

Table 1

	Solution Name	Sector	Tons of Carbon	Cost	Savings	Berkeley Measurements	Sunk Cost	Life Cycle Cost	Action	Actor
1	Refrigerant Management	Materials	89.74	N/A	-\$902.77	# refrigerators;#heat exchangers;#AC; #car AC units; Total Volume of Refrigerant: Residences; Commercial; Industry; Campus; cars, ; age;			replace refrigerant in all Berkeley locations; replace old refrigerators, AC units; survey all car AC systems; all fleets; cover 20 blocks each weekend	City; Costco, Sears, WalMart, all white goods stores. All appliance service locations.
2	Wind Turbines (Onshore)	Energy	84.60	\$1,225.37	\$7,425.00	Count turbines in B.; analyze wind patterns; sky vanes;			Explore locations;	
3	Reduced Food Waste	Food	70.53	N/A	N/A	Total mass entering B; home-grown; #restaurants, food prep; disposal volume; green pickup mass; dump and recycle centers; biomass generated daily;			Consumer awareness; install composting in all B. housing; special restaurant/ dormitory pickup;	UC; restaurants; Whole Foods, Berkeley Bowl, all food outlets; fast food outlets;
4	Plant-Rich Diet	Food	66.11	N/A	N/A	Current meat volumes: home, restaurant, dorm; distance to source; butcher shops;			Educational campaign;	UC; restaurants; Whole Foods, Berkeley Bowl, all food outlets; fast food outlets;
5	Tropical Forests	Land Use	61.23	N/A	N/A	Number of trees in B; species; Botanical Garden; Campus; Eucalyptus; total			Total tree inventory;	
6	Educating Girls	Women and Girls	59.60	N/A	N/A	School Stats; weekly progress; Girls Garage; Maker Faire;				
7	Family Planning	Women and Girls	59.60	N/A	N/A	Fertile; births; deaths;				
8	Solar Farms	Energy	36.90	-\$80.60	\$5,023.84	Available PV area; angle; efficiency; inventory; roof area; installed base; inverter inventory; solar thermal; thermoelectric potential; artificial leaf			Inventory unused land area not capable of garden; cover all parking lots. Berkeley wharf reconstruction	
9	Silvopasture	Food	31.19	\$41.59	\$699.37	Tree inventory; available area; construction volume annually; distance of transport			Cows in Berkeley?	
10	Rooftop Solar	Energy	24.60	\$453.14	\$3,457.63	Available PV area; angle; efficiency; inventory; roof area; installed base; inverter inventory; solar thermal; thermoelectric potential; artificial leaf; bond-financed finance; PACE			Every rooftop in Berkeley	
11	Regenerative Agriculture	Food	23.15	\$57.22	\$1,928.10	Food production in Berkeley; marshland				

12	Temperate Forests	Land Use	22.61	N/A	N/A	Tree inventory; available area; construction volume annually; distance of transport			Tree inventory	
13	Peatlands	Land Use	21.57	N/A	N/A	Inventory				
14	Tropical Staple Trees	Food	20.19	\$120.07	\$626.97	Inventory				
15	Afforestation	Land Use	18.06	\$29.44	\$392.33	Inventory			10,000 trees in Berkeley; West Berkeley first.	
16	Conservation Agriculture	Food	17.35	\$37.53	\$2,119.07	Inventory				
17	Tree Intercropping	Food	17.20	\$146.99	\$22.10	Inventory				
18	Geothermal	Energy	16.60	-\$155.48	\$1,024.34	Geology; inventory; heat exchanger inventory;			Heat pump inventory	
19	Managed Grazing	Food	16.34	\$50.48	\$735.27	Livestock inventory; species inventory				
20	Nuclear	Energy	16.09	\$0.88	\$1,713.40	Reopen nuclear reactor				
21	Clean Cookstoves	Food	15.81	\$72.16	\$166.28	Stove inventory; vent sensors; temp sensors; electric signature; disaster stockpile; REI				
22	Wind Turbines (Offshore)	Energy	14.10	\$572.40	\$274.57	PG&E tariff; COB credits;				
23	Farmland Restoration	Food	14.08	\$72.24	\$1,342.47	Inventory				
24	Improved Rice Cultivation	Food	11.34	N/A	\$519.06	Volume of rice eaten in Berkeley; source; whole rice; rice substitutes				
25	Concentrated Solar	Energy	10.90	\$1,319.70	\$413.85	Inventory			survey heat requirements of process industries; concentrate for solar thermal, possibly PV	
26	Electric Vehicles	Transport	10.80	\$14,148.00	\$9,726.40	Inventory; grid control; storage at house; fleet conversion, UC and city; power distribution by PG&E; energy storage capacity; charging spaces; pooling; Phasor Sensing Units			Move to 100%; change all city vehicles, all UC fleet; introduce free electric bike , scooter; recharge network throughout; PACE financing for Berkeley residents	
27	District Heating	Buildings and Cities	9.38	\$457.10	\$3,543.50	Survey; Inventory of HVAC; inventory of heat sinks;				
28	Multistrata Agroforestry	Food	9.28	\$26.76	\$709.75	Inventory				
29	Wave and Tidal	Energy	9.20	\$411.84	-\$1,004.70				Use wharf for tidal, wave generation; Liquid Robotics	

30	Methane Digesters (Large)	Energy	8.40	\$201.41	\$148.83	Total mass cycle; EBMUD capture; biomass capture; dump; anaerobic population; marsh and wetland analyze composting losses			Move to household waste treatment; anaerobic processing with Methane, ammonia, SO2 capture;	
31	Insulation	Buildings and Cities	8.27	\$3,655.92	\$2,513.33	HH inventory; commercial; campus; structural inventory; temperature sensors; IR inventories; incentive plans;			Complete Berkeley retrofit.	
32	Ships	Transport	7.87	\$915.93	\$424.38	Berkeley dock; ferry stop costs;				
33	LED Lighting (Household)	Buildings and Cities	7.81	\$323.52	\$1,729.54	Inventory; retrofit programs; HH rewiring; comms applications?; indoor/outdoor retrofit; street retrofit			Complete Berkeley retrofit;	
34	Biomass	Energy	7.50	\$402.31	\$519.35	mass created daily; mass removed;			Enhance Gilman processing site; change fee structure; subsidize Berkeley garden trimming collection	
35	Bamboo	Land Use	7.22	\$23.79	\$264.80	Inventory; neighborhood gardens; furniture replacement; construction materials				
36	Alternative Cement	Materials	6.69	-\$273.90	N/A	Inventory all existing asphalt, concrete; building mass; demolition mass; recycle to porous pavement; CO2 capture; Introduction of FOSS strain sensors			Replace all asphalt with reground construction and demolition cement; pervious street replacement;	
37	Mass Transit	Transport	6.57	N/A	\$2,379.73	Increase diversity of terminal feeders; Calthorpe measures of multi-modal			Free Berkeley bus, a la Corvallis	
38	Forest Protection	Land Use	6.20	N/A	N/A	Tree canopy inventory; shade impact;				
39	Indigenous Peoples' Land Management	Land Use	6.19	N/A	N/A	Ohlone tribe?				
40	Trucks	Transport	6.18	\$543.54	\$2,781.63	Last mile diversification; alley, street parking impact; volume of daily load; weight impact on streets;real-time FOSS				
41	Solar Water	Energy	6.08	\$2.99	\$773.65	Inventory				
42	Heat Pumps	Buildings and Cities	5.20	\$118.71	\$1,546.66	Inventory; add thermoelectric capture;				
43	Airplanes	Transport	5.05	\$662.42	\$3,187.80					

44	LED Lighting (Commercial)	Buildings and Cities	5.04	-\$205.05	\$1,089.63	Inventory; retrofit programs; HH rewiring; comms applications?; indoor/outdoor retrofit; retrofit campus, hospitals; free space optical transmission				
45	Building Automation	Buildings and Cities	4.62	\$68.12	\$880.55	sensors, eliminate SCADA; BIM requirements				
46	Water Saving - Home	Materials	4.61	\$72.44	\$1,800.12	leak detection; signal processing in water column; toilet and faucet monitoring; drip irrigation; total potable reuse; grey for gardens;			Home metering; leak detection; acoustic signal processing on all water columns;	
47	Bioplastic	Materials	4.30	\$19.15	N/A	mass used inventory; container trash mass; change in thermal values;				
48	In-Stream Hydro	Energy	4.00	\$202.53	\$568.36	add in-sewer generation; underground flows; storm water				
49	Cars	Transport	4.00	-\$598.69	\$1,761.72	Car free areas; alternate parking; alternate final mile; inventory; daily street pattern; change parking patterns; space real-time control; exhaust monitoring			Move to periphery, free bus, shuttle, Berkeley "Uber" dispatch; grocery delivery;	
50	Cogeneration	Energy	3.97	\$279.25	\$566.93	inventory all existing thermal capture; residential; campus; incentivize;			Use waste 70C heat for forward osmosis waste water processing	
51	Perennial Biomass	Land Use	3.33	\$77.94	\$541.89	Wood inventory in existing structures; reuse of all material in new building; wood houses				
52	Coastal Wetland	Land Use	3.19	N/A	N/A	rebuild; regrow species;				
53	System of Rice Intensification	Food	3.13	N/A	\$677.83	Any grown in Berkeley?				
54	Walkable Cities	Buildings and Cities	2.92	N/A	\$3,278.24	Match to Rockefeller incentives				
55	Household Recycling	Materials	2.77	\$366.92	\$71.13	Decentralize; public inventory, public exchange: Elmwood; new composting tech; sewage composting; urine separation for fertilizer			Install district recycling, serving 20 square blocks with collection point;	
56	Industrial Recycling	Materials	2.77	\$366.92	\$71.13	Inventory mass moving today; re-chain production; waste capture, reuse;				

57	Smart Thermostats	Buildings and Cities	2.62	\$74.16	\$640.10	Deploy in all structures; residential, commercial; industrial; process industry model			Nest everywhere;	
58	Landfill Methane	Buildings and Cities	2.50	-\$1.82	\$67.57	Real-time measurement; label all methane processes: septic, biomass, EBMUD. Total methane cycle; reengineer anaerobic species;				
59	Bike Infrastructure	Buildings and Cities	2.31	-\$2,026.97	\$400.47	Fleet of white bikes; electric recharging; maintenance centers; parking centers; use for cm accurate street quality sensors			Add Copenhagen hub to all bikes;	
60	Composting	Food	2.28	-\$63.72	-\$60.82	HH composting bins for all HH; instruction; compost exchange for gardens;				
61	Smart Glass	Buildings and Cities	2.19	\$932.30	\$325.10	Inventory; Replacement schedule;				
62	Women Smallholders	Women and Girls	2.06	N/A	\$87.60	Property title inventory;				
63	Telepresence	Transport	1.99	\$127.72	\$1,310.59	Jobs for HH; decrease transport and parking load				
64	Methane Digesters (Small)	Energy	1.90	\$15.50	\$13.90	Inventory; link to composting anaerobic				
65	Nutrient Management	Food	1.81	N/A	\$102.32	analyze all flows; follow protein streams;				
66	High-speed Rail	Transport	1.52	\$1,040.98	\$368.10	CalTrans plans;				
67	Farmland Irrigation	Food	1.33	\$216.16	\$429.67					
68	Waste-to-Energy	Energy	1.10	\$36.00	\$19.82	Links to Total Potable reuse composting, urine separation;Solid trash treatment with Janicki (Gates Foundation) pyrolysis machine; redo all trash collection; HH disposal re plumbing				
69	Electric Bikes	Transport	0.96	\$106.75	\$226.07	SF Program; Amsterdam				
70	Recycled Paper	Materials	0.90	\$573.48	N/A	Tonnage; local reuse				
71	Water Distribution	Buildings and Cities	0.87	\$137.37	\$903.11	EBMUD redesign for distributed treatment; water main, fire pressure system monitoring ;reservoir rebuilding; new pump systems;TPR				
72	Biochar	Food	0.81	N/A	N/A					
73	Green Roofs	Buildings and Cities	0.77	\$1,393.29	\$988.46	LBL criteria for white roofs; water estimates, cooling; PV vs green				

74	Trains	Transport	0.52	\$808.64	\$313.86	Bus use of roadbed;				
75	Ridesharing	Transport	0.32	N/A	\$185.56	impact of autonomous; freight-sharing;;				
76	Micro Wind	Energy	0.20	\$36.12	\$19.90	evaluate; aerial tether;				
77	Energy Storage (Distributed)	Energy	N/A	N/A	N/A	35,000 residential retrofits				
77	Energy Storage (Utilities)	Energy	N/A	N/A	N/A	design capital reward for utilities to shift to distributed storage				
77	Grid Flexibility	Energy	N/A	N/A	N/A	Couple local storage with grid reliability; harmonic distortion, phase imbalance;;power factor correction				
78	Microgrids	Energy	N/A	N/A	N/A	Couple local storage with grid reliability; harmonic distortion, phase imbalance;;power factor correction				
79	Net Zero Buildings	Buildings and Cities	N/A	N/A	N/A	NetZero Water				
80	Retrofitting	Buildings and Cities	N/A	N/A	N/A	tax structure for 2% annual turnover; lead pipe analysis; legal structure for new tax, test, monitor standards; NetZero requirement for all sales				
S u b y c o l u m n			1050.99	\$29,638.96	\$73,874.44	0	0	0	0	0
T o t a l s f r o m w e b s i t e			1050.99	\$29,638.96	\$73,874.44					