Smart Driving Pilots

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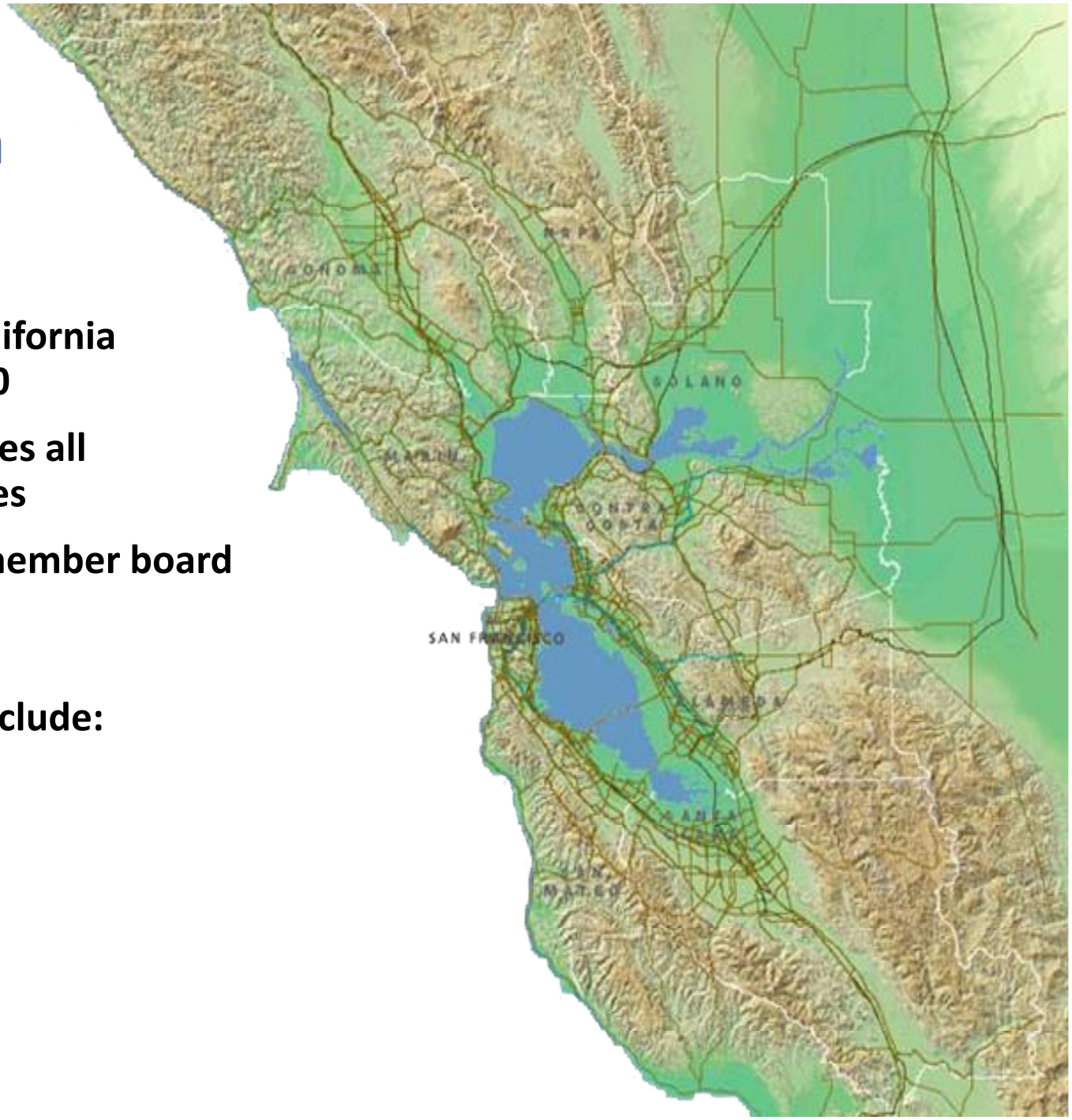
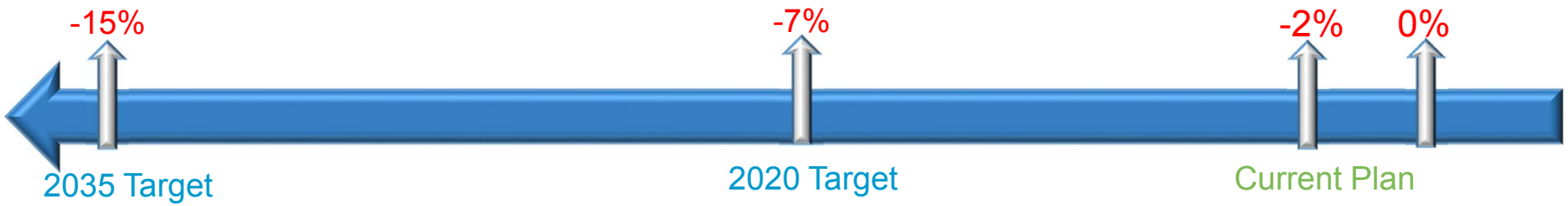
Metropolitan Transportation Commission

- **Created by the California Legislature in 1970**
- **Jurisdiction includes all 9 Bay Area counties**
- **Governed by 21-member board of primarily local elected officials**
- **Responsibilities include:**
  - Planning
  - Funding
  - Coordination
  - Operations
  - Advocacy



California Climate Change Legislation

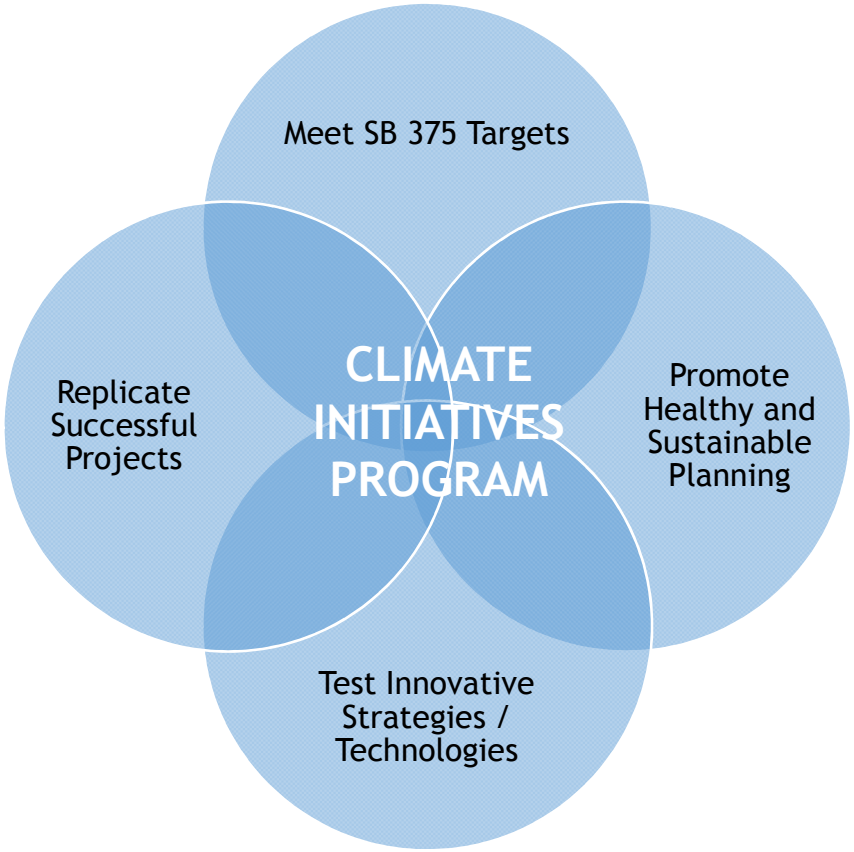
- **Assembly Bill 32: Global Warming Solutions Act**
  - Sets the state GHG emissions limit in 2020 at 1990 levels and points the way towards 80% reduction by 2050
- **Senate Bill 375: Sustainable Communities Strategy**
  - Requires the integration of land use and transportation planning in a Sustainable Communities Strategy (SCS) to reduce emissions from light duty vehicles



Per Capita Light Duty Vehicle Emission Reduction Targets

Goals of MTC's Climate Program

- **Meet SB 375 GHG emission reduction requirements** that mandate the region to reduce GHG emissions
- **Test innovative transportation strategies / technologies** that reduce GHG emissions, VMT, single occupancy vehicle travel, and support mode shift
- **Promote co-benefits**, such as improved public health and reduced transportation costs
- **Replicate successful projects** throughout the region



Plan Bay Area Climate Program

Plan Bay Area invests $630m over 25 years in Climate Program activities

Policy Initiative	2035 Cost in YOE millions	Per Capita CO_2 Emissions Reductions in 2035	Cost per GHG Ton Reduced in 2035	Funds Expended to Date (in millions)
Commuter Benefits Ordinance	$0	-0.3%	$0	$.4
Car Sharing	$13	-2.6%	$14	$2
Vanpool Incentives	$6	-0.4%	$29	--
Clean Vehicles Feebate Program	$25	-0.7%	$108	--
Smart Driving Strategy	$160	-1.5%	$322	$.9
Vehicle Buy-Back & Plug-in or Electric Vehicle Purchase Incentive	$120	-0.5%	$684	--
Regional Electric Vehicle Charger Network	$80	-0.3%	$812	--
Climate Initiatives Innovative Grants	$226	TBD	TBD	$44
Total	$630	-6.3%		$47.3

Conducted Market Research in 2011

- **All behavior changes are not equal**
  - SMART driving (modifying driving style or vehicle) is viewed as comparatively easy actions to take
  - Trip reduction/trip modification actions are mixed – trip linking and reducing a trip are viewed as easy, telecommuting and flex-schedules were difficult
  - Mode or vehicle shift are perceived as the most difficult actions to take, with walking being a possible exception
- **Themes & motivators**
  - Altruistic factors were the most compelling – keep Bay Area beautiful for future generations, protect the environment, protect public health
  - Self-interested factors included better for their health, reduce energy use, save time & save money

Existing Smart Driving Research

- **U.S. study found 2.7 average reduction in fuel consumption:**
  - A 2013 study by Kurani et al. found a 2.7% reduction in fuel consumption using in-vehicle devices (CA and NV)
- **European studies found up to 22.5% reduction in fuel consumption:**
  - Eco:Drive Fiat studied their app, which yielded a 6% average reduction in fuel consumption (Europe)
  - European insurance companies tracked the number of insurance claims before and after the introduction of smart driving campaigns and found a reduction in claims from between 14% and 35%

Smart Driving Pilots

1. **MTC/ICF Pilot**: tested effectiveness of in-vehicle, real time device and smart driving education on MPG savings.
2. **UC Davis Pilot**: tested effectiveness of four smart phone app types, displayed while driving, on MPG savings.

MTC/ICF Pilot

- Began Pilot in late 2012 by recruiting participants on **511.org** website
- Developed educational elements that would be sent to all participants (Powerpoints with video) and also used social media to engage participants
- Used two devices: OBD Key (to accurately measure vehicle performance) and Ecometer (to provide instant feedback in-vehicle).
- Began installing in-vehicle devices in 2013; half received Ecometer, half did not; all received smart driving lessons
- Conducted two waves of testing
- Total of 23 participants completed pilot

Ecometer Device

MTC/ICF Pilot Results Overview

- Pilots showed promising, yet varied results:
  - Ecometer resulted in only a small (**1.6%**) improvement in fuel economy (not statistically significant)
  - Lessons alone actually decreased fuel efficiency by **3%** (not statistically significant)
  - Ecometer reduced hard accelerations by **20%** and high speed travel by **10-16%**
  - Participant trips were **9%** shorter following the installation of the Ecometer

MTC/ICF Pilot Results

Pilot Overview

- Twenty three people completed pilot:
  - 19 cars
  - 3 SUVs
  - 1 Minivan

- Ecometer + OBD Key + Educational Elements = 12 participants
- OBD Key + Educational Elements = 11 participants

Pilot Parameters:

- Fuel economy was averaged across all 23 vehicles during the baseline period and the test period.
- A 95% confidence interval (95% CI) was also calculated for the data to show its statistical significance.

MTC/ICF Pilot Results, cont.

Aggressive Driving

Test	Baseline		Test		Difference
	AD[a]	95% CI	AD	95% CI	
Ecometer	6.5%	6.8%	5.3%	6.1%	-19.3%
Lessons	7.4%	4.6%	9.1%	4.7%	23.3%

- OBDKey recorded a measure of aggressive driving.
- Assumption of a 30 degree throttle angle to indicate rapid acceleration.
- Aggressive driving was reduced however, the change was not statistically significant due to the variation in values.

Over Speeding

Test	Baseline		Test		Difference
	OS[a]	95% CI	OS	95% CI	
Ecometer	29.7%	8.4%	26.3%	8.4%	-11.6%
Lessons	26.3%	6.0%	25.0%	6.2%	-4.9%

- The OBDKeys also recorded miles driven over 65 mph.
- Over speeding was reduced by the program. However, the change was not statistically significant due to the variation in values.
- **The three vehicles that drove over 40% of their miles speeding reduced over speeding by 11% due to the Smart Driving program.**

MTC/ICF Pilot Results, cont.

Trip Length

Test	Baseline		Test		Difference
	miles	95% CI	miles	95% CI	
Ecometer	8.40	1.84	7.65	1.59	-9.0%
Lessons	9.49	1.62	9.39	1.39	-1.0%

- Reduction in trip length affects fuel economy by decreasing the portion of the time spent driving at more efficient speeds (~45 to 60 mph)
- May be an indication of trip chaining which can reduce emissions due to lower cold starts
- **Average trip length decreased by 9% (statistically significant)**, which likely contributed to limited fuel economy gains, since shorter trips tend to be less fuel efficient.

Adjusted Results

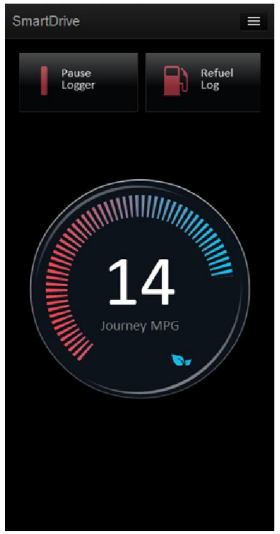
Test	Baseline		Test		Difference
	MPG	95% CI	MPG	95% CI	
Ecometer	27.79	3.51	28.23	3.76	1.6%
Lessons	32.42	5.41	31.44	5.46	-3.0%

- **Improvement in fuel economy for the Ecometer group when adjusted for trip length and average speed, but the results are still not statistically significant**
- Ecometer provided small positive benefits for the test groups, while the lessons alone had a small negative effect.

UC Davis Pilot

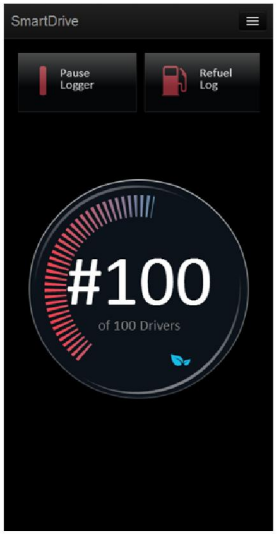
- Tested four variations of driver feedback Android app:
  1. Numerical per-trip score
  2. Trip ranking comparing trip to other participants'
  3. Trip ranking with fuel cost
  4. Trip ranking with GHG emission info

Journey MPG



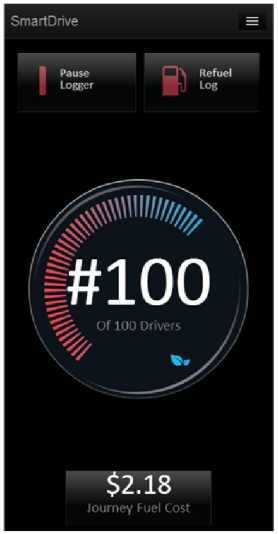
Journey refers to a user defined resettable trip, similar to a trip odometer. The driver can choose to reset the journey any time.

Driver Rank



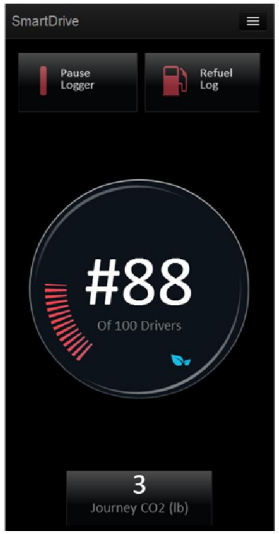
The driver rank is calculated by comparing the current trip efficiency to similar trips taken by other participating drivers.

Driver Rank with Cost



This version adds the total fuel cost of the journey to the bottom of the screen.

Driver Rank with CO2



This version adds the total carbon dioxide produced by combusting the fuel.

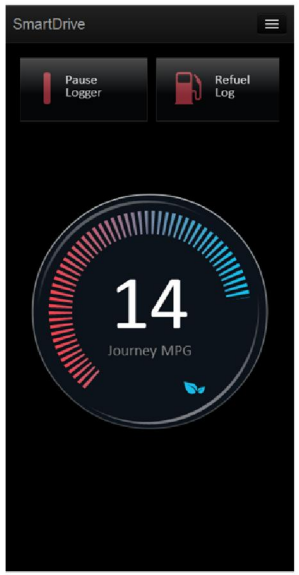
UC Davis Study, cont.

- Used Facebook and 511.org to attract 545 pilot participants
- Of those, 70 participants completed pilot
- The experiment tested both the effect of any driving feedback and the effectiveness of personal vs. social rank feedback

UC Davis Pilot Results

- **The app type had a strong effect on the result:**
  - The numerical per trip score type was most effective, **providing a 15.5% reduction in fuel consumption (statistically discernable at the 95% confidence rate)**
  - The social rank views had no statistically discernable effect.

Journey MPG



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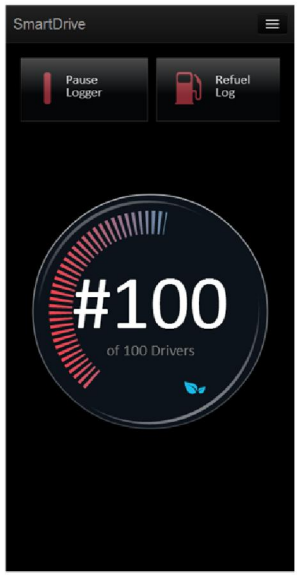

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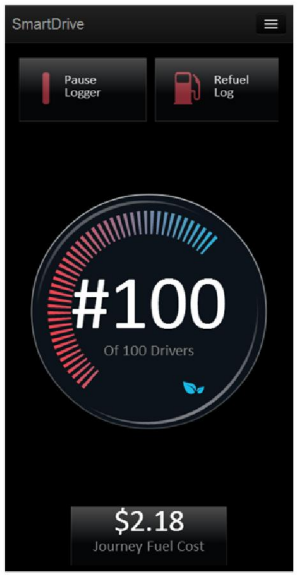

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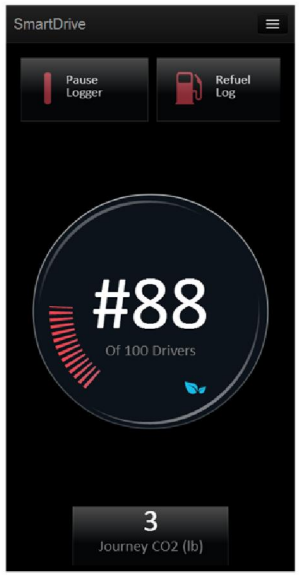

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Lessons Learned

- Small sample size makes it difficult to come to significant findings
- Devices difficult to install, program and obtain accurate results
- Participants found devices fun and useful
- Given varied yet promising results, we are moving forward with a larger pilot program

Smart Driving Program
Phase 2

- MTC and ICF have continued smart driving effort
- Partnering with Automatic on distribution of discounted devices to Bay Area public
- Creating smart driving video and other educational elements to enhance Automatic's information
- Planning to launch in January 2016

Automatic Device

Thank you!

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