**100%**

(c) Waste

As noted in Table A, the waste sector contributed 3,165 metric tons CO_2 to the total community inventory. These emissions result from anaerobic decomposition of organic waste, such as paper, food scraps, plant debris, and wood, which are deposited in a landfill. Since there are no landfills within the Emeryville city boundaries, all the waste generated in the city is transported outside of the city boundaries for disposal, resulting in only Scope 3 emissions for the sector. The emissions accounts for the methane capture at the landfill, as modeled by the ClearPath software. Overall, the city has made progress with its recycling and composting programs, resulting in a 35% reduction in the solid waste tonnage from 2004-2014.

(d) Water/Wastewater

Table F describes the emissions from potable water service and the wastewater process. Energy usage for potable water service includes groundwater extraction, conveyance, treatment, and distribution. Although energy use for wastewater treatment is generated on site through the anaerobic digester, there are still emissions from the N2O released during the wastewater process, the effluent disposal, and combustion of digester gas. Overall, there has been a 13.46% reduction in water-related emissions since 2004, which may be due to reduced water consumption by the community during the drought years.

Table F: Water and Wastewater Emissions by Source

Emission Source	Potable Water Service	Wastewater Effluent Disposal	Wastewater Process N2O Emissions	Combustion of Digester Gas	Total

Total $MTCO_{2e}$	195.53	403.81	17.64	0.69	617.67
Percentage of Sector Emissions	31.66%	65.38%	2.86%	0.11%	100%

Article IV. 2014 LOCAL GOVERNMENT GHG INVENTORY

Section 4.01 Key Findings

The City government of Emeryville, made up of approximately 150 city employees and seven buildings, contributed a total of 1,643 metric tons of CO_2 during 2014 (Table G). The biggest sector contributor to the inventory emissions was employee commute, followed by building energy and vehicle fleet fuel consumption. Emissions from water/wastewater and transit fleet use were fairly marginal.

Table G: Municipal GHG Emissions by Sector in 2014

Sector	Building Energy	Street & Traffic Lights	Vehicle Fleet	Solid Waste	Water & Wastewater	Transit Fleet	Employee Commute	Fugitive Emissions	Total
Metric Tons CO_{2e}	402	234	410	131	1	7	431	27	1,643
Percentage	24.46%	14.23%	24.94%	7.99%	0.06%	0.42%	26.22%	1.64%	100%

Section 4.02 Methods Summary

This is the third GHG municipal inventory completed for Emeryville and the first by a CivicSpark AmeriCorps Fellow. As with the previous inventories, this 2014 inventory follows the Local Government Operations Protocol (LGO Protocol) developed by the California Air Resources Board (ARB) in conjunction with ICLEI, The Climate Registry, and the California Climate Action Registry. The LGO protocol was utilized with ICLEI's ClearPath software and results were reported to the CDP and carbon*n* Climate Registry platforms.

The inventory included emissions from activities occurring within as well as outside the city boundary. The GPC groups emissions into three categories based on where they occur: Scope 1, Scope 2, or Scope 3. Table H shows the inventoried emissions sources by scope.

- **Scope 1**: GHG emissions from sources located within the local government's operations.
- **Scope 2**: GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam, and/or cooling within local government operations.
- **Scope 3**: All other GHG emission sources that hold policy relevance to the local government. These include indirect emissions not covered in Scope 2 that occur as a result of the local government operations such as tailpipe emissions from employee commutes, employee business travels, and emissions from solid waste disposal.

Table H: Emission Sources and Scopes Covered by Emeryville Municipal GHG Inventory

Scope 1	Scope 2	Scope 3
Fuel consumed at facilities	Purchased electricity consumed by facilities	Solid waste generated by government operations
Fuel consumed by vehicle fleet and mobile equipment	Purchased electricity consumed by electric vehicles	Fuel consumed by vehicles during employee commuting
Fuel consumed to generate electricity	Purchased steam	

Leaked refrigerants from facilities and vehicles	Purchased cooling (chilled water)	
Leaked/deployed fire suppressants		
Solid waste in government landfills		

Emissions were quantified primarily through calculations based on activity data and emission factors. Activity data and emissions factors were compiled from sources such as PG&E, EBMUD, and CalRecycle. An employee commute survey was created and conducted in February 2016 to gather data about commute emissions. A more detailed breakdown of the data sources and calculation methods can be found under the Emeryville CivicSpark CAP Methodology 2016 and the Emeryville 2014 Municipal Master Data Workbook files.

Due to difficulty obtaining updated data, results from the 2010 inventory for contractor vehicle/mobile equipment and city building fugitive emissions were included in this 2014 municipal inventory.

Section 4.03 Buildings and Other Facilities

Building energy use resulted in 402.66 metric tons CO_2, making up 24.46% of the total municipal emissions (Table I). The City Hall, as the most central location for City employees, was the largest contributor to the sector total at 204.28 metric tons CO_2. Between 2010 and 2014, some retrofits and energy efficiency upgrades were made to some of the City buildings, which may account for the 19.28% decrease in building emissions since 2010. The proportion of emissions for electricity and natural gas use remains similar: 49.41% and 50.59% respectively. This indicates there can be greater savings to be made from switching over to electrification entirely.

Table I: Government Buildings Emissions by Source

Building Type	CO_{2e} (Metric Tons)	Percentage of Sector Emissions	Electricity Use (kWh)	Natural Gas Use (Therms)
City Hall	204.28	50.73%	431,312	22,280
Child Development Center	32.86	8.16%	73,344	3,435
Recreation Center	8.20	2.04%	41,200	-
Fire Station	49.50	12.29%	123,470	4,689
Police	47.22	11.73%	205,299	1,198
Senior Center	33.55	8.33%	46,605	4,566
Temporary Courtyard	21.87	5.43%	52,660	2,143
Minor Facilities	5.18	1.29%	26,040	-
TOTAL	402.66	100%	999,930	38,311

Section 4.04 Streetlights, Public Lights, and Other Lighting

Emissions from public lighting use come from the electricity consumption associated with the lighting. Similarly with the building sector, there have been some energy efficiency upgrades since 2004, and with the installations of new LED lights, there has been a 79 metric ton CO_2 savings for public lighting, a 25.24% reduction (Table J).

Table J: Public Lighting Emissions by Source

Light Type	CO_{2e} (Metric Tons)	Percentage of Sector Emissions	Electricity Use (kWh)
Traffic Signals	15.75	6.70%	79,172
Streetlights	192.17	81.80%	965,891
Park Lighting	7.98	3.40%	40,109
Other Outdoors Lighting	19.02	8.10%	95,614
TOTAL	234.92	100%	1,180,786

Section 4.05 Water Deliveries

This sector includes emissions from equipment for distribution or transport of water or wastewater as well as sprinkler and irrigation systems (Table K). Compared to the baseline in 2004, there has been a sharp 92% decline in emissions related to municipal water deliveries for 2010 and 2014. This may be due to the volume of water used since 2004 or the mislabeling of water accounts in PG&E's list of Emeryville accounts.

Table K: Water Emissions by Source

Irrigation Type	CO_{2e} (Metric Tons)	Percentage of Sector Emissions	Electricity Use (kWh)
Sprinklers/Irrigation Control	0.51231	36.83%	2,575
Lift Station	0.87859	63.17%	4,416
TOTAL	1.39	100%	6,991

Section 4.06 Fleet Vehicles

The city fleet and transit vehicle sector contributed in total 417.99 metric tons CO_2 in 2014 (Table L). This included vehicles and mobile equipment from the police, public works, and community services department, as well as the paratransit van and contractor equipment. The contractor services comprise of waste hauling, street cleaning, and landscaping services; due to lack of updated data, 2010 inventory data on contractor services was used for this inventory with the assumption that no significant changes were made to the services. The fire department trucks, which were included in the 2010 inventory, are now operated by Alameda County and therefore are not included here. This accounts for some of the variation in fuel consumption for city fleet between the inventory years; however, after compensating for the fire department transition, there is an overall increase in fleet emissions since 2004.

Table L: Fleet Vehicle Emissions by Department

Department	CO_{2e} (Metric Tons)	Percentage of Sector Emissions
Police	219.32	52.47%
Public Works	59.23	14.17%
Community Services	0.90	0.22%
Paratransit	7.81	1.87%
Contractors	130.73	31.28%
TOTAL	417.99	100%

Section 4.07 Waste

Local government operations in Emeryville generated 448.61 tons of waste in 2014, resulting in 131 metric tons CO_2. This represents an 18% reduction in emissions since 2004. Overall, the city

has made significant progress in reducing solid waste both at the municipal and community level through its recycling and compost programs.

Section 4.08 Employee Commute

Employee commute was the largest sector contributor to the overall municipal emissions in 2014 and the only sector to see an increase from the 2010 inventory. This may be due to a number of possible reasons: more accurate survey data, employees living further away from Emeryville and opting to drive rather than take public transit, or a higher quantity of employees.

Of 166 City employees, 43 employees (25.9%) responded to the employee commute survey. The most common mode of commute for respondents was driving alone (56%), a decrease from the 2010 employee commute survey (70%), citing that they needed to run errands before/after work, need their car for personal business, time inconvenience, and preferring to drive their own car as the top reasons. The survey results highlighted possible methods to incentivize employees to use alternative commute modes, such as helping match carpoolers, enroll employees in a guaranteed ride home program, and city subsidy for biking or public transit. More structurally speaking, there was a consensus that public transit services needed to be faster, more frequent, and more connected, and biking lanes need to be safer and more widespread.

Table M: Common Commute Modes

COMMON COMMUTE MODES	Count	%
Drive	24	56%
Split Mode	8	19%
Carpool	3	7%
Bike/Public Transit	3	7%
Bike	2	5%
Public Transit	1	2%
Walk	1	2%
Car/ Public Transit	1	2%
Motorcycle	0	0%
Paratransit	0	0%
TOTAL RESPONSES	43	100%

Table N: Interest in AC Transit Passes and EV Chargers

AC TRANSIT PASSES	Count	%
No	24	56%
Yes	18	42%
Maybe	1	2%
TOTAL RESPONSES	43	100%
EV CHARGERS AT CITY HALL	Count	%
Yes	22	51%
No	21	49%
TOTAL RESPONSES	43	100%

Table O: Reasons for Driving Alone

MAJOR REASONS FOR DRIVING ALONE	Count	%
Need to run errands before or after work	22	63%

Need my car at work for personal business	16	46%
Anything else takes too much time	15	43%
Prefer to drive my own car	14	40%
Parking is free	11	31%
Need to transport my children	11	31%
Need my car at work for city business	10	29%
Don't have anyone to ride with	10	29%
Cannot get home in an emergency	9	26%
Irregular work schedule	9	26%
Transit services are too infrequent	8	23%
No transit service close by	7	20%
Safety concerns	7	20%
Too many transfers	7	20%
Don't like to depend on others	6	17%
Live close to work	4	11%
Other	4	11%
Poor bicycle and pedestrian access	1	3%
Need a specially equipped vehicle	0	0%
TOTAL RESPONSES	35	100%

Table P: Interest in Alternative Commute Modes

ALTERNATIVE COMMUTE POSSIBILITIES	Count	%
Bicycle	13	46%
Carpool Driver	10	36%
Public Transit	10	36%
Telework	10	36%
Carpool Rider	8	29%
Walk	4	14%
Other	1	4%
TOTAL RESPONSES	28	100%

Table Q: Incentives for Carpooling

INCENTIVES FOR CARPOOLING	Count	%
Help finding people with whom to carpool	13	46%
Guaranteed ride home in the event of an emergency	13	46%
Use of company car during work day	9	32%
City subsidy for carpoolers	8	29%
More flexible work hours	8	29%
Change of work shift	4	14%
Child care facilities at or near the work site	3	11%
Prizes, drawings, contests, etc.	3	11%
More fixed work hours	2	7%
Other	1	4%
Reserved parking close to the building	0	0%
TOTAL RESPONSES	28	100%

Table R: Incentives for Public Transit

INCENTIVES FOR PUBLIC TRANSIT	Count	%
More frequent transit services	19	66%
City subsidy for transit riders	17	59%
Faster transit services	17	59%
Fewer transfers to work	13	45%
Guaranteed ride home in the event of an emergency	10	34%
Use of city car during work day	9	31%
Other	6	21%
Sale of transit passes at work	5	17%
Change of work shift	4	14%
Bus route and scheduling information	4	14%
Prizes, drawings, contests, etc. for transit riders	2	7%
Child care facilities at or near the work site	1	3%
TOTAL RESPONSES	29	100%

Table S: Incentives for Biking

INCENTIVES FOR BIKING	Count	%
Safer bike lanes	12	71%
City subsidy for bicycle riders	10	59%
Secure, convenient bicycle parking racks	8	47%
Bicycle lockers	7	41%
Guaranteed ride home in the event of an emergency	5	29%
Showers and clothing lockers	5	29%
Change of work shift	3	18%
Other	3	18%
Seminars on riding safely in traffic	3	18%
Use of city car during work day	3	18%
Bicycle route maps	2	12%
Prizes, drawings, contests, etc. for bike riders	2	12%
Child care facilities at or near the work site	0	0%
TOTAL RESPONSES	17	100%

Section 4.09 Fugitive Emissions

Fugitive emissions were calculated for refrigerant and generator fuel use in city buildings, totaling 27.15 metric tons CO_2. Due to lack of updated data, 2010 inventory data was used for this sector under the assumption that the type of refrigerants and use were unlikely to change significantly over the past few years.

Article V. CLIMATE HAZARD VULNERABILITY ASSESSMENT

The following assessment was conducted by 427 Climate Solutions, consultants hired through StopWaste funding.

Section 5.01 Introduction

The purpose of this climate hazard analysis is to describe projected changes in key climate hazards of concern for the City of Emeryville and the critical assets that these hazards are likely to affect. The content is intended to inform the city's efforts to incorporate climate hazards and anticipated changes in these hazards into relevant plans such as the local hazard mitigation plan, General Plan safety element, climate action plan, adaptation plan, and resilience strategy. In doing so, the content may also assist the city in meeting the requirements of relevant legislation (e.g., California Senate Bill 379) and guidance (e.g., Federal Emergency Management and Compact of Mayors).

This analysis provides a description of the city and summarizes future projections of key climate hazards in Emeryville, including probability of occurrence, extent of impact and affected assets. The hazards covered in this analysis are inland flooding, sea level rise, changes in temperature and precipitation, rainfall induced landslides and fire hazard. The methods used to assess the exposure of assets to the climate hazards as well as the data sources for each section are explained in the Appendix.

(a) Emeryville, California

Emeryville is a fairly flat, low-lying city in the San Francisco Bay Area, located just north of the Bay Bridge with a population of about 10,000 people. It is highly urbanized, comprised primarily of a combination of residential, commercial, industrial and mixed use properties. Nearly half of its total area (~1.8 square miles overall, 1.2 square miles of land) lies directly adjacent to the San Francisco Bay. As a result, Emeryville will likely be most affected by the combination of sea level rise and extreme tides in the near term. However, the most severe impacts will be seen in the long-term, when projected temperature increases and the frequency of very hot days will impact a broader set of the city's assets and population.

Climate Hazard	Exposure	Summary
Inland Flooding	Low	Exposure limited to non-critical[1] assets
Sea Level Rise	High	Critical exposure likely by end of century with a 50-year storm surge
Precipitation Change	Medium	Likely increase in intensity of events, limited change in overall rainfall
Temperature Change	High	Increase in the number of extreme heat days
Rainfall-Induced Landslides	Low	Limited exposure
Wildfire	Low	Limited exposure

Figure 1. Climate Hazards and Exposure

[1] Criticality was determined by exposure of emergency assets and resources or infrastructure that is vital to public health and safety.

Throughout the remainder of the 21st century, Emeryville's climate is projected to grow substantially hotter with fluctuations in precipitation patterns characterized by less consistent rainfall patterns and more intense rainfall events. However, inland flooding is not expected to significantly affect the city's critical assets, with areas of inundation limited to the East Shore State Park and the Emeryville Marina. Emeryville's critical assets are protected from substantial damage from sea level rise through the end of the century based on the best available science. However, critical levels of flooding are possible when projected sea level rise is compounded by a 50-year or worse extreme tide event. (See Figure 1.)

Section 5.02 Inland Flooding

(a) Flooding and Climate Change

Emeryville's assets are well protected from historical floodplains. However, as climate change causes more intense precipitation events, the intensity and rate of rainfall-induced flooding events may lead to more frequent inundation of vulnerable assets. Flood events expected to have a 0.2 percent chance of occurring in a given year, or a 500-year recurrence period, based on historical information may occur more often under changing climate conditions.

(b) Probability of Occurrence

Flood Insurance Rate Maps (FIRMs) created by the Federal Emergency Management Agency (FEMA) were analyzed to identify impact to assets in the 100-year and 500-year floodplains. The 100-year floodplain includes land that has a one percent chance of flooding in a given year and therefore is expected to flood once every 100 years. The 500-year floodplain includes land that has a 0.2 percent chance of flooding in a given year. [2] The floodplain maps are based on historical data and do not incorporate climate projections into the floodplain delineations, yet provide an accurate depiction of where floodwaters are likely to concentrate, even if recurrence intervals change.

(c) Extent of Flooding and Affected Assets

According to FEMA flood maps, Emeryville has relatively few assets located in the 100-year (see Figure 2) and 500-year flood plains.

In a 100-year flood, city parks along the Bay may be inundated, including Point Emery Park, Shorebird Park and the perimeter of Marina Park. The marina may also be affected, but impacts are expected to be limited to the docks and boat slips. In Emeryville's case, the 500-year floodplain does not have an increased impact on the shoreline.

The assets exposed to flooding near the Bay in Emeryville are strategically placed to reduce the risk of damage. The marina docks are meant to adjust to changing water levels and the parks are well suited to serve as storm barriers, minimizing the risk of flooding in the city.

[2] FEMA Flood Insurance Rate Map. 100 Year Floodplain. Alameda County.

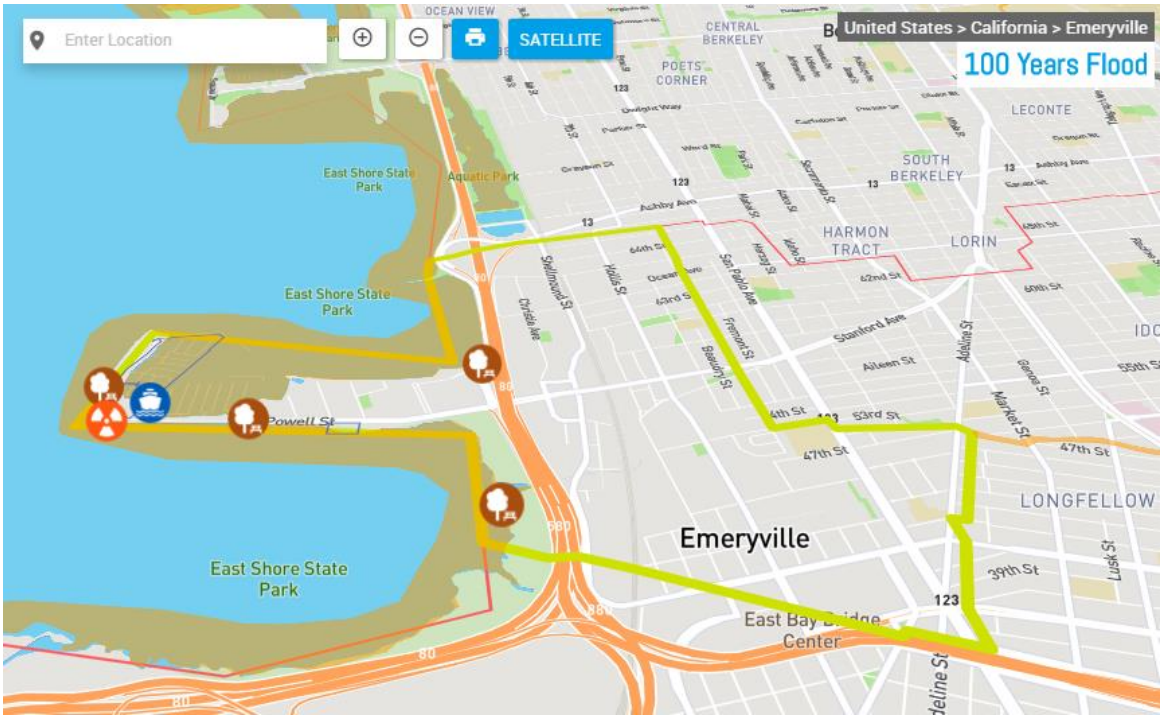


Figure 2: Emeryville Assets in the 100-year Floodplain. The area shaded in orange is the 100-year floodplain and has a one percent chance of flooding in a given year based on historical data. The assets inundated under these conditions are indicated by icons, while facility parcels are framed with a blue line. The green line represents the city borders. Source: Emeryville Local Asset Data and FEMA [3] as represented on the Vizonomy Climate Risk Platform (Vizonomy).

Section 5.03 Sea Level Rise

(a) Sea Level Rise and Climate Change

Sea levels are rising as a result of higher atmospheric and oceanic temperatures across the globe. The rate of sea level rise is expected to accelerate throughout the century, threatening coastal resources, but projections are complicated by the potential for a substantial acceleration of glacial ice melt resulting in rapid sea level rise, which is not currently accounted for in many global scenarios.[4] The Bay Area is especially exposed to the impacts of sea level rise because of the large number of assets located on the coast. In Emeryville, the assets most at risk from sea level rise include those located on the peninsula and shoreline, along with those neighboring the railroad to the southwest.

(b) Probability of Occurrence

Considered the best available science, the National Research Council (NRC) identified likely sea level rise estimates for the west coast of the United States. These values are accompanied by ranges of possible sea levels based on low and high emissions scenarios and ice melt scenarios.

[3] FEMA Flood Insurance Rate Map. 100 Year Floodplain. Alameda County.
[4] M. K. Buchanan, R. E. Kopp, M. Oppenheimer, and C. Tebaldi. (2016). Allowances for evolving coastal flood risk under uncertain local sea-level rise. *Climatic Change* 137, 347-362. doi:10.1007/s10584-016-1664-7.

Figure 3 summarizes the projections applicable to Alameda County are six inches of sea level rise by 2030 (range: 2-12 in), 11 inches by 2050 (range: 5-24 in), and 36 inches by 2100 (range: 17-66 in) relative to the year 2000. [5]

Year	Projections	Ranges
2030	6 ± 2 in	2 to 12 in
2050	11 ± 4 in*	5 to 24 in
2100	36 ± 10 in	17 to 66 in

Figure 3: Sea Level Rise Estimates Relative to the Year 2000. Source: NRC 2012.

These projections characterize the estimated timeline for permanent increases in water levels. However, the conditions may occur sooner on a temporary basis under a number of different circumstances given the combination of permanent sea level rise and temporary extreme tides resulting from the additive impact of high tides and storm surge. For example, water levels could reach the equivalent of 49 inches of inundation by 2050 in the event of a 50-year storm, even though that level of sea level rise is not projected to occur by the end of the century.[6]

(c) Extent of Flooding and Affected Assets

Some of Emeryville's assets are expected to be inundated by sea level rise, either temporarily or permanently, once the increase in water level reaches 24 inches, which is possible by 2050. At this point, water begins encroaching beyond the natural buffer of the shoreline and begins to reach shoreline parks and three commercial buildings, two storm sewer lines and a streetlight on the peninsula.

At 36 inches of sea level rise, which is likely by the end of the century, the water levels reach marina facilities, culverts and sewers, Trader Vic's and Chevy's restaurants, the Emeryville Marina Office building, five parks, and another streetlight.[7] The parks are Davenport Mini Park, Shorebird Park, Marina Park, Point Emery Park, and McLaughlin Eastshore State Park. (See Figure 4 for a map of areas inundated by 36 inches of sea level rise and Figure 7 for a list of affected assets.)

At 48 inches, likely by the end of the century when combined with average yearly storm surge, water threatens five buildings along the peninsula shoreline, and floods Powell Street between Anchor Drive and Admiral Drive, cutting off transport to the marina. Other flooded assets include two additional streetlights, two additional gravity main storm sewer lines, two storm sewer manholes, two pipelines and the railroad tracks south of Emeryville, which would prevent rail traffic from passing through the area. Westbound access to the Bay Bridge will also be

[5] National Research Council. (2012). *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*. Report. DOI: 10.17226/13389

[6] AECOM and Brian Fulfrost & Associates. (2015). *Adapting to Rising Tides: Alameda County Shoreline Vulnerability Assessment Final Report*.

[7] This is especially relevant to the sewer system, which could experience temporary inundation at this level by mid-century with a five-year extreme tide event, which corresponds with the five-year design storm conditions for sewer capacity design.

prohibited under these conditions. (Figure 5 depicts the areas inundated by 48 inches of sea level rise.)

The critical transition between manageable and devastating flooding is between 48 and 72 inches of inundation for the city of Emeryville. (Figure 6 provides a snapshot of the areas affected by 72 inches of sea level rise.) With predicted end-of-century sea level rise compounded by glacial melting and/or King Tides and storm surge, there is the possibility that the Bay Area will experience sea level rise related flooding at or above these levels. The equivalent of 72 inches of sea level rise could likely result from a combination of sea level rise and storm surge, such as 36 inches of sea level rise combined with a 50-year storm surge, or 48 inches of sea level rise combined with a 5-year storm surge.

At this level, flooding would begin to impact numerous critical assets. Most significantly, Powell Street would flood east of the police station and Alameda County Fire Station 34, preventing critical access to emergency personnel and equipment throughout Emeryville. Marina Park would be completely inundated, along with eight buildings on the peninsula. The railway flooding would extend into southern Emeryville and impact a few blocks of the Park Avenue District, the mixed use area to the east of the railway, as well as sections of the Bay Street shopping center to the west. Ten significant buildings (as defined by the City of Emeryville) are expected to flood in the western end of the Park Avenue District along with six fire hydrants and the IKEA building. The sewer system is also impaired with 35 storm sewer gravity mains and 35 lateral lines, 25 storm sewer manholes, and five irrigation backflow facility assets impacted across the peninsula and the mixed use area at Park Ave. and Bay Street. Other assets projected to experience flooding include 64 streetlights, one piece of public art, two pipelines and eight parks. Outside Emeryville itself, access to the freeway interchange south of the city may be compromised, which could have serious implications for access to San Francisco over the Bay Bridge. It will also be important to look to the magnitude of potential impacts to the storm sewer system and implications of the East Bay Municipal Utility District (EBMUD) wastewater treatment plant being affected by sea level rise compounded by storms that reach 72 inches or more above current water levels.

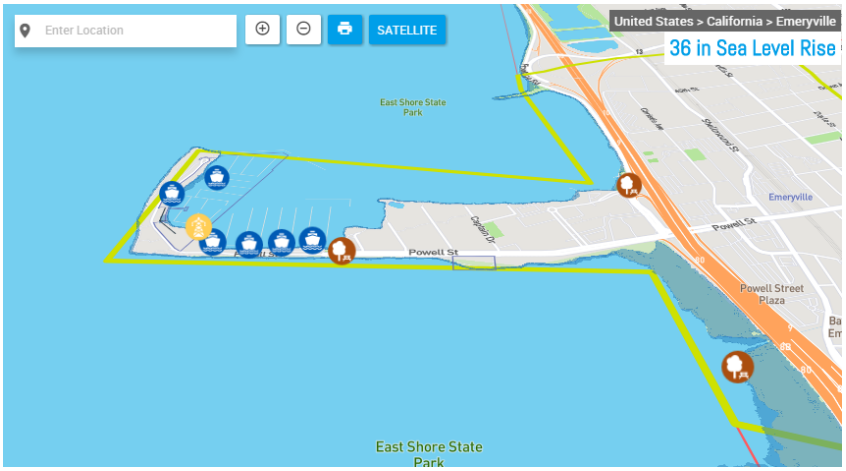
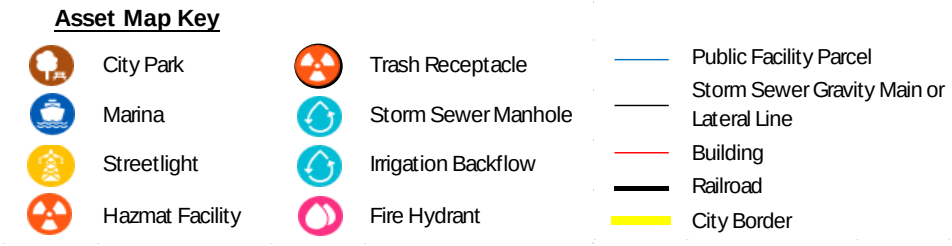


Figure 4: Emeryville Assets Impacted Under 36 Inches of Sea Level Rise. The area shaded in blue indicates the area inundated by 36 inches of sea level rise. The assets inundated under these conditions are

indicated by icons, while facility parcels are framed with a blue line. The green line represents the city borders. Source: Emeryville Local Asset Data and AECOM [8] as represented on Vizonomy.



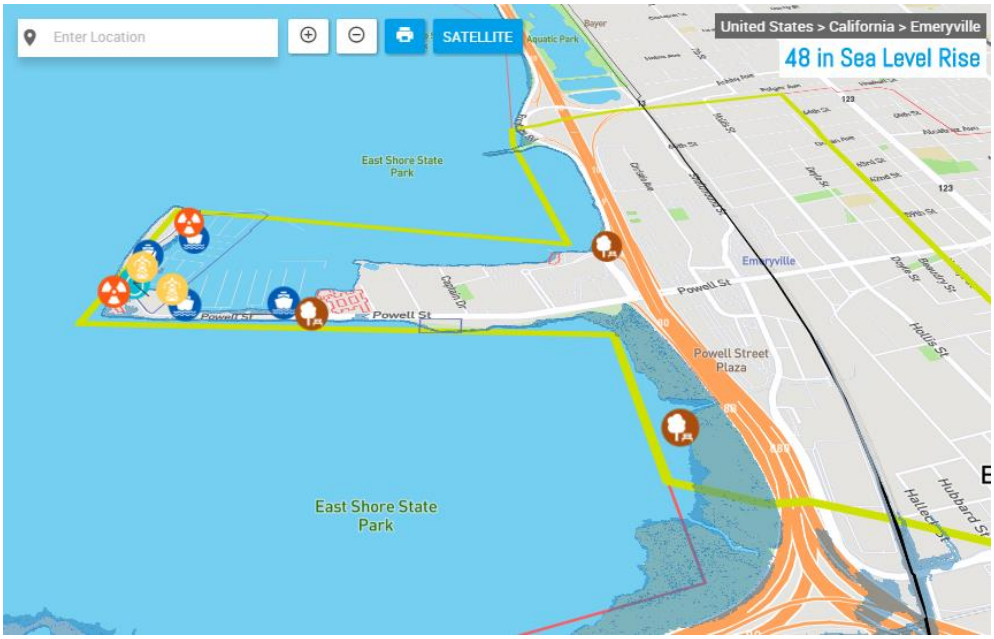
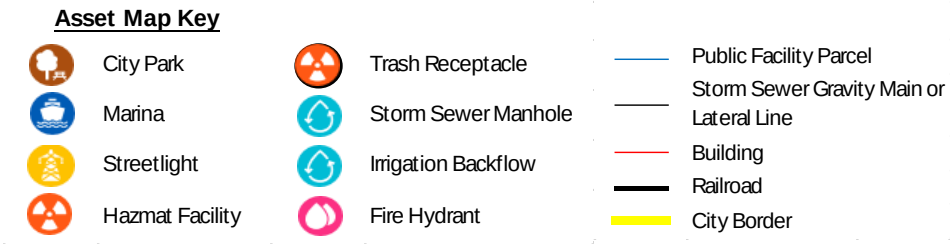


Figure 5: Emeryville Assets Impacted Under 48 Inches of Sea Level Rise. The area shaded in blue indicates the area inundated by 48 inches of sea level rise. The assets inundated under these conditions are indicated primarily by icons. The inundated railroad and sewer lines are in black, while affected facility parcels are framed with a blue line and buildings are framed with a red line. The green line represents the city borders. Source: Emeryville Local Asset Data and AECOM [9] as represented on Vizonomy.



[8] AECOM and Brian Fulfrost & Associates. (2015). *Adapting to Rising Tides: Alameda County Shoreline Vulnerability Assessment Final Report*.
[9] AECOM and Brian Fulfrost & Associates. (2015). *Adapting to Rising Tides: Alameda County Shoreline Vulnerability Assessment Final Report*.

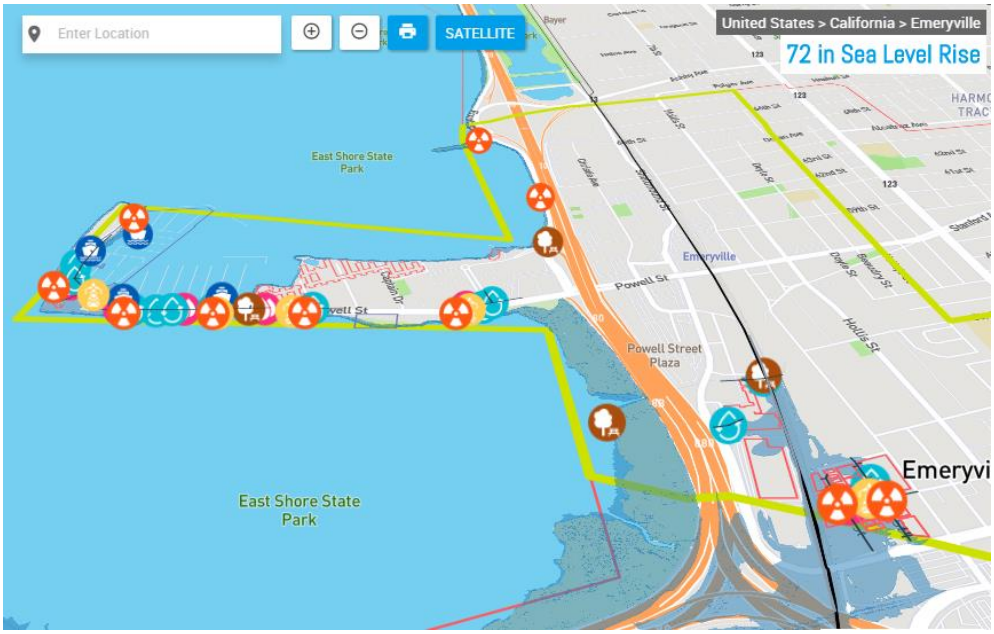
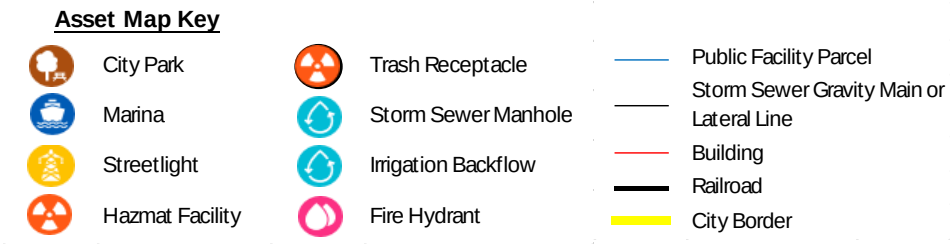


Figure 6: Emeryville Assets Impacted Under 72 Inches of Sea Level Rise. The area shaded in blue indicates the area inundated by 72 inches of sea level rise. The assets inundated under these conditions are indicated primarily by icons. The inundated railroad and sewer lines are in black, while affected facility parcels are framed with a blue line and buildings are framed with a red line. The green line represents the city borders. Source: Emeryville Local Asset Data and AECOM [10] as represented on Vizonomy.



[10] AECOM and Brian Fulfrost & Associates. (2015). *Adapting to Rising Tides: Alameda County Shoreline Vulnerability Assessment Final Report*.

Asset Type	Area	Impact	12 in.	24 in.	36 in.	48 in.	72 in.
Freeway Interchange	Oakland	H			1	2	2
Railroad	Park Ave & Bay St.	H				1	1
Alameda County Fire Station No. 34	Peninsula	H					1
Fire Hydrant	Peninsula	M					6
Fire Hydrant	Park Ave & Bay St.	M					6
Wastewater Treatment Plant	Oakland	H					1
Irrigation Backflow Facility	Peninsula	H					5
Storm Sewer Gravity Main	Peninsula	H		1	2	4	18
Storm Sewer Gravity Main	Park Ave & Bay St.	H					17
Storm Sewer Lateral Line	Peninsula	M		1	2	2	8
Storm Sewer Lateral Line	Park Ave & Bay St.	M					27
Storm Sewer Manhole	Peninsula	M				2	12
Storm Sewer Manhole	Park Ave & Bay St.	M					13
Pipeline	Park Ave & Bay St.	M				2	2
Hazmat Facility	Peninsula	M					2
Hazmat Facility	Park Ave & Bay St.	M					4
Trash Receptable	Shoreline	L					2
Trash Receptacle	Peninsula	L				15	39
Trash Receptacle	Park Ave & Bay St.	L					2
Streetlight	Peninsula	M		1	2	4	35
Streetlight	Park Ave & Bay St.	M					29
Marina Dock	Peninsula	L		8	8	8	8
Public Facility Parcel	Peninsula	L		2	2	2	2
Park	Peninsula	L		2	2	2	2
Park	Park Ave & Bay St.	L					3
Park	Shoreline	L		2	3	3	3
Public Art	Peninsula	L					1
Significant Building	Park Ave & Bay St.	M					10
Buildings	Peninsula	L		3	3	5	8
Buildings	Park Ave & Bay St.	L					24

Figure 7: List of Assets Exposed to Sea Level Rise. Exposed assets by asset type and level of impact. The "impact" ranking is based on a high, medium, low scale. High - Critical resources during a disaster or assets that could lead to immediate secondary hazards if damaged. Medium – Important assets or those that could lead to secondary hazards if damaged. Low – Assets that will not compound hazard effects or that are easily replaced. This distinction is based upon reasonable judgement and should be scrutinized by local officials for accuracy. Inland flooding is not included due to relatively low levels of exposure. Source of asset count: Emeryville Local Asset Data and AECOM [11] as represented on Vizonomy.

Section 5.04 Temperature Changes and Precipitation Events

(a) Temperature, Precipitation and Climate Change

[11] AECOM and Brian Fulfrost & Associates. (2015). *Adapting to Rising Tides: Alameda County Shoreline Vulnerability Assessment Final Report*.

As greenhouse gas emissions increase, temperatures are expected to increase globally, placing growing stress on human health, water resources, energy systems and other critical assets. Emeryville's climate is no exception and temperatures are projected to increase throughout the city with the number of days over 90 °F increasing from less than once a year between 1970-2000 to 6 days per year by end of century. The impact of climate change on precipitation events is less clear, but the pattern of precipitation is expected to become more variable with high-intensity events increasing in frequency while projections of annual totals show no clear signal of significant directional change.

(b) Probability of Occurrence

Temperature and precipitation projections were provided by Four Twenty Seven using scenarios from the Intergovernmental Panel on Climate Change (IPCC). The greenhouse gas concentration trajectories adopted by the IPCC for use in modeling and research are called Representative Concentration Pathways (RCPs). RCP 8.5 represents a minimal greenhouse gas mitigation effort and high emissions, resulting in the largest increase in radiative forcing and warming, while RCP 4.5 is considered a moderate mitigation scenario where climate action limits the amount of global emissions.[12] Temperatures in Emeryville are projected to increase under both scenarios throughout the century.

(c) Changes in Precipitation

During the period of 1970-2000, Emeryville received approximately 20.4 inches of rainfall per year. By mid-century, in a high emissions scenario, the percent change in total precipitation varies widely between -16.4 percent and +37.6 percent, indicating that no clear directional change in cumulative precipitation volumes is expected by the end of the century when using this method. Under both low and high emissions scenarios, mid-range projections of maximum five-day precipitation totals indicate averages between three and four inches of rainfall, consistent with the historical average of 3.5 inches. Thus, annual precipitation totals may remain analogous to present conditions.

Projections also indicate that while extreme rainfall events will occur less frequently, these rainfall events will be more intense resulting in a greater volume of rain within a shorter timeframe. Although the frequency of days per year with more than one inch of rainfall in Emeryville is not projected to change drastically by the end of the century, there is some indication that two-inch rainfall events may occur twice a year, equivalent to a tripling in frequency, by 2075 in a high warming scenario. Figure 8 depicts the projected occurrence of intense rainfall events in Emeryville between 2020 and 2099.

[12] IPCC. (2014). Scenario Process for AR5. Accessed at: http://sedac.ipcc-data.org/ddc/ar5_scenario_process/RCPs.html

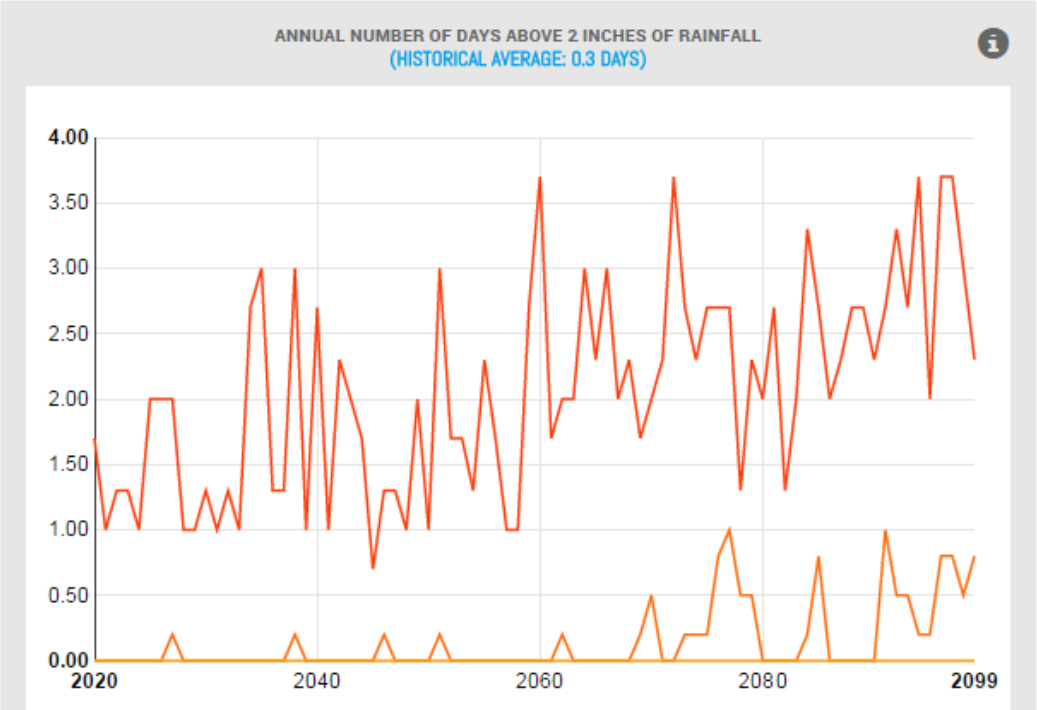


Figure 8: Projected Occurrence of Intense Rainfall Events in Emeryville. RCP 8.5 projected percent changes in intense precipitation throughout the 21st century. Lines represent low-end (light orange), mid-range (dark orange) and high-end (red) model results. Source: Four Twenty Seven as represented on Vizonomy.

(d) Changes in Temperature

From 1970-2000, Emeryville has experienced a daily average temperature of about 59 °F, an average maximum temperature of 66.5 °F and an average minimum temperature of 51.5 °F. According to climate models, temperature exhibits a clear trend toward warmer average temperatures, which translate to more extreme temperatures. By mid-century, in a high-emissions scenario, daily average temperatures in Emeryville will increase between +2.5 °F to +3.7 °F, daily minimum temperatures by +2.3 °F to +3.7 °F, and daily maximum temperatures by +2.7 °F to +3.8 °F. Even under a low emissions scenario, temperature increases are evident and range between an average daily increase of +2.3 °F and +3.6 °F by mid-century. By the end of the century, temperature changes will be substantial, for daily average, minimum, and maximum temperatures with the high-end of the range of RCP 8.5 temperature increase projections suggesting increases from +6.2 °F to +9.3 °F. This means that Emeryville's average maximum temperature would be comparable to current levels in Vallejo, California. These projections do not indicate seasonal fluctuations, but yearly averages.

The foremost change will be an increase in extreme heat. Historically, Emeryville averaged less than one day per year exceeding 90 °F. This number may climb exponentially after mid-century. In both the low and high emissions scenarios, Emeryville will likely begin to experience 90 °F days by 2060, with the potential for as much as one 90 °F day per year as soon as 2020 under RCP 8.5 projections. By century's end, the number of days per year above the 90 °F mark could be up to 4 days per year in a low emissions scenario, but as high as 32 days per year in a

business-as-usual scenario (although mid-range RCP 8.5 projections indicate this number is closer to 6 days). (See Figure 9.) Higher temperatures will likely increase the magnitude of heat hazards in the city.

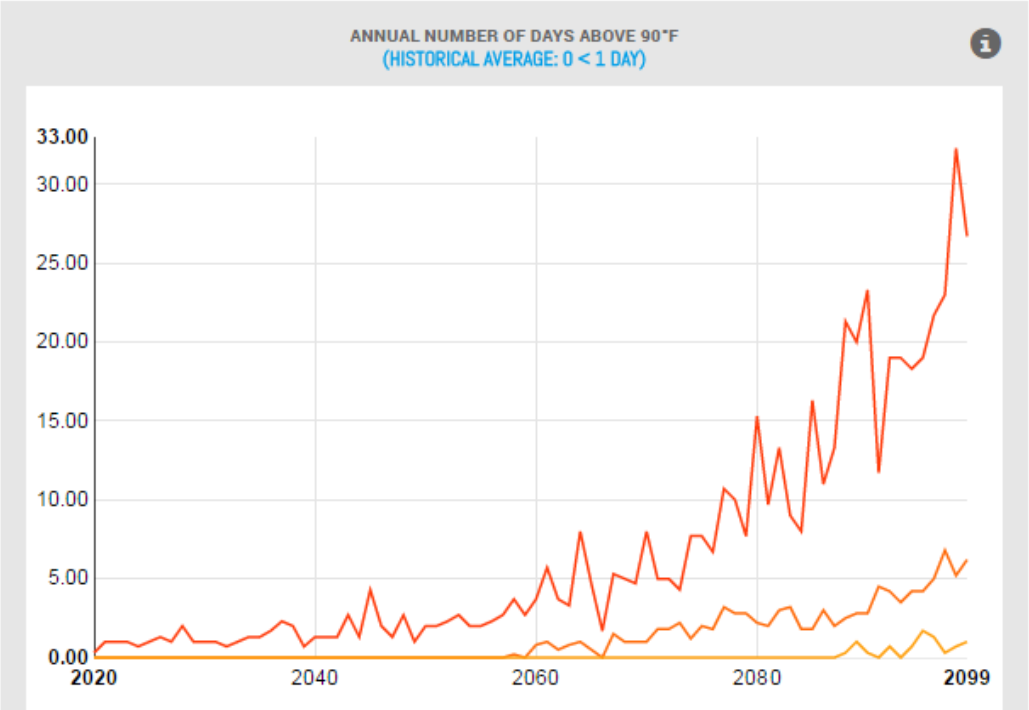


Figure 8: Projected Extreme Heat Days in Emeryville. RCP 8.5 projected annual number of days above 90 °F throughout the 21st century. Lines represent low-end (light orange), mid-range (dark orange) and high-end (red) model results. Source: Four Twenty Seven as represented on Vizonomy.

Low average temperatures in Emeryville are rare, yet the number of very cold days is expected to decrease and minimum temperatures gradually to rise. For both emission scenarios, projections indicate that Emeryville is not likely to experience freeze throughout the entire century. In a high emissions scenario, it would be unlikely to experience one day below 32 °F after 2063 even according to high-end projections.

Section 5.05 Rainfall Induced Landslides

(a) Landslides and Climate Change

As high-intensity rainfall events increase in frequency there is greater risk for inland flooding. Impacts associated with flooding include landslides and liquefaction and cities with hilly terrain can experience increased risk of these events. However, based on Emeryville's location and topography, its risk of experiencing landslides remains low.

(b) Probability of Impact

According to the United States Geological Survey (USGS),[13] Emeryville is located entirely in a zone identified as experiencing "very few landslides."

(c) Extent of Landslide Risk and Affected Assets

Emeryville is at a limited risk for experiencing a landslide event that will impact critical assets.

Section 5.06 Fire Hazard

(a) Fire and Climate Change

Extreme temperatures and increased variability in rainfall will likely cause dry conditions in California, exacerbating the risk of wildfire throughout the state. However, due to its location on the San Francisco Bay away from wildland-urban interface zones, the threat of wildfire is low in Emeryville.

(b) Data Sources

According to the California Department of Forestry and Fire Protection (CAL FIRE) Wildland Urban Interface (WUI) maps,[14] there are no WUI zones in Emeryville.

(c) Extent of Fire Risk and Affected Assets

No city assets are threatened by wildfire risk in Emeryville.

Section 5.07 Appendix: Methods and Data Sources

(a) Methods

The Emeryville Climate Hazards Assessment was conducted using a digital mapping tool called The Vizonomy Climate Risk Platform (Vizonomy). This platform overlays geographical representations of sea level rise and rainfall-induced inland flooding with the location of critical assets throughout Emeryville, creating a visual representation of the spatial extent and the number of specific assets that could be affected by each hazard throughout the city. The asset information was collected from open data sources available through various federal agencies, OpenStreet Map and local data provided by the City of Emeryville and Alameda County. Hazard projections and data were collected from the sources explained in the next section of this appendix. In addition, modeling and graphical representations of projected temperature and precipitation changes throughout the 21st century were provided by Four Twenty Seven.

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[13] Pike, R.J. (1997). San Francisco Bay Region Landslide Folio Part D. USGS. Accessed at: http://pubs.usgs.gov/of/1997/of97-745/of97-745d.html

[14] Homer, C.G., et al. (2015). Completion of the 2011 National Land Cover Database for the conterminous United States-Representing a decade of land cover change information. *Photogrammetric Engineering and Remote Sensing*, v. 81, no. 5, p. 345-354.

(b) Rainfall Induced Inland Flooding

FEMA creates Flood Insurance Rate Maps (FIRMs) as part of the National Flood Insurance Program to determine flood insurance requirements and inform local hazard mitigation actions that address flood risks. FIRMs incorporate statistical information on river flow, storm surge, hydrology and topography in order to delineate 100-year and 500-year floodplains, or areas that have a one percent and 0.2 percent chance of happening in a given year respectively. The statistical information and associated maps are based on historical data and do not incorporate climate projections into the floodplain delineations, yet provide an accurate depiction of where floodwaters are likely to concentrate, even if recurrence intervals change.

(c) Sea Level Rise

Considered the best available science, the 2012 National Research Council (NRC) Report *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future* identified likely sea level rise estimates throughout the 21st century for the west coast of the United States based on moderate greenhouse gas emissions and continued acceleration of glacial melt patterns. These values are accompanied by ranges of possible sea levels based on low and high emissions scenarios and ice melt scenarios. The projections applicable to Alameda County are six inches of sea level rise by 2030 (range: 2-12 in), 11 inches by 2050 (range: 5-24 in), and 36 inches by 2100 (range: 17-66 in) relative to the year 2000. (See Figure 9.)

Year	Projections	Ranges
2030	6 ± 2 in	2 to 12 in
2050	11 ± 4 in*	5 to 24 in
2100	36 ± 10 in	17 to 66 in

Figure 9: Sea Level Rise Estimates Relative to the Year 2000. *Source: NRC* [15]

In the report *Adapting to Rising Tides: Alameda County Shoreline Vulnerability Assessment*,[16] these projections inform a sea level rise analysis for Alameda County. Four inundation maps were created which incorporate remote sensing data using light detection and ranging (LiDAR) methods to depict the elevation on natural and hard structures and determine the level of "overtopping" at 5-meter resolution. Each map represents a range of scenarios that are possible given different combinations of sea level rise and extreme tides. Extreme tides are caused by the additive impact of unusually high tides, or King Tides, which happen twice per year, and storm surge, which results from the high winds and low atmospheric pressure associated with storm conditions.

The analysis includes maps of water levels increasing by 12 inches, 24 inches, 36 inches and 48 inches over the Mean Higher High Water (MHHW), or the average height of the higher high tide of each day. (Refer to Figure 10.) Based on the likely sea level rise projections within climate

[15] National Research Council. (2012). *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*. Report. DOI: 10.17226/13389

[16] AECOM and Brian Fulfrost & Associates. (2015). *Adapting to Rising Tides: Alameda County Shoreline Vulnerability Assessment Final Report*.

scenarios, the areas flooded in the map depicting 36 inches of sea level rise are likely to be permanently inundated by 2100. However, this same water level could occur temporarily on an annual basis by mid-century with high tides and storm surge.

Two additional maps of water level increases at 72 and 96 inches illustrate flooding that can potentially take place under circumstances in which sea level rise is combined with higher than projected glacial melt and extreme tides. For example, a 72-inch scale flood is possible with 36 inches of sea level rise and a 50-year extreme tide. A 96-inch scale flood, which would inundate half the city, is possible with 54 inches of sea level rise and a 100-year storm event.

Sea Level Rise Scenario	Daily Tide *Permanent Inundation*	Extreme Tide (Storm Surge) *Temporary Flooding*						
	+SLR	1-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
	Water Level above MHHW (in)							
Existing Conditions	0	14	19	23	27	33	37	42
MHHW + 6 inch	6	20	25	29	33	39	43	48
MHHW +12 inch	12	26	31	35	39	45	49	54
MHHW +18 inch	18	32	37	41	45	51	55	60
MHHW +24 inch	24	38	43	47	51	57	61	66
MHHW +30 inch	30	44	49	53	57	63	67	72
MHHW +36 inch	36	50	55	59	63	69	73	78
MHHW +42 inch	42	56	61	65	69	75	79	84
MHHW +48 inch	48	62	67	71	75	81	85	90
MHHW +54 inch	54	68	73	77	81	87	91	96
MHHW +60 inch	60	74	79	83	87	93	97	102
HYDRODYNAMIC ZONE 1								

Figure 10. Sea Level Rise and Extreme Tide Matrix (Hydrodynamic Zone 1). Source: Adapting to Rising Tides [17]

(d) Temperature and Precipitation

Temperature and precipitation projections were provided by Four Twenty Seven using an ensemble of 19 global circulation models, statistically downscaled to better represent local conditions. Probabilistic estimates were generated for extreme indicators using Gaussian distribution, with the most likely value falling between the 25th and 75th percentiles. For indicators showing changes to average precipitation and temperature, an envelope-based approach was used by bounding the range of models based on their departure from the historical mean. Temperature and precipitation indicators have been parametrized to show future trends in terms of averages and extremes at the city-level (~12 x 12 km). All future values (2020-2060) were amended with probabilistic estimates and compared to a historical baseline (1970-2000).

The models used scenarios from the IPCC. The RCP 8.5 represents the most minimal greenhouse gas mitigation effort and high emissions, resulting in the largest increase in

[17] AECOM and Brian Fulfrost & Associates. (2015). *Adapting to Rising Tides: Alameda County Shoreline Vulnerability Assessment Final Report*.

radiative forcing and warming, while RCP 4.5 is considered a moderate greenhouse gas mitigation scenario where climate action limits the amount of global emissions.[18]

(e) Rainfall Induced Landslides

The USGS conducted a survey of landslide risk in the San Francisco Bay Area leading up to the 1997-1998 El Niño event. Today, these maps are used to predict future landslides since they are generally believed to occur within and around the places where they have previously taken place.[19] Geographic locations are assigned risk based on a five-point scale from surficial deposits (very low risk) to mostly landslide (high risk). Areas which have experienced few landslides have a mid-level risk for landslide events.

(f) Wildfire

CAL FIRE produces WUI maps to determine the potential exposure of residential and commercial properties to wildfire based on U.S. Census Bureau Housing Unit density (2000) and USGS National Land Cover Data (NLCD).[20]

[18] IPCC. (2014). Scenario Process for AR5. Accessed at: http://sedac.ipcc-data.org/ddc/ar5_scenario_process/RCPs.html

[19] Pike, R.J. (1997). San Francisco Bay Region Landslide Folio Part D. USGS. Accessed at: http://pubs.usgs.gov/of/1997/of97-745/of97-745d.html

[20] Homer, C.G., et al. (2015). Completion of the 2011 National Land Cover Database for the conterminous United States-Representing a decade of land cover change information. *Photogrammetric Engineering and Remote Sensing*, v. 81, no. 5, p. 345-354.

Article VI. GLOSSARY

- **Benchmarking**: building ratings to help measure how much energy a building consumes and to compare against other buildings
- **BikeShare:** regional Bay Area bike sharing program to be launched in Emeryville late 2016. The public can pay for an annual membership and rent bikes out for 30 min sessions for short commutes or bike rides
- **Carbon fee**: tax to off-set the greenhouse gas emissions for a particular service or product; different rates could be implemented for different sectors
- **Community choice energy (CCE)**: county-wide program to allow local governments to procure or develop power on behalf of residents and businesses, giving consumers a choice in cleaner energy sources. This can result in lower greenhouse gas emissions and potentially more competitive rates than through the public utility
- **Direct solar installation program**: program or organization such as SunShares that installs solar panels for residents or businesses
- **Energy audit**: energy assessment of a building; can either be efficiency of the structural infrastructure or the operations
- **Greenhouse gas (GHG) emissions**: Includes carbon dioxide (CO_2), methane (CH_4), and nitrogen dioxide (NO_2) and other gases. This is the primary driver for climate change.
- **Greenway**: trail for walking and biking with maintained vegetation or landscaping
- **Green tenant practices**: toolkit created by San Francisco Environment and the Business Council on Climate Change for best practices between tenants and landlords on reaching sustainability goals for commercial buildings
- **Green building design**: sustainable architectural design of a building. This can include LEED, zero net energy (ZNE), passive buildings, Living Building Challenge, and others
- **Greywater**: wastewater which has not come in contact with toilet or chemical water; including water from bathtubs, showers, bathroom sinks, laundry washing machines, and laundry tubs. This does NOT include water from kitchen sinks, photo lab sinks, dishwashers, or laundry water from soiled diapers. Greywater can be used for irrigation or toilet flushing
- **Fix-It clinics**: community workshops on fixing things at home, biking and other alternative transportation options, where residents can bring things to fix
- **Solar micro grid**: local energy grid run on solar energy with capacity to disconnect from the traditional grid and operate independently, useful for generating and sharing energy locally and being more responsive to variation in energy use
- **Solar/wind tree**: structure shaped like a tree that can capture solar or wind energy
- **Rain water capture system**: systems such as cisterns or rain barrels that collect and store precipitation from above-ground impervious surfaces for irrigation or indoor use
- **Recycled water**: water which, as a result of treatment, is suitable for beneficial uses that would not otherwise occur
- **Retro-commissioning**: taking an existing building and adjusting the equipment, lighting, and control systems to improve the efficiency of what's already in place (as opposed to upgrading to newer appliances with retro-fitting)
- **Tool lending libraries**: library of tools or appliances that can be shared among a neighborhood or community to reduce unnecessary redundancy in buying new things

- **Water smart grid**: integrating smart meters to a water system for tracking water usage
- **Zero net energy (ZNE) building**: building with zero net energy consumption (total energy usage is equal to the renewable energy generation