



Research Update: Recent Highlights

December 6, 2012

California Environmental Protection Agency

 **Air Resources Board**

Research Partners

- Federal Agencies
- State Agencies
- NGOs
- Air Districts
- National Labs
- University of California
- California State Universities
- Private and Land Grant Universities



Research Coordination

Coordination Groups

- CAT Research Working Group
- Transportation Research Roundup
- Behavior Research Group

Research Planning Process

- Proposal Reviews
- Project Quarterly Meetings
- Reviews of Final Reports

Emerging Research Topics

1970

Ozone & Car Emissions



1980

SIP Models, PM10 & Indoor Air Quality



1990

Children's Health & Diesel Emissions



2000

PM2.5 & Greenhouse Gas Mitigation



2010

Sustainable Communities & Program Effectiveness



Highlighted Research Findings

Children's Health

Diesel Emissions

Greenhouse Gas Mitigation

Health
Research



Children's
Health



The Children's Health Study



- 5,500 children
- 12 Communities in Southern California
- Followed children from 4th to 12th grade
- National Institute of Health funding follow-up study

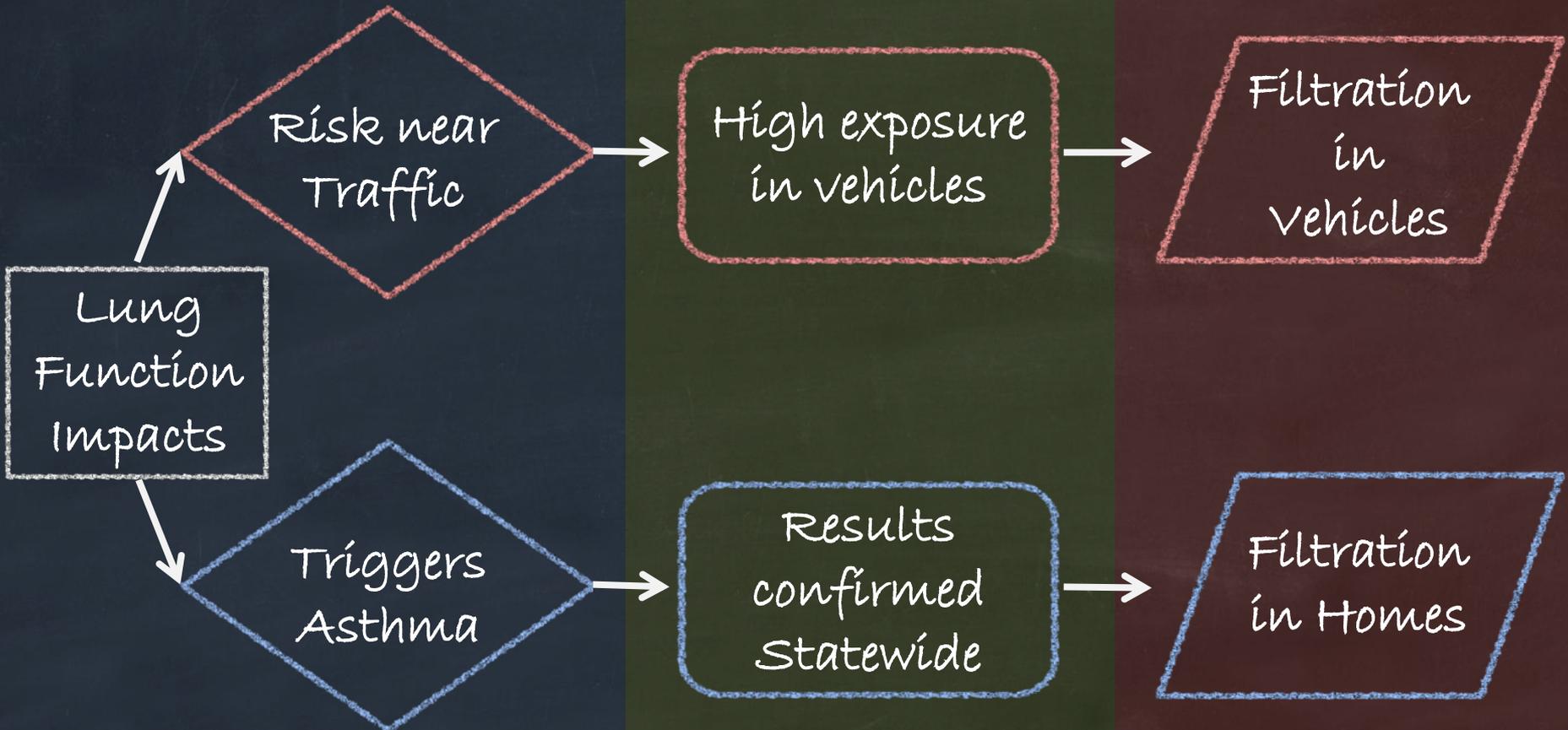


Children's Health Research

CHS Research

Recent Findings

Current Research



Lung Function Impacts



CHS Research:

- Air pollution reduces lung growth and development
- Restored lung growth when air quality is improved
- 1.7 million school absences per year linked to ozone

Risk near Traffic



CHS Research:

- Lung function reduced in children living closest to freeways

Recent Findings:

- High exposure within 500 feet of freeways
- Cars, school buses a significant source of in-vehicle exposure

Current Research:

- Quantifying benefits of filters in cars and buses

Asthma



CHS Research:

- Asthma onset linked to high ozone exposure
- Asthma prevalence, symptoms and medication use linked to traffic pollution

Recent Findings:

- Asthma onset linked to traffic pollution
- Exposure to PAHs linked to symptoms in asthmatic children

Current Research:

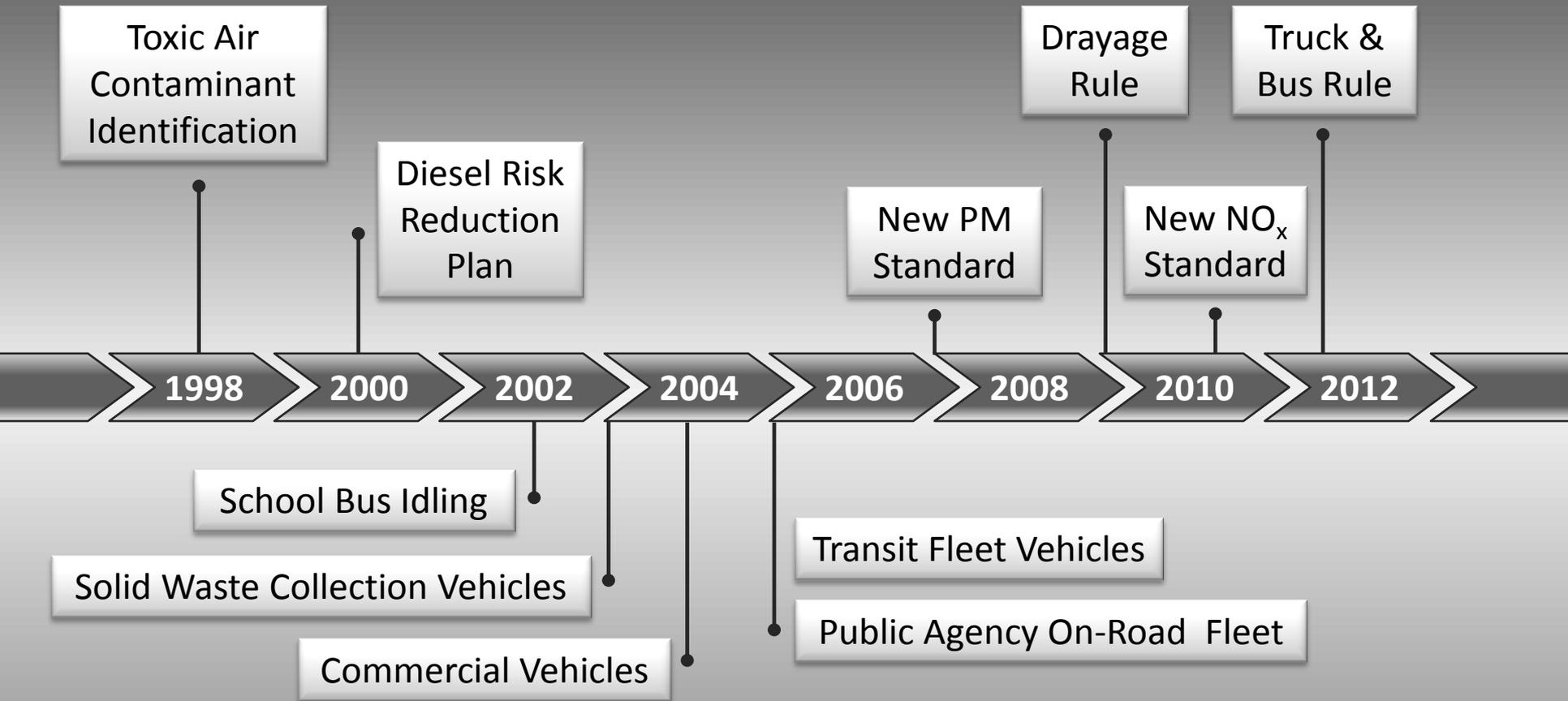
- Examining benefit of high efficiency filtration in homes of asthmatic children

Diesel Emissions

Reducing Emissions from Heavy Duty Vehicles



Diesel Regulatory Program



Diesel Research Program

Real World Testing
of Retrofit
Aftertreatment

Testing Real World Effect of:

- Drayage Truck Rule
- Truck and Bus Rule

1998

2000

2002

2004

2006

2008

2010

2012

Real World Testing
of Aftertreatment

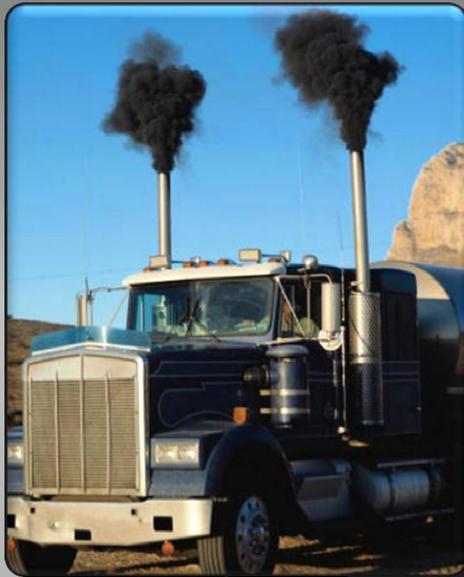
Testing Ability to Lower NO_x

- New Technology CNG
- Bio-diesel

Biological and Chemical Assays for Toxicity Screening



Testing Trucks with Aftertreatment Technology



No Diesel Particulate Filter



With Diesel Particulate Filter

Benefits of New Technology



NO_x

- Diesel, -95%
- CNG, -95%

PM

- Diesel, -99%
- CNG, -95%

Hydrocarbon

- Diesel, -99%
- CNG, -50%

Benefits of New Technology

Toxicity Testing*

- Oxidative Stress, -99.9%
- Inflammation, -99.8%
- DNA Damage, -97%

* Expressed per mile driven

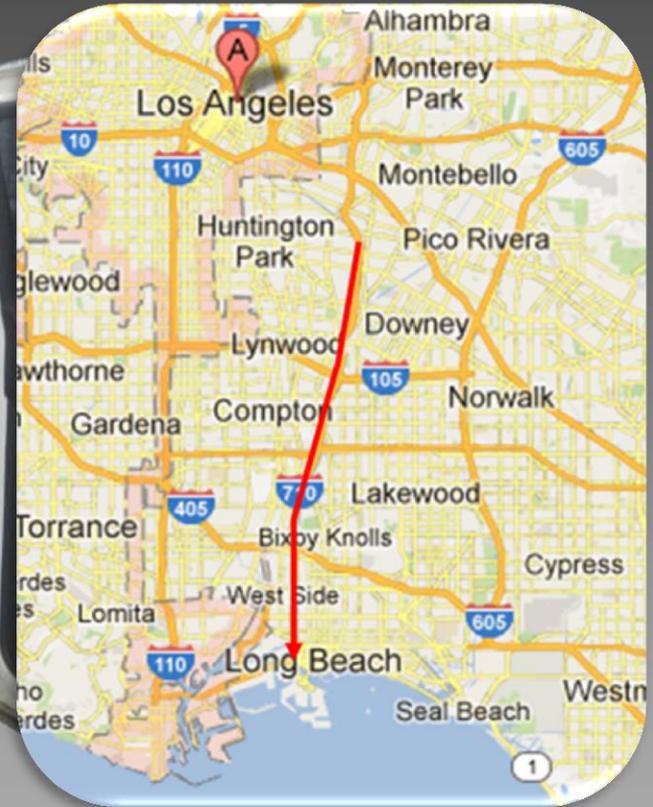


Measuring Real World Emissions

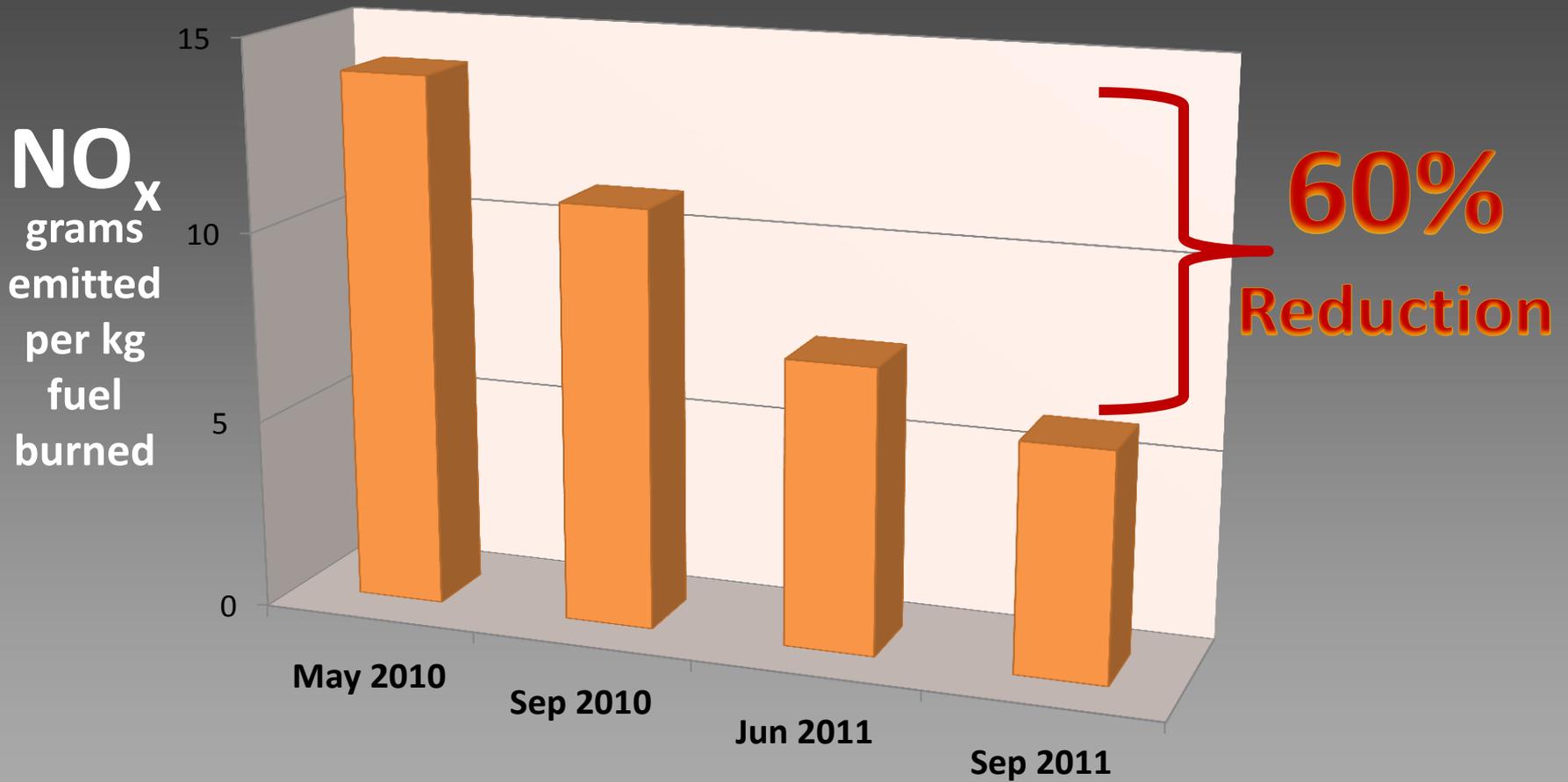
Mobile Monitoring Platform



Measures:
PM_{2.5}
Black Carbon
CO₂
NO_x

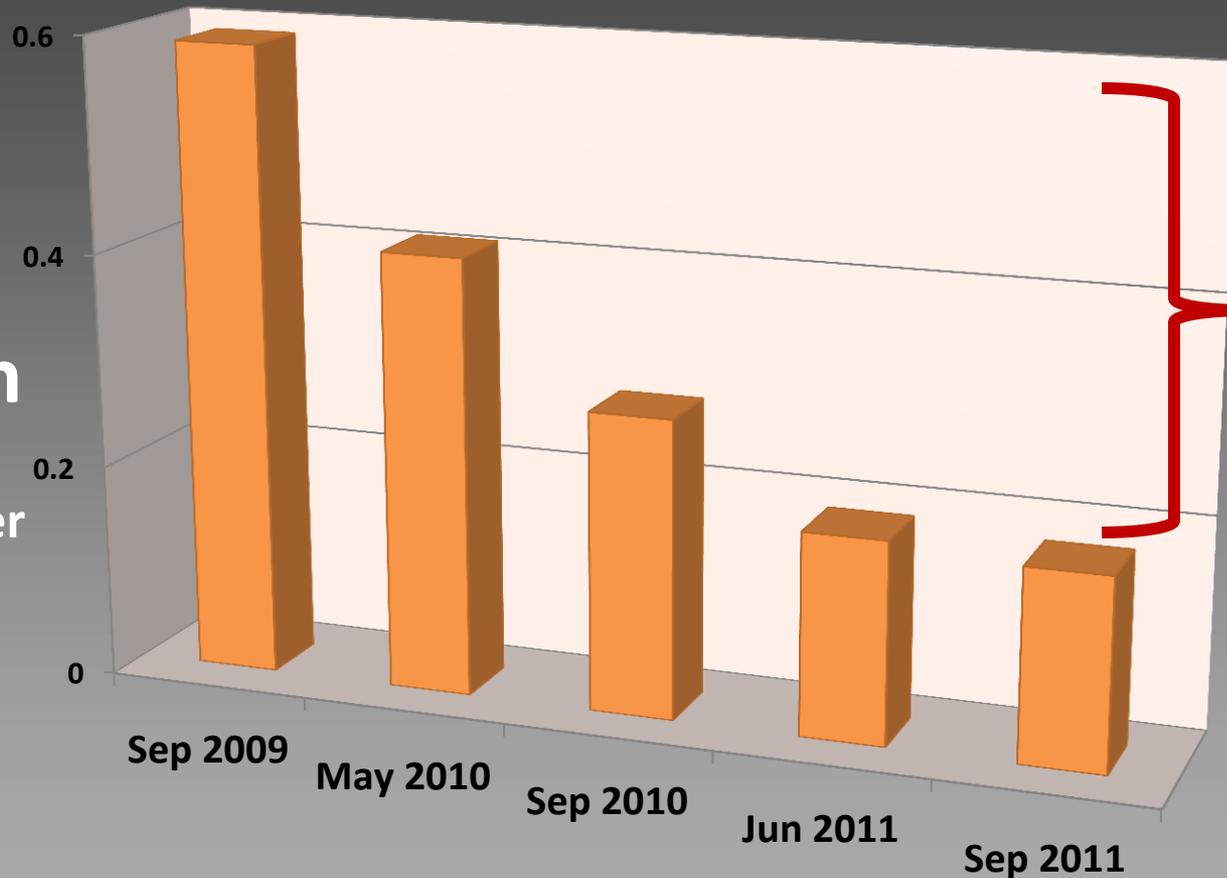


710 Heavy Duty Emission Rate



710 Heavy Duty Emission Rate

**Black
Carbon**
grams
emitted per
kg fuel
burned



**70%
Reduction**



Testing Durability, Degradation and Failure Rates of Emission Control Technologies



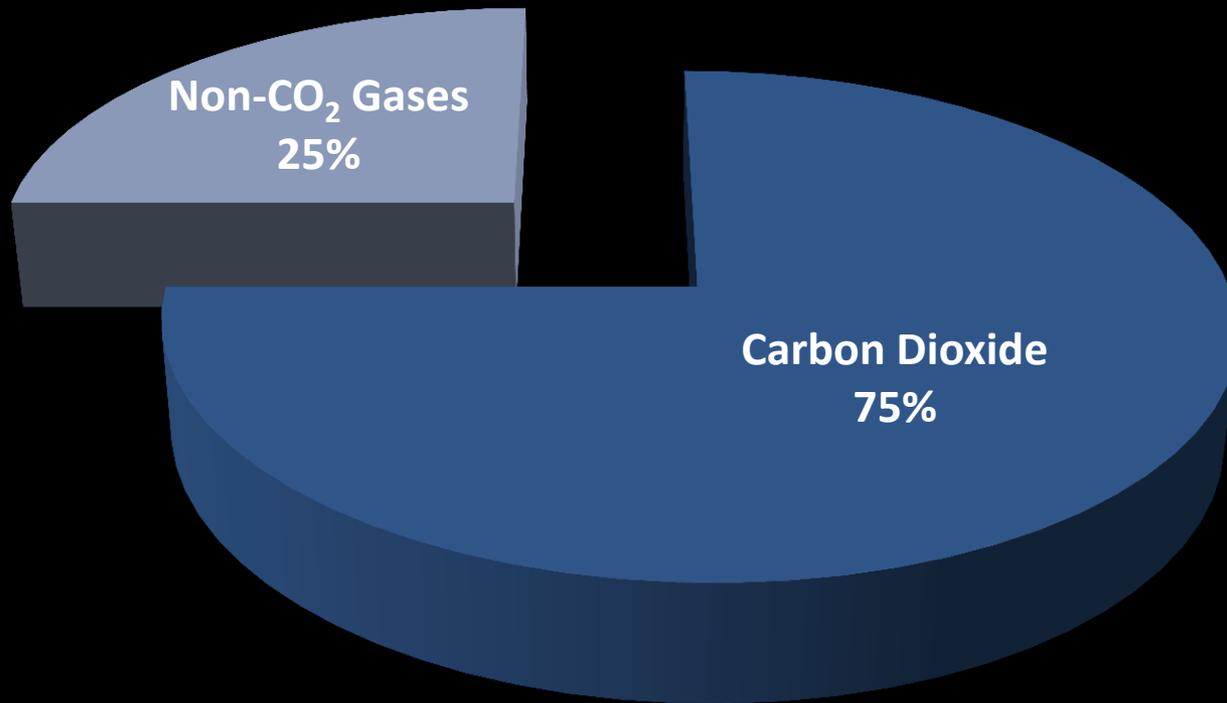
Perforated
Pipe



GHG Mitigation

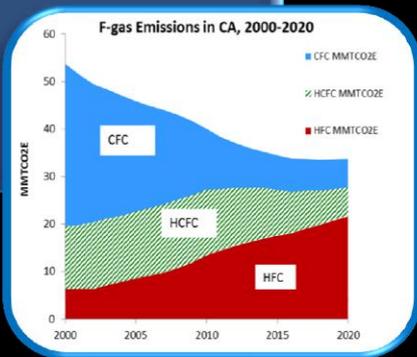
Reduction of Non-CO₂ Gases

California's Greenhouse Gas Inventory



High Global Warming Potential Gases

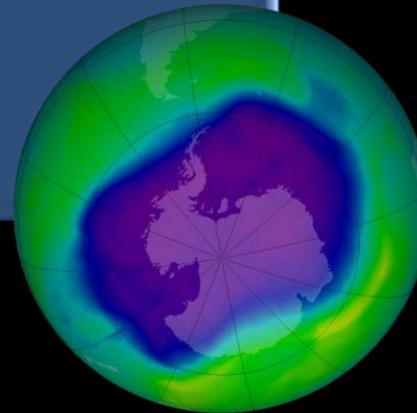
Developed and verified inventory for California



Identified control options and costs



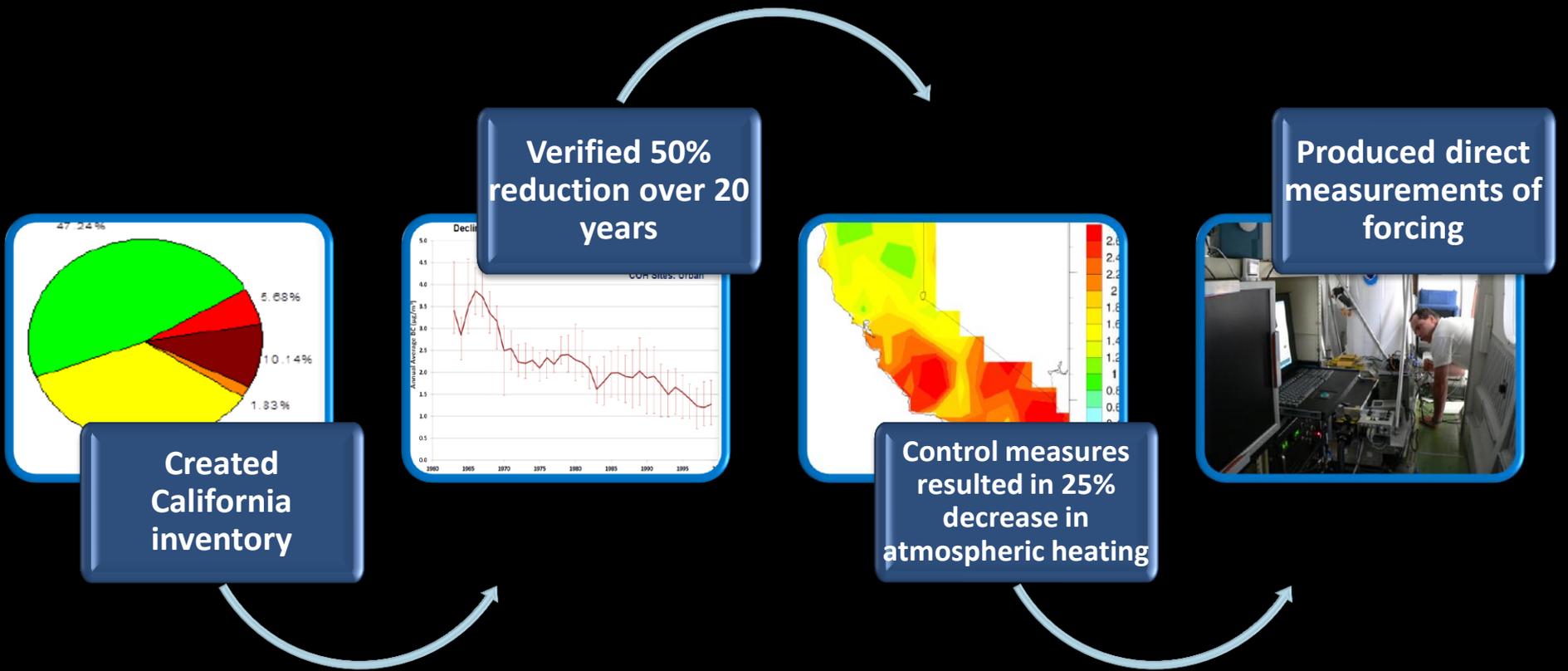
8 million metric tons of reductions



Adopted offset protocol for cap and trade



Black Carbon



Greenhouse Gas Monitoring

California's Tower Network



LA Basin Sources




Mt. Wilson



San Fernando Valley

San Bern

San Bernardino

Local Methane Source



Anaheim

Santa Ana M

Beach

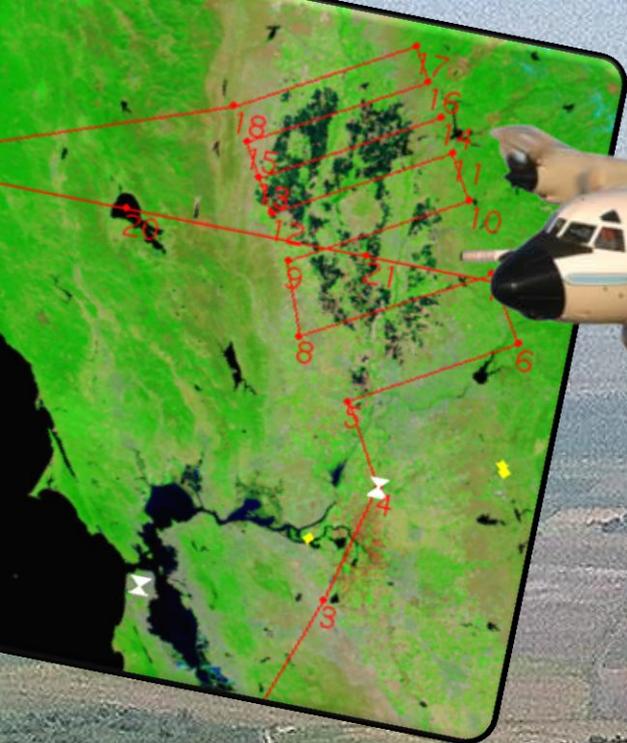
Huntington Beach

Urban Versus Rural Sources

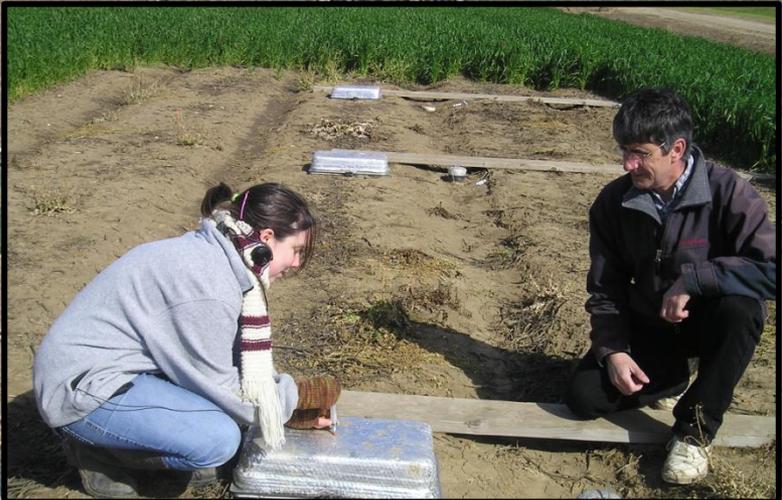
Mt Wilson to Walnut Grove



Central Valley Sources



Walnut Grove Radio Tower



Research Communication



- ARB Research Website & listserv
 - Press Releases
 - Factsheets
 - Research Briefs
 - Peer-reviewed Journal Articles
 - Final Reports
- Public Seminars