



BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

Regional Air Quality Planning in the San Francisco Bay Area

9th City AQM Workshop , Regional Air Quality Management and Collaboration

地点：南京 Nanjing, China

日期：2013年3月19-20日 March 19-20

Henry Hilken

Director of Planning, Rules & Research
Bay Area Air Quality Management District

Overview

- Bay Area & BAAQMD
- Air Quality progress & challenges
- Bay Area 2010 Clean Air Plan
 - multi-pollutant plan
 - public health benefits
- Future progress requires increasing cooperation
- Concluding thoughts



Bay Area AQMD

- Regional air pollution control agency
- Formed in 1955, ~ 330 employees
- Board of Directors:
22 local elected officials from cities in Bay Area
- 9 Bay Area counties, 101 cities
- San Francisco, San Jose, Oakland
- 7+ million people, 5+ million vehicles
- ~ 200 million vehicle miles per day



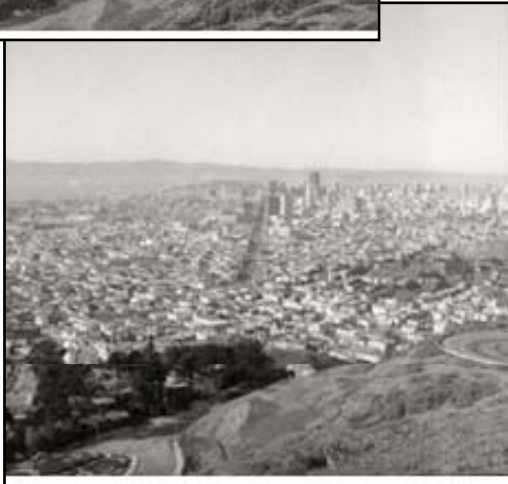
Bay Area AQMD

- Roles & Responsibilities:
 - Regulating stationary sources:
oil refineries (5), power plants, gas stations, etc.
 - Monitoring air quality: extensive monitoring network
 - Develop plans to attain State & national AQ standards
- No direct authority over motor vehicles, land use, energy policy, GHGs
- Must coordinate efforts with many agencies:
 - United States Environmental Protection Agency
 - California Air Resources Board
 - Regional transportation & land use agencies
 - Local cities and counties





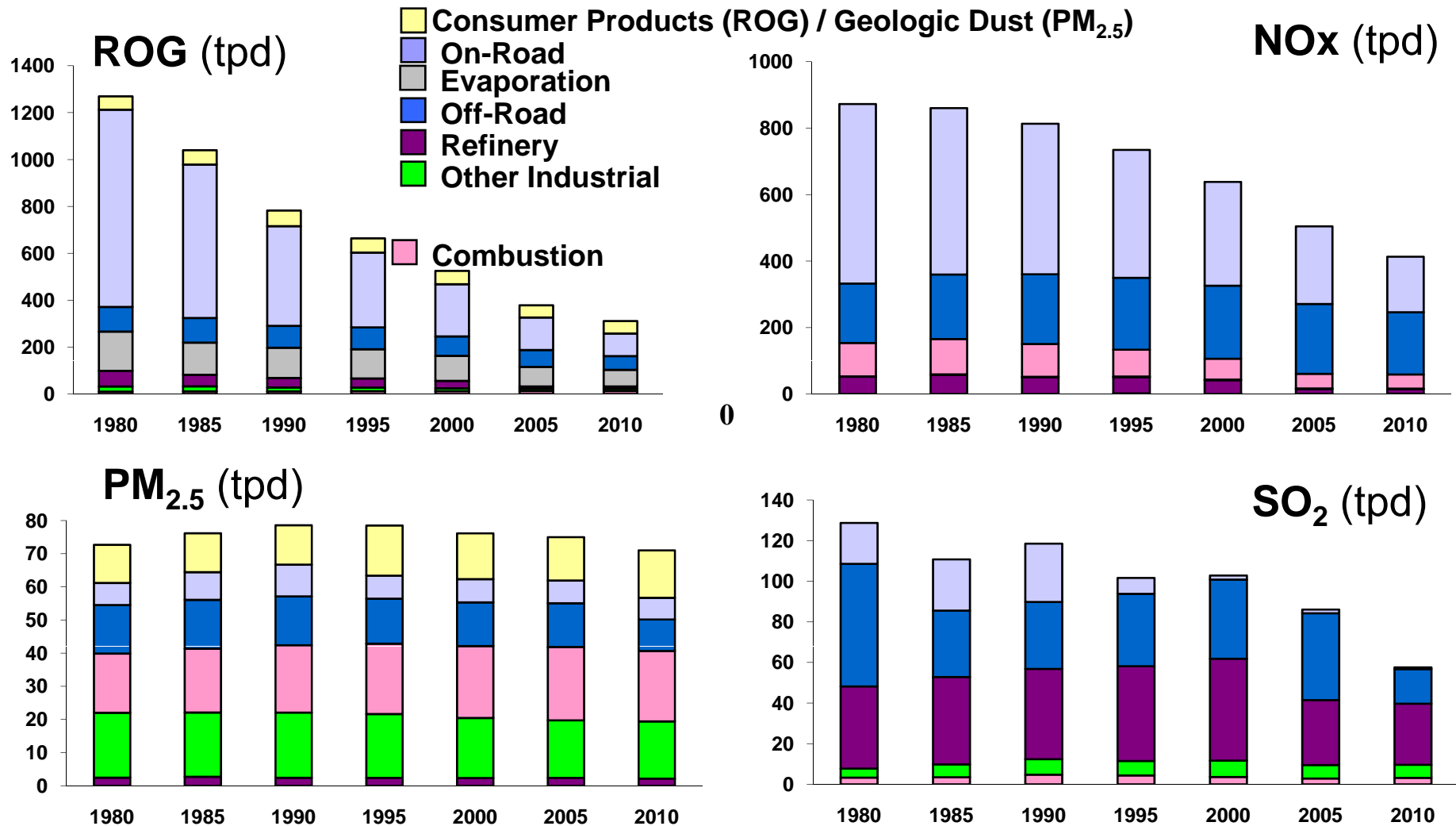
How It Use to Be



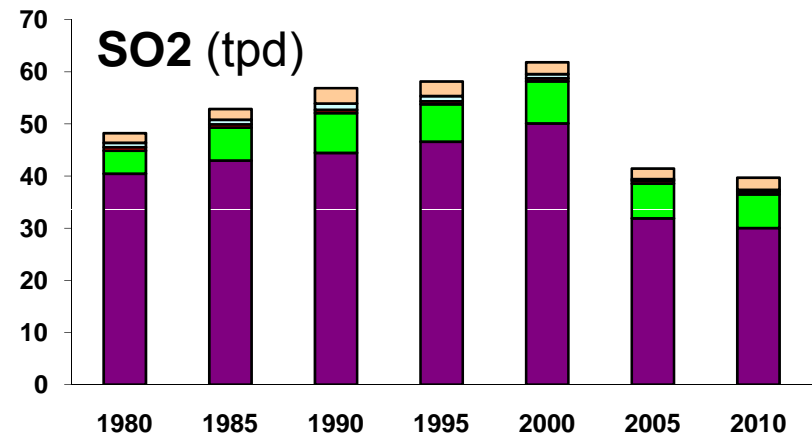
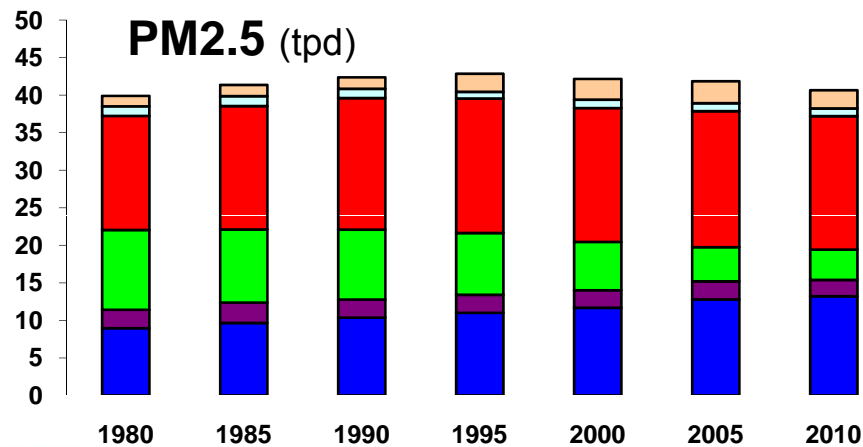
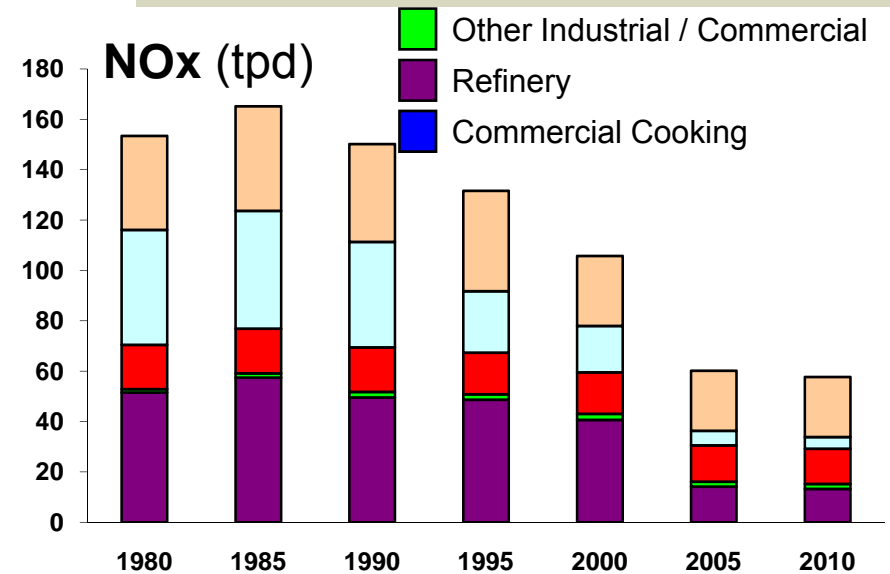
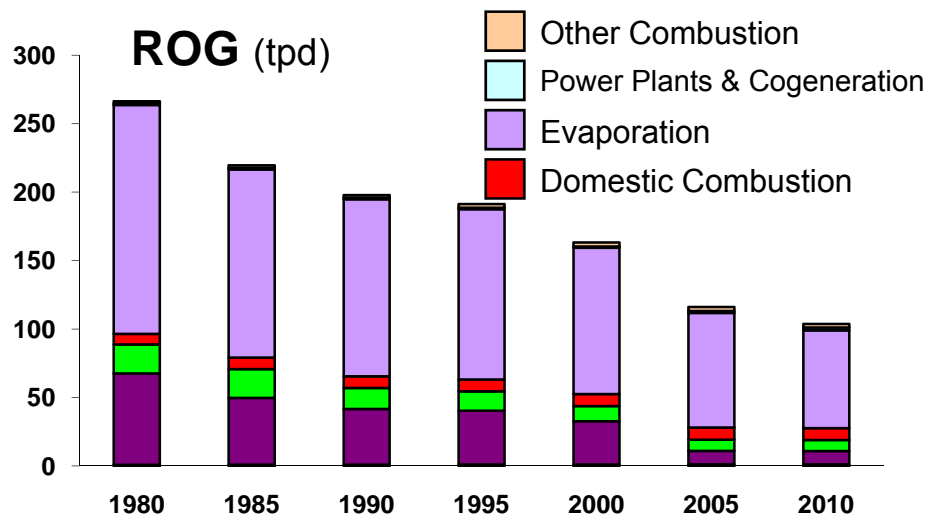
How it is Today



All Sources Emission Trends 1980-2010

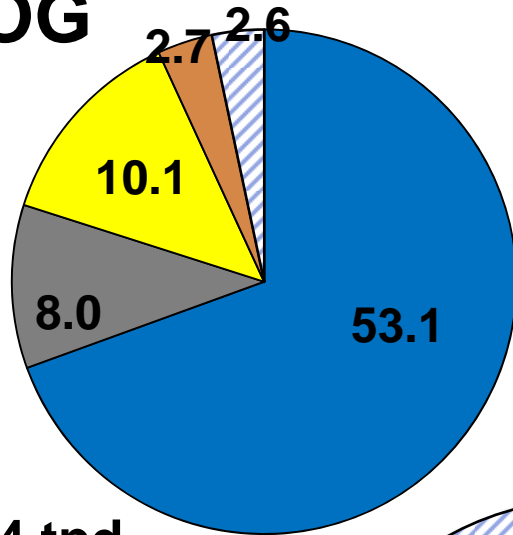


Stationary Source Emission Trends 1980-2010



Emission Reductions from Adopted BAAQMD Regs & Grants 1992-2012

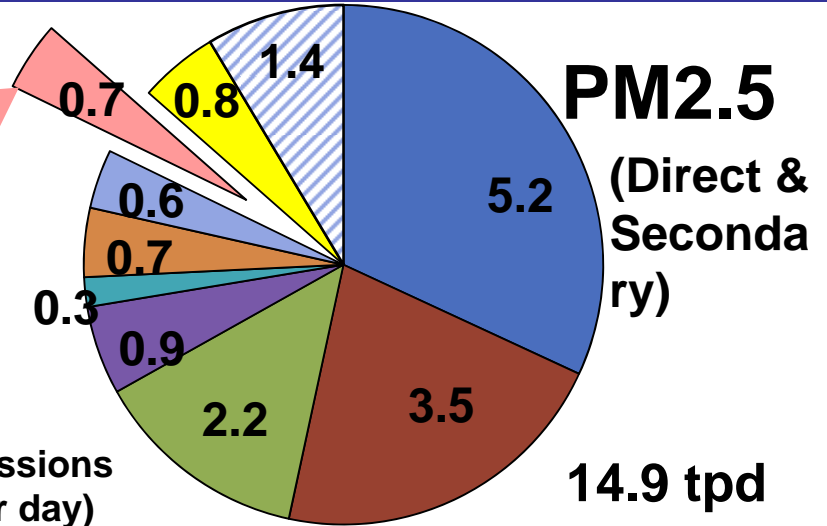
ROG



78.4 tpd

Winter Peak: 6 tpd

Annual Average Emissions Reductions (tons per day)

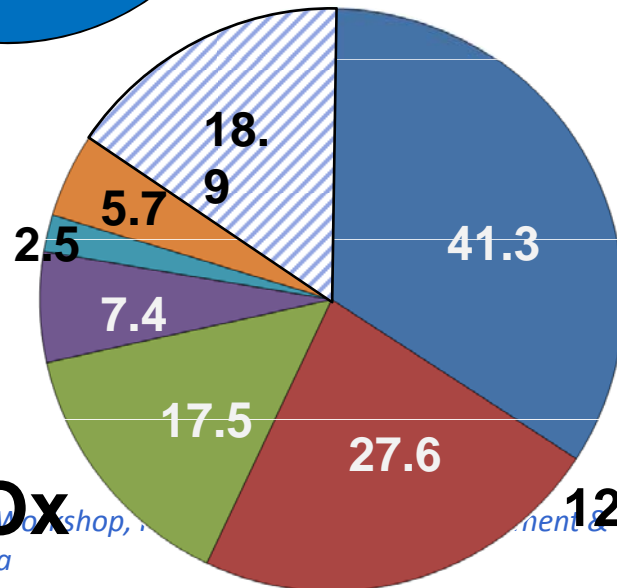


PM2.5

(Direct & Secondary)

14.9 tpd

NOx

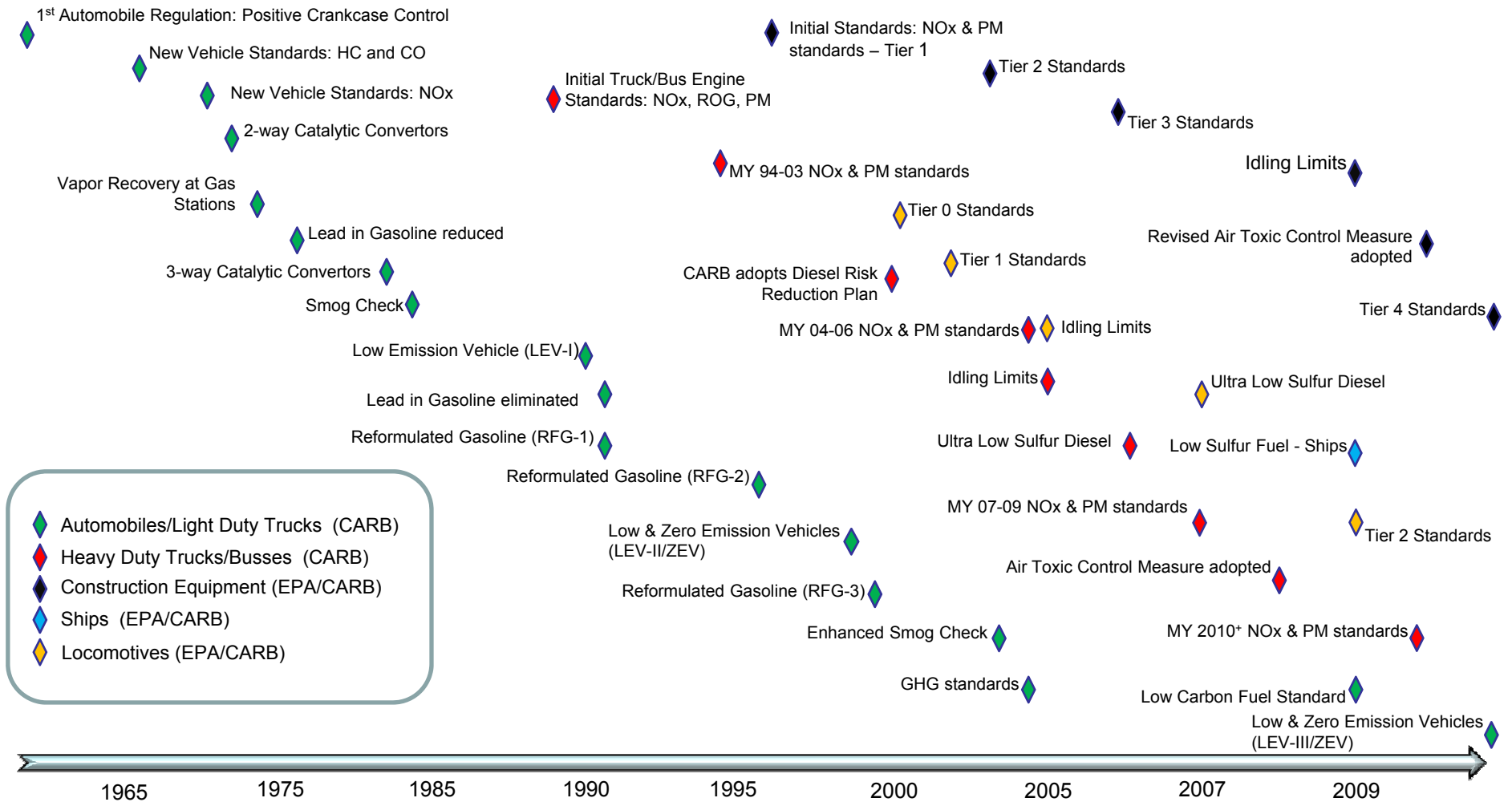


121 tpd

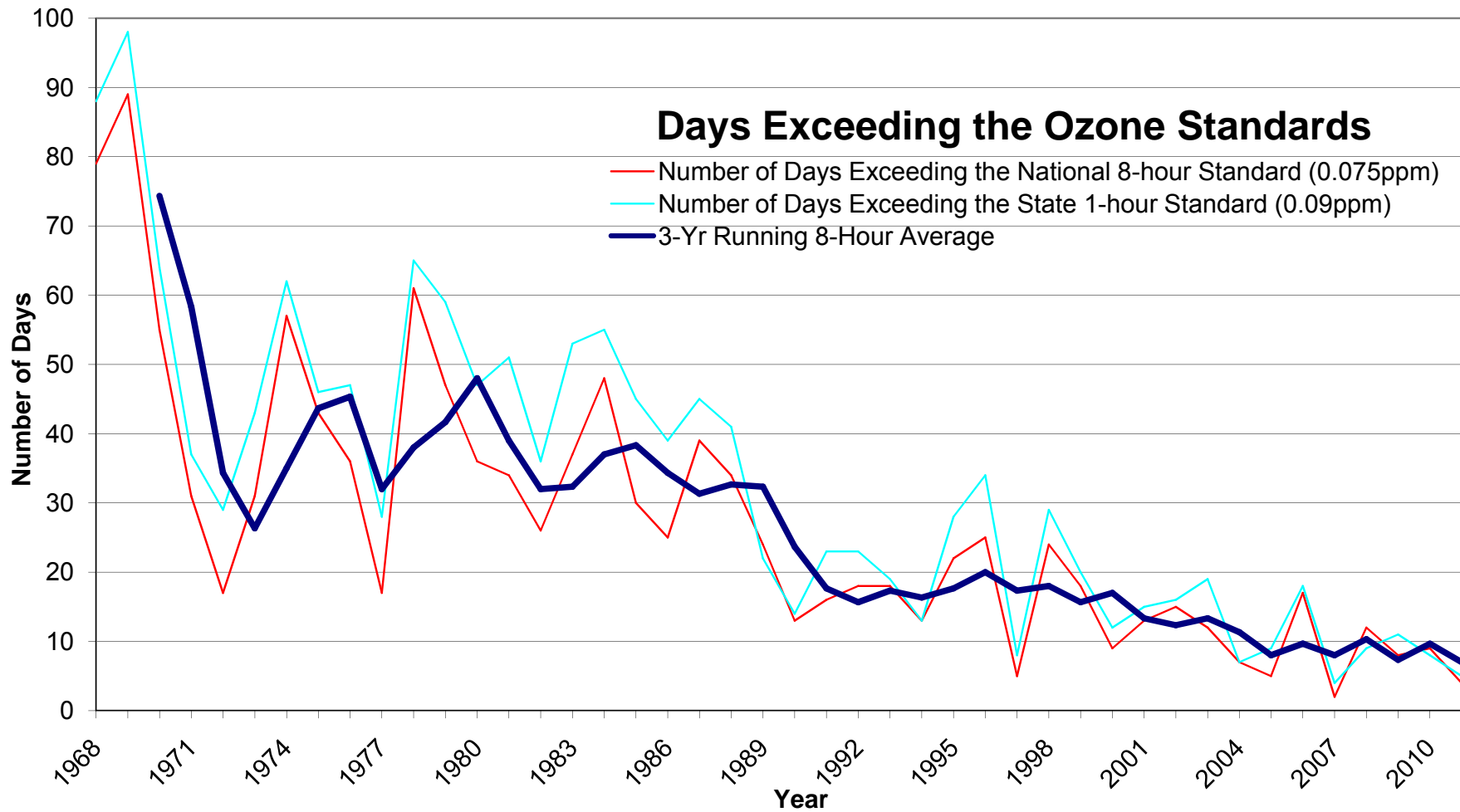
- Boilers, Steam Generators & Heaters
- Stationary IC Engines
- Electric Power Generating Boilers
- Stationary Gas Turbines
- Gas-Fired Gas Turbines
- All Other Combustion Sources
- Charbroilers
- Wood Burning
- Coatings & Solvents
- Fuels
- Refineries & Chemical Plants
- Grants



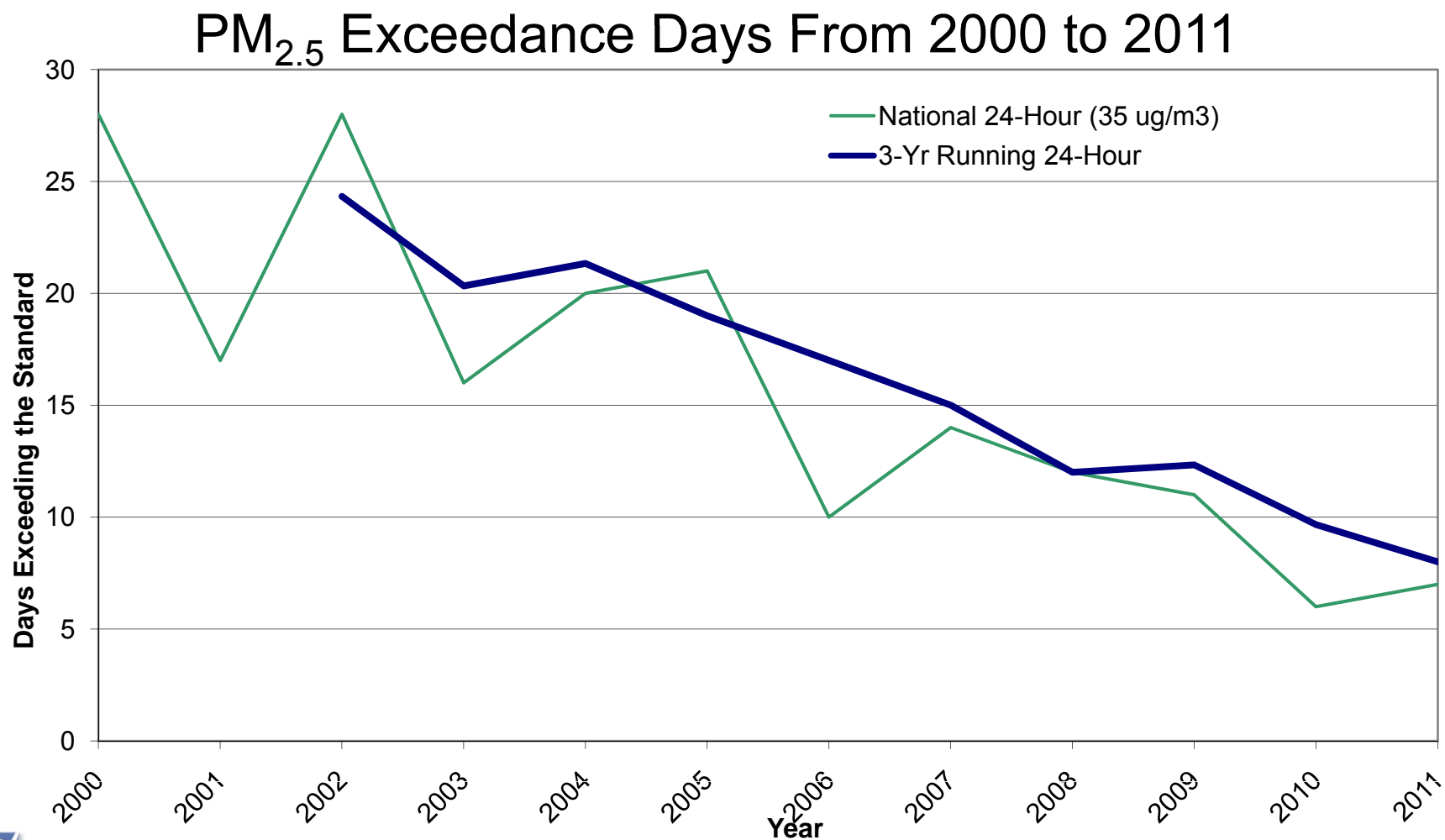
Significant State and National Mobile Source Regulations



Bay Area Ozone Exceedance Trends



PM_{2.5} Exceedance Trends



Bay Area AQMD Regulatory History

- **1960's – Smoke, Nuisance**
 - Open burning, agricultural burning, incinerators
- **1970's, 1980's – Volatile Organic Compounds (Ozone)**
 - Permits; gasoline refining, delivery and marketing; coating and solvent evaporation; printing; liquid storage tanks
- **1990's – Oxides of Nitrogen (Ozone and transport into neighboring air basins)**
 - Power plants, boilers, turbines, water heaters, IC engines
- **2000's to present – Particulate Matter, Exposure, Risk**
 - Toxics permits, refinery flares, foundries, residential wood smoke



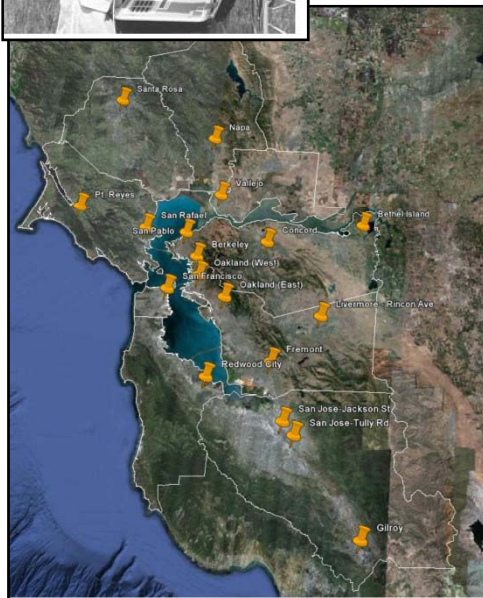
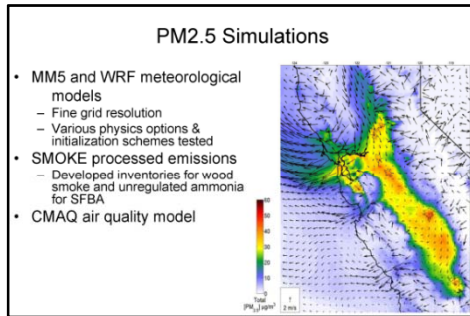
Air Quality Trends Summary

- Significant emissions reductions have been achieved in Bay Area
 - State, national requirements for vehicles and fuels
 - BAAQMD regulations for stationary sources, grants for mobile sources
- Bay Area air quality has improved
 - Ozone, PM, toxics reduced significantly despite population and economic growth
 - Adverse health outcomes and costs have been reduced
- Continuing challenges
 - Largest, most cost-effective regulations have already been implemented
 - PM focus on smaller particles (TSP → PM10 → PM2.5 → ultrafine)
 - State and national Air Quality standards regularly being revised, tightened
 - Local areas with high exposure and health impacts
 - Climate change and greenhouse gases

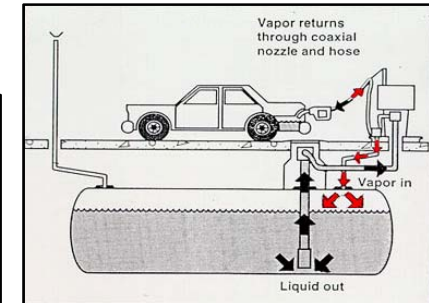


Fundamental Principles

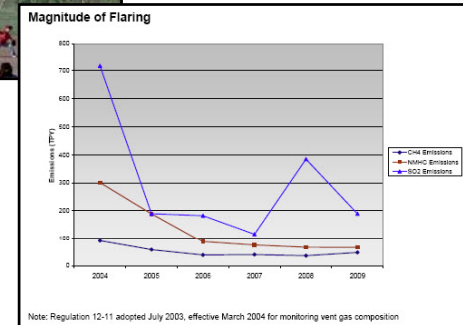
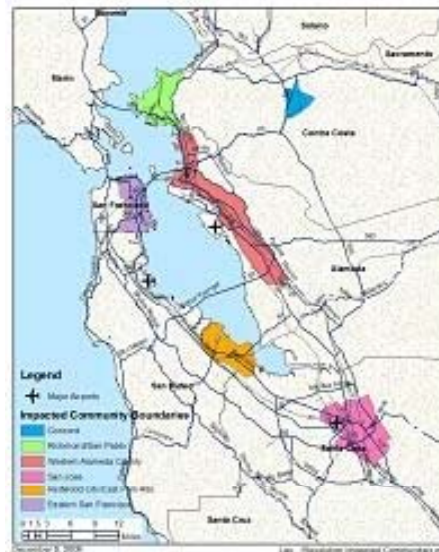
Sound Science



Leadership



Public Health



Collaboration



Bay Area 2010 Clean Air Plan

- **Integrated plan and control strategies to reduce:**
 - ground-level ozone (VOC & NO_x)
 - particulate matter (PM_{2.5})
 - key air toxics (diesel PM)
 - key greenhouse gases: “Kyoto 6” GHGs
- **Key goals of plan:**
 - protect public health: at regional scale and in local areas most impacted by pollution
 - protect climate
- **Quantifying health and economic benefits of Air Quality programs**
 - Multi-pollutant evaluation method (MPEM)



Clean Air Plan Control Strategy

Stationary Source Measures	Transportation Control Measures	Mobile Source Measures	Land Use & Local Impact Measures	Energy & Climate Measures
SSM 1: Metal-Melting Facilities	TCM A – Improve Transit Services A-1: Improve Local & Area-wide Bus Service A-2: Improve Local & Regional Rail Service	MSM A-1: Promote Clean, Fuel Efficient Vehicles	LUM 1: Goods Movement	ECM 1: Energy Efficiency
SSM 2: Digital Printing	TCM B – Improve System Efficiency B-1: Freeway & Arterial Operations Strategies B-2: Transit Efficiency & Use Strategies B-3: Bay Area Express Lane Network B-4: Goods Movement Improvements & Emission Reduction Strategies	MSM A-2: Zero Emission Vehicles & Plug-in Hybrids	LUM 2: Indirect Source Review Rule	ECM 2: Renewable Energy
SSM 3: Livestock Waste	TCM C – Encourage Sustainable Travel Behavior C-1: Voluntary Employer-Based Trip Reduction Program C-2: Safe Routes to School & Safe Routes to Transit C-3: Rideshare Services & Incentives C-4: Conduct Public Outreach & Education C-5: Smart Driving	MSM A-3: Green Fleets	LUM 3: Updated CEQA Guidelines & Enhanced Review	ECM 3: Urban Heat Island Mitigation
SSM 4: Natural Gas Processing & Distribution	TCM D – Support Focused Growth D-1: Bicycle Access & Facilities Improvement D-2: Pedestrian Access & Facilities Improvements D-3: Local Land Use Strategies	MSM A-4: Replacement or Repair of High-Emitting Vehicles	LUM 4: Land Use Guidance	ECM 4: Shade Tree Planting
SSM 5: Vacuum Trucks	TCM E – Implement Pricing Strategies E-1: Value Pricing Strategies E-2: Promote Parking Pricing to Reduce Motor Vehicle Travel E-3: Implement Transportation Pricing Reform	MSM B-1: Fleet Modernization for Medium- & Heavy-Duty Trucks	LUM 5: Reduce health Risk in Impacted Communities	
SSM 6: General Particulate Matter Weight Rate Limitation		MSM B-2: Low NOx Retrofits in Heavy-Duty Trucks	LUM 6: Enhanced Air Quality Monitoring	
SSM 7: Open Burning		MSM B-3: Efficient Drive Trains		
SSM 8: Coke Calcining		MSM C-1: Construction & Farming Equipment		
SSM 9: Cement Kilns		MSM C-2: Lawn & Garden Equipment		
SSM 10: Refinery Boilers & Heaters		MSM C-3: Recreational Vessels		
SSM 11: Residential Fan Type Furnaces				
SSM 12: Space Heating				
SSM 13: Dryers, Ovens, Kilns				
SSM 14: Glass Furnaces				
SSM 15: GHG in Permitting	SSM 17: New Source Review for Toxic Air Contaminants			
SSM 16: New Source Review Addressing PM2.5	SSM 18: Revise Air Toxics "Hot Spots" Program			



Multi-Pollutant Evaluation Method

MPEM based upon:

- BAAQMD emissions inventory & AQ modeling
- Health effects studies: EPA, CARB, etc.
- Existing studies: \$ value of health & climate
- US EPA BenMAP model

Used MPEM to help analyze control measures:

- Estimate benefits across all pollutants
- Evaluate co-benefits or trade-offs
- Analyze impacts on key health outcomes
- Express health & climate protection benefits of the plan in \$\$ terms



Key Steps in Multi-Pollutant Evaluation Method

Ozone, PM, Toxics

1) Δ Emissions



2) Δ Concentrations



3) Δ Population Exposure



4) Δ Health Effects



5) \$ Health Benefits

GHGs

(Kyoto 6 – CO₂-e)

Δ Emissions



\$ Social Benefits

(\$28/ton of CO₂-e)

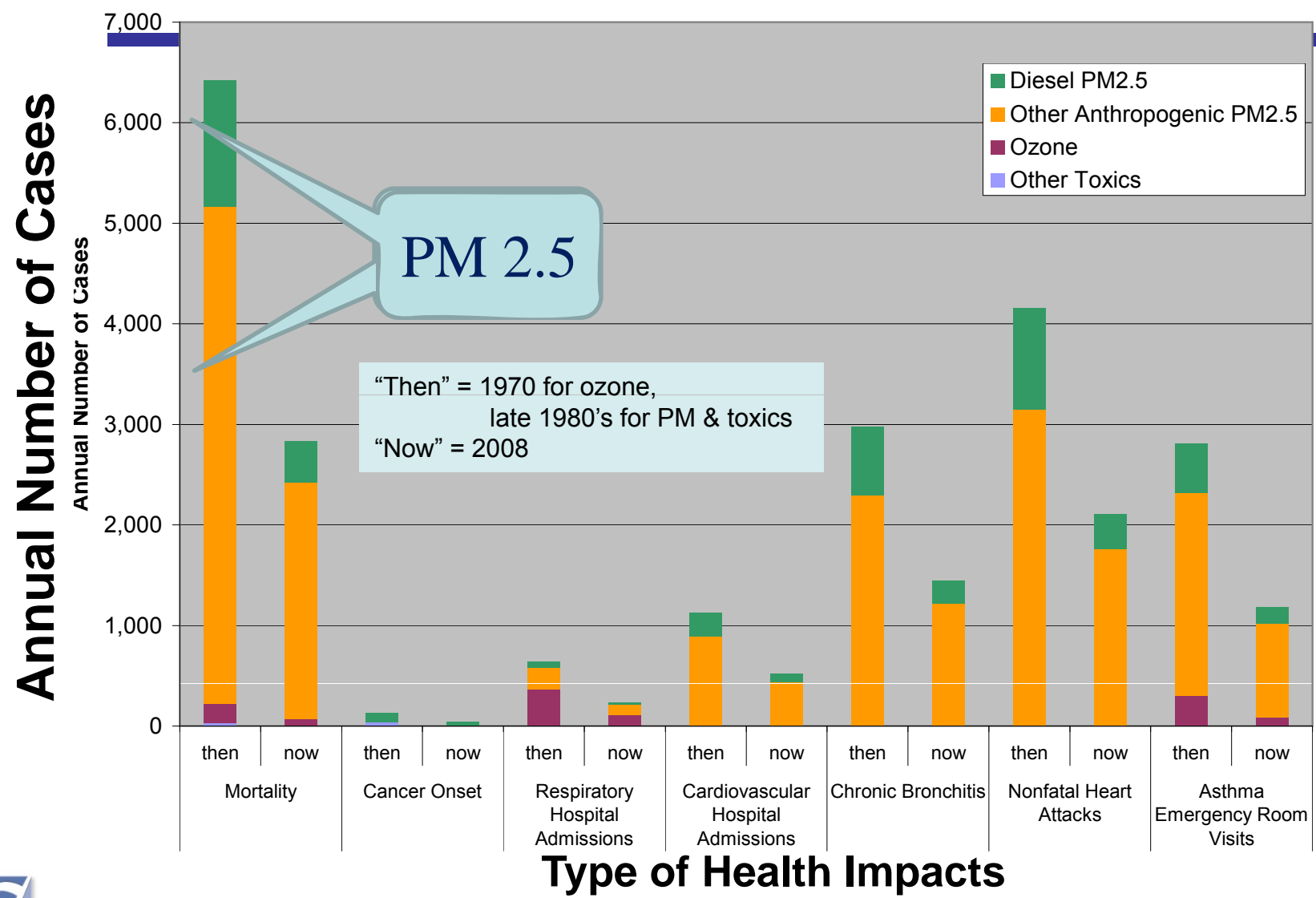


Health Impact Analysis

- Health impacts from air pollution in Bay Area have been greatly reduced over past 30-40 years
- Improved AQ helped to increase life expectancy:
 - Added ~6 months to average Bay Area lifespan since 1990
- Improved AQ provides health & economic benefits worth multiple \$ billions each year:
 - reduced deaths
 - reduced sickness & health care costs
 - improved productivity
- Air pollution still has negative health impacts
- PM2.5 is the most hazardous pollutant

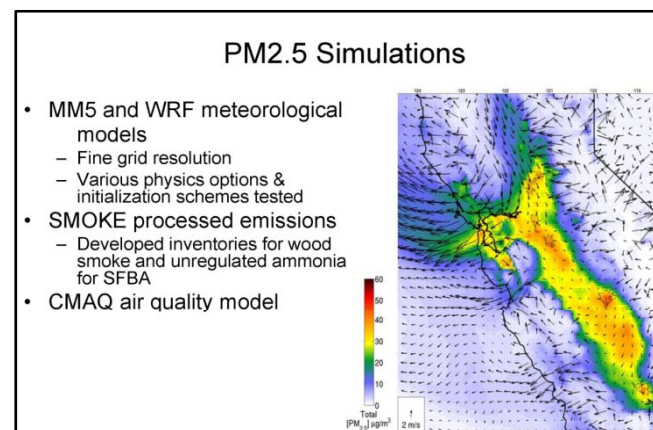
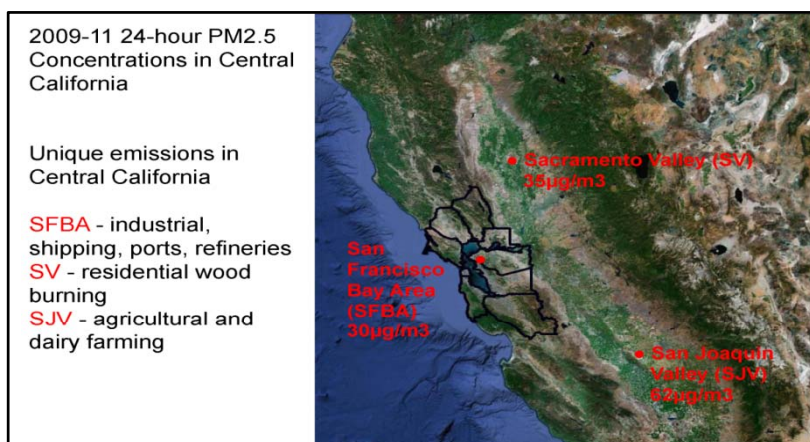


Health Burden: Past and Present



Collaboration is Essential

- National – cooperate with federal agencies and other states
- Within California – cooperate with state agencies and different air quality control districts in California
 - Example: joint PM 2.5 research with Sacramento and San Joaquin Valleys



- With the Bay Area region
 - Other regional agencies – transportation, land use
 - Cities and counties
 - Business and community groups



Conclusions

- Significant health benefits, especially reducing PM2.5
- Benefits of improved air quality outweigh the costs (very important to consider both)
- As regional air quality improves, greater focus on local pollution exposure and health effects
- Collaboration takes time, but is necessary
- Remember fundamental principles:
 - Public health
 - Sound science
 - Leadership
 - **Collaboration**



Additional Information

Henry Hilken: hhilken@BAAQMD.gov

Bay Area 2010 Clean Air Plan

www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx

Multi-Pollutant Evaluation Method

www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans/Resources-and-Technical-Docs.aspx

