



Applications and Implications: Science-Based Policy Formation at the California Air Resources Board

Dr. Michael T. Benjamin

Chief, Air Quality Planning and Science Division

Los Angeles 50 Years Ago

- Unhealthy levels of lead, NO₂, SO₂, carbon monoxide, ozone, particulate matter, and air toxics
- Ozone:
 - Over 100 air pollution alerts annually
 - Over 200 days with unhealthy air annually
 - Peak ozone level of 490 ppb - five times allowable level



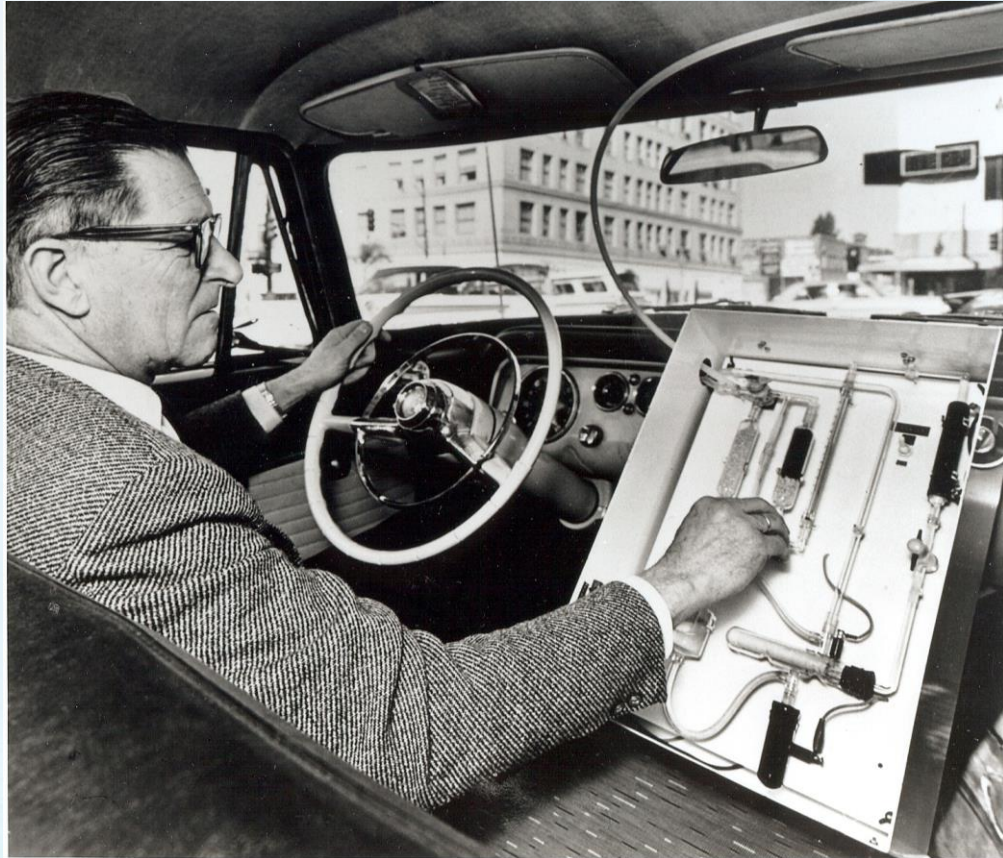
The Public Expects Clean Air



Highland Park Optimists Club (1954)

Courtesy of UCLA Library Special Collections - Los Angeles Times Photographic Archive

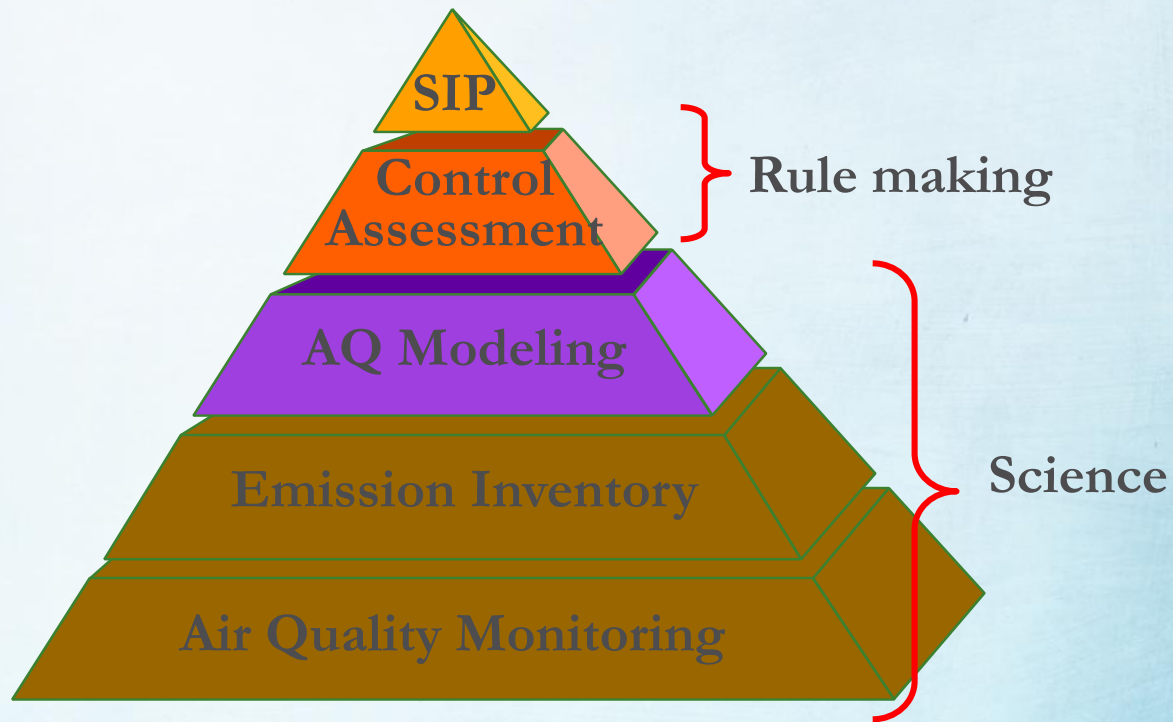
Understanding the Problem



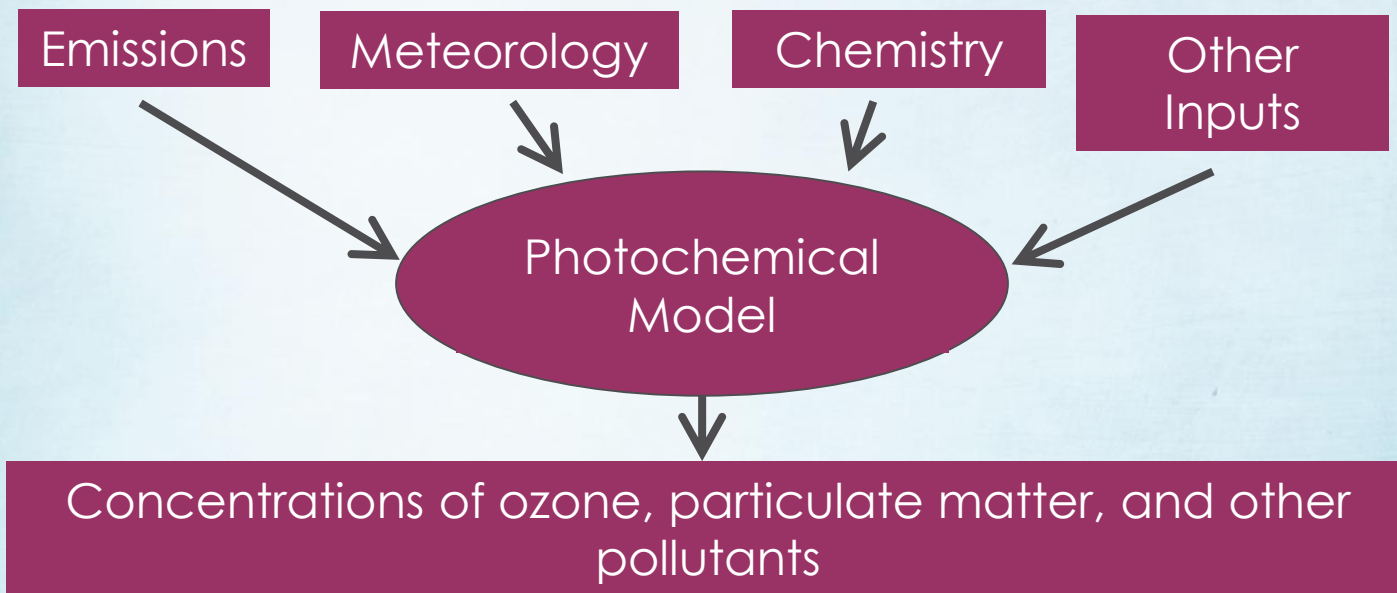
Science-Based Air Quality Management

- California has two of the most polluted air basins in the U.S. (South Coast and San Joaquin)
- Emissions controls to attain NAAQS are expensive (~\$10B) and must get them right the first time
- Air Quality Management in California has a strong scientific basis – multiple research-grade field campaigns
- CARB is a prominent and consistent provider of funding for basic/applied air quality research and conferences

Process for Developing SIPs



Photochemical Modeling



Models are mathematical representations of our best current knowledge of atmospheric processes

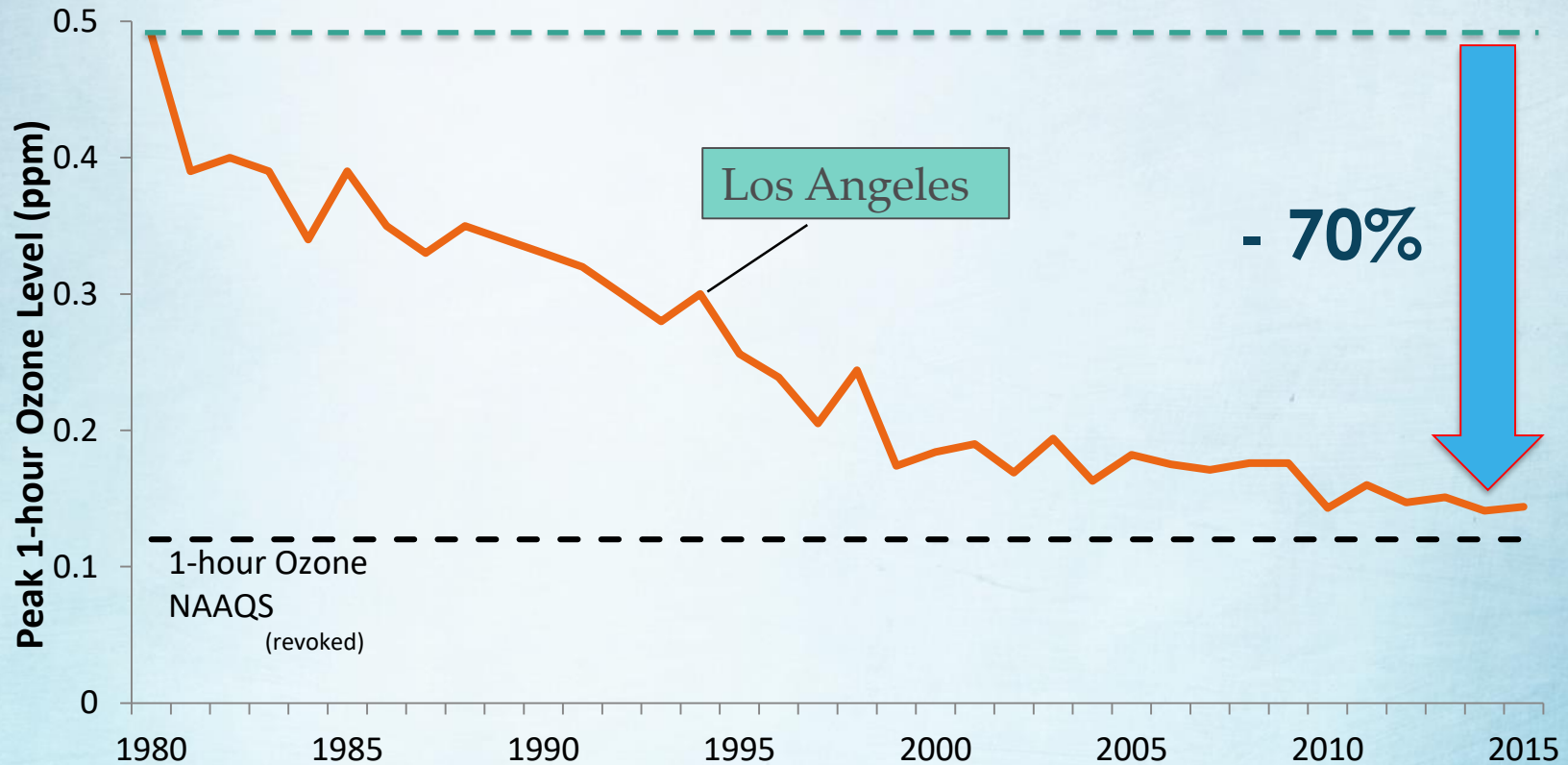
Chemistry Foundational To AQ Management

- The better the chemistry in the photochemical model, more defensible the control strategies derived with it
- CARB is committed to SAPRC chemistry (started in SAPRC90, now at SAPRC07, will move to SAPRC16)
- CARB has many chemistry-based regulatory programs besides photochemical modeling
- This conference is the foundation of CARB's internal chemistry improvement effort

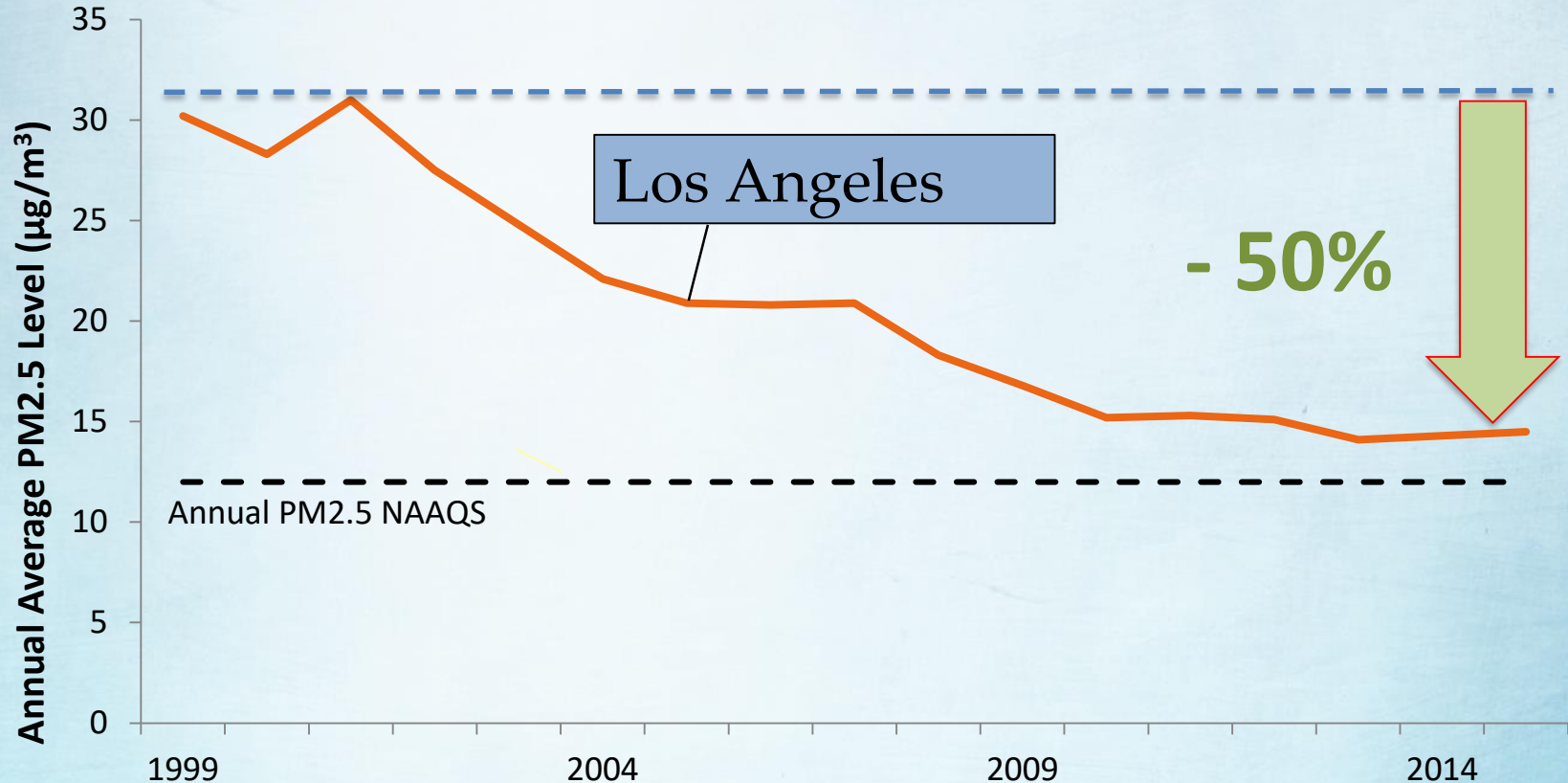
Chemistry at CARB

- CARB's first chair, Dr. Arie Haagen-Smit, was a bioorganic chemistry professor at Caltech
- California Reformulated Gasoline (CaRFG) regulation (13 CCR 2250-2273.5) – Based on MIR
- Consumer Products Regulations (four of them) 13 CCR 94500-94555 – Based on MIR
- Reactivity Program - VOC Exemptions (VOCs that are not expected to meaningfully contribute to ozone formation due to their low reactivity in the atmosphere)
- Regulatory monitoring program
- Ocean-going Vessels program
- (every program has some chemistry)

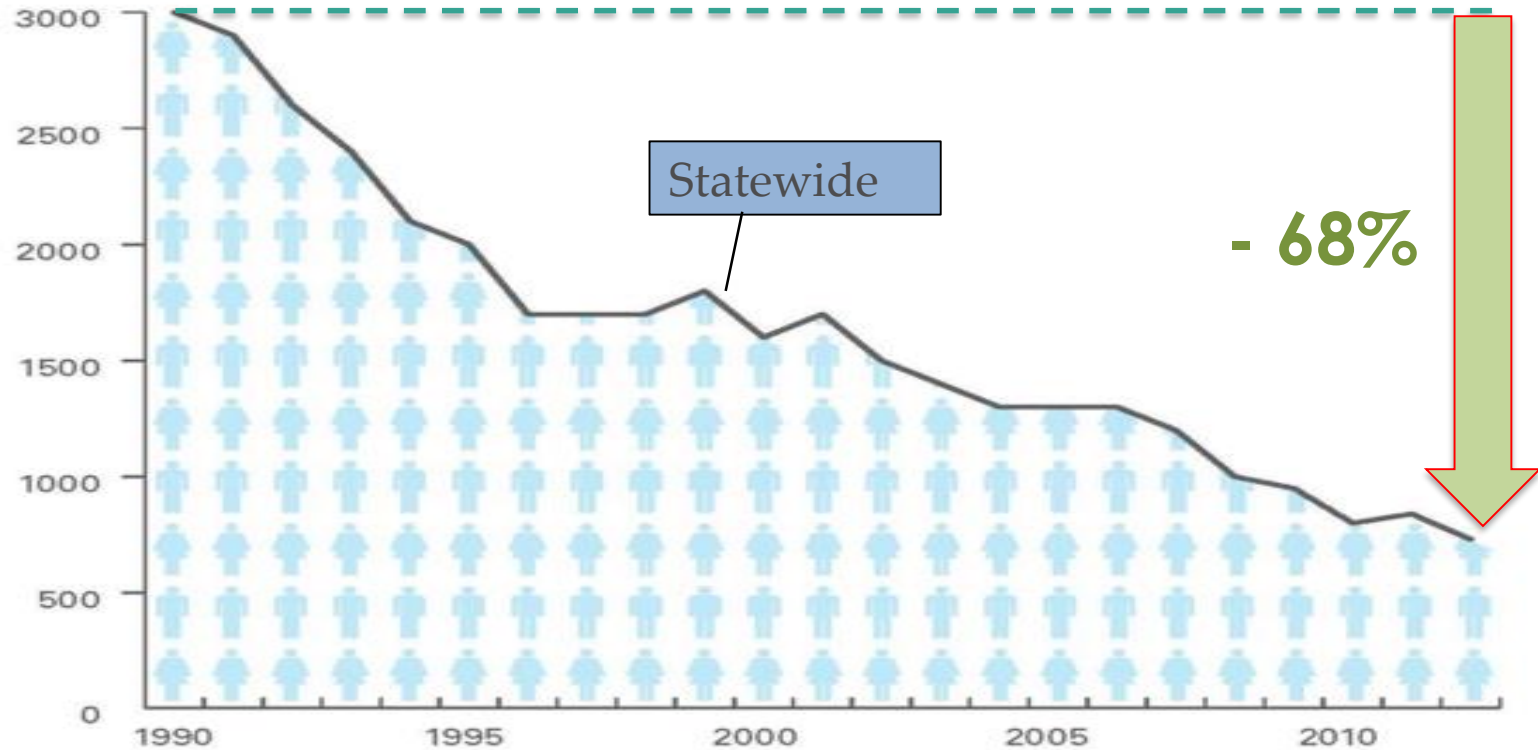
Decline in Peak Ozone Levels



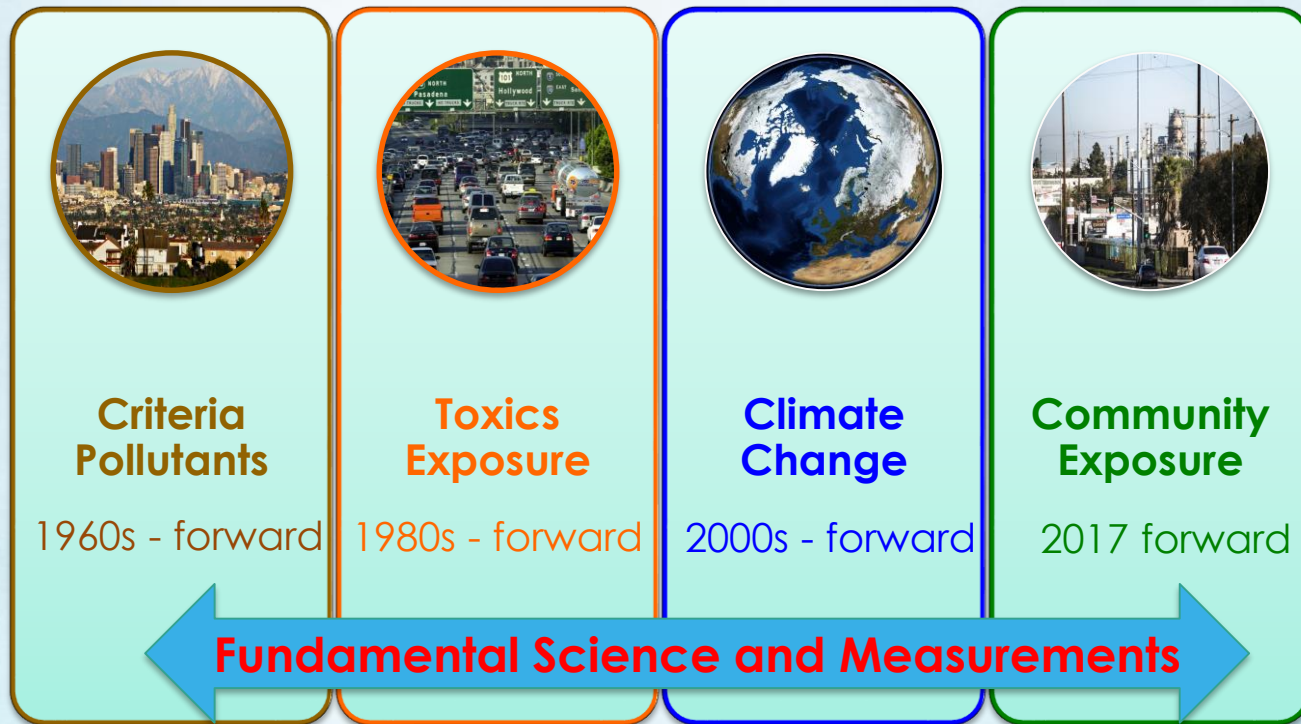
Decline in Annual PM2.5 Levels



Reduction in Toxics Cancer Risk



California's Evolving Air Quality Priorities



AB 617: Community Air Protection

- Community focused framework and actions
 - ✓ Build on existing successful programs
 - ✓ Enhanced information on community level air pollution
 - ✓ Community specific emission reduction programs
 - ✓ Targeted incentive funding
 - ✓ Focus on early actions
 - ✓ Emphasis on community participation
- Collaborative process involving CARB, air districts, and community representatives

Identifying Communities

- Prioritize communities with highest exposure burdens:
 - ✓ Deployment of community air monitoring
 - ✓ Development of community emission reduction programs
- Focus on disadvantaged communities and sensitive receptor locations

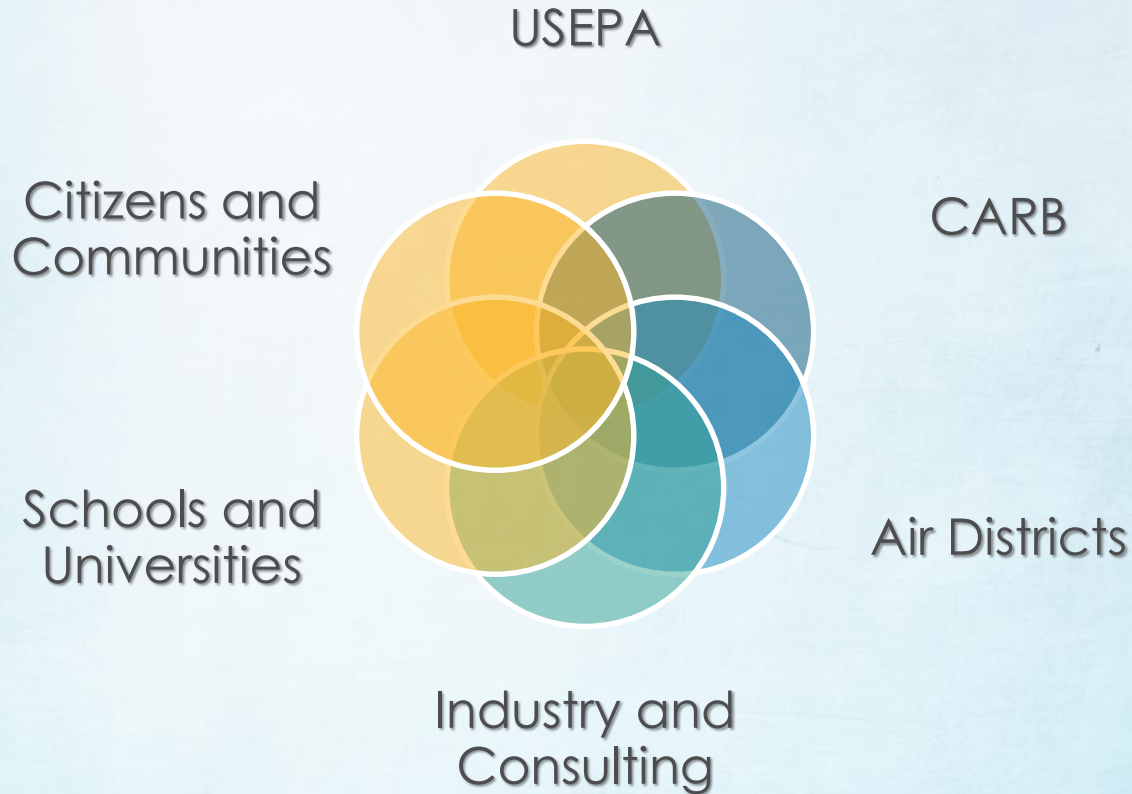
Low-Cost Air Sensors

- Community air monitoring – low-cost air sensor networks can screen exposure
- Sensor availability is limited – no reliable sensors for VOC and air toxics
- Help from chemists are needed to design/build new low-cost sensors and interpret the results
- Have a separate CARB-sponsored conference on this (Air Sensor International Conference), but could also be a session in the next ACM

Science Drives California Policy



Success Through Collaboration



Conclusions

- CARB is a world-renowned pro-active leader in AQ management.
- Chemistry is the bedrock of CARB's science-based regulations
- CARB's internal chemistry improvements benefit tremendously from this conference
- CARB needs help from this group on design/development of low-cost sensors, especially for VOCs and air toxics