

BAY AREA AIR QUALITY MANAGEMENT DISTRICT



David Burch, Principal Planner,  
Bay Area Air Quality Management District  
Urban Heat Island Conference

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# Presentation Overview

- Profile of Bay Area AQMD
- Multi-pollutant planning
- Control Strategy for Bay Area 2009 Clean Air Plan (CAP)
- Role of UHI Mitigation in CAP
- UHI data to help frame policy





# Bay Area AQMD Profile

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- Regional agency responsible for AQ in Bay Area  
(we're not the California Air Resources Board)
- Governing board made up of elected officials from all 9 counties
- 100+ cities with > 7 million population
- Regulate emissions from stationary sources
- Develop air quality plans to attain state & federal standards



# BAAQMD Mission

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Two fundamental goals:

- Protect Air Quality
- Protect Climate

These goals are closely related

Higher temperatures will exacerbate AQ problems:

- more potent ozone formation
- higher evaporative emissions of VOCs
- increased emissions from power plants



# BAAQMD Climate Protection Program

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- Board adopted climate policy in 2005
- Incorporated climate protection into BAAQMD mission statement
- First air district to compile regional GHG emissions inventory
- Adopted GHG fee on stationary sources
- Climate grant program to support local efforts
- Complement ARB's climate scoping plan



# Benefits of Clean Air

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Good air quality provides a range of benefits:

- Ecosystem protection
- Agricultural production
- Economic benefits: tourism, property values
- Quality of life
- **Protect public health**



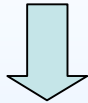
# Air Quality → Health

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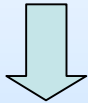
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## 4 key steps

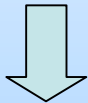
1)  $\Delta$  Emissions of each pollutant



2)  $\Delta$  Ambient Concentrations



3)  $\Delta$  Population Exposure



4)  $\Delta$  Health Effects



# Traditional AQ Planning

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- Develop AQ plan to address a single pollutant
- Focus on reducing emissions & ambient concentrations (Steps 1 & 2 previous slide)
- AQ stds expressed as ambient concentrations
  - easy to measure
- But traditional AQ planning does not consider :





# Innovative Aspects of 2009 CAP

Develop integrated **multi-pollutant** plan to reduce:

- ozone precursors (ROG & NO<sub>x</sub>)
- direct particulate matter (PM) & PM precursors
- key air toxics
- key greenhouse gases (“Kyoto 6”)
- Protect **public health**, both at regional scale & in communities most heavily impacted by pollution



# Multi-Pollutant Planning

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- More holistic approach to AQ planning
- Conceptual groundwork:  
National Research Council (2004) & US  
EPA
- EPA pilot efforts under way in 4 states /  
areas
- Voluntary effort on the part of BAAQMD
- No guidelines available as yet:  
- we're on the cutting edge



# Multi-Pollutant Planning

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MP planning makes sense, but more complex

- Policy challenges:
  - - Where to draw the line?
- Technical challenges:
  - Need inventory data & emission factors
  - AQ modeling for ozone, PM & air toxics
  - How to compare the various pollutants ?



# Multi-Pollutant Evaluation Method (MPEM)

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Used our technical data & tools to develop MPEM to help analyze control measures:

- MPEM based on the 4 steps outlined above
- Evaluate control measures in order to:
  - Optimize co-benefits across pollutants
  - Minimize trade-offs
- Identify control measures that provide greatest overall health & climate protection benefit



# Overview of CAP Control Strategy

57 control measures:

- Stationary sources measures (19)
- Mobile sources measures (10)
- Transportation control measures (18)
- Land use & local impacts measures (6)
- Energy & climate measures (4)



# Energy & Climate Measures

- ECM 1: Energy Efficiency
  - promote green building codes & practices
- ECM 2: Renewable Energy
  - promote solar power & other renewables
- ECM 3: Urban heat islands
  - cool roofing & cool paving
- ECM 4: Tree-Planting
  - promote planting of low VOC emitting trees





# Heat Island Control Measure

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- Promote cool roofing and paving through model ordinances that cities can adopt
- Provide training for local agencies re: cool roofing and paving technologies & benefits
- Use policy levers to encourage cool strategies as GHG offsets in new development projects



# UHI Policy Needs

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UHI makes sense conceptually, but need to **quantify** GHG reductions & other benefits

Data gaps:

- electricity saving per square meter of cool roofs & cool paving installed
- evaporative emission reductions from cool paving
- square meters of rooftops & parking lots in the Bay Area





# Closing Thoughts

- We need fresh thinking & new strategies to address today's AQ & climate challenges
- MPEM integrates our 3 key objectives:
  - addressing multiple air pollutants
  - protecting public health
  - reducing GHGs & protecting climate

**Broad support for the MP planning concept**

**Bay Area 2009 CAP will break new ground**



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***Bay Area 2009 Clean Air Plan website:***  
***<http://www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx>***

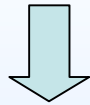
***David Burch:***  
***[DBurch@BAAQMD.gov](mailto:DBurch@BAAQMD.gov)***



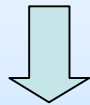
# Stages of MPEM Analysis

## Ozone, PM, Toxics

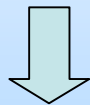
1)  $\Delta$ Emissions



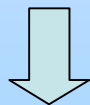
2)  $\Delta$ Concentrations



3)  $\Delta$ Exposure



4)  $\Delta$ Health Effects

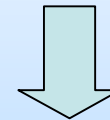


5)  $\Delta$ \$Health  
Benefits

## GHGs

(Kyoto 6 – CO<sub>2</sub>-e)

1)  $\Delta$ Emissions



5)  $\Delta$ \$Social  
Benefits



# Pollutants & Effects considered

Ambient Pollutant	Effect
PM2.5	Range of health effects
Ozone	Range of health effects
Toxics: DPM, benzene, 1,3-butadiene, acetaldehyde, formaldehyde	Cancer
Greenhouse gases (GHGs)	Health, Environment & Economic Effects

Category	Emitted Pollutants		Ambient Pollutants
TOXICS	Benzene	→	Benzene
	1,3-Butadiene	→	1,3-Butadiene
	Formaldehyde	→	Formaldehyde
	Acetaldehyde	→	Acetaldehyde
OZONE	ROG NO <sub>x</sub>	→	Ozone
PM <sub>2.5</sub>	Ammonia NO <sub>x</sub> ROG	→	Ammonium Nitrate
	Ammonia SO <sub>2</sub> Sulfate	→	Ammonium Sulfate
	Carbonaceous PM <sub>2.5</sub>	→	Carbonaceous PM <sub>2.5</sub>



# Economic Valuation: GHGs

- Value of reductions = a dollar value per ton of CO<sub>2</sub> equivalent reduced
- We're concerned about social cost, not market price
- GHG valuation is complicated:
  - Global in scale
  - Wide range of effects & costs (not just health)
  - Effects of today's emissions will be felt far into the future. How to value future benefits in current \$\$?
- We've chosen a value of \$28 per ton of CO<sub>2</sub>-e based on meta-study by Richard Tol (2005/2008)



# MPEM caveats / limitations

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- Does not include all pollutants: only a subset of criteria pollutants, toxics & GHGs

Does not fully capture all health effects:

- only health effects that are well-documented
  - no synergistic interactions among pollutants
  - does not consider downwind benefits (beyond Bay Area)
- Consider other non-air quality benefits
  - MPEM is Bay Area-specific
  - Need to strengthen MPEM technical foundation