Understanding What Is In the Air to Inform Air Quality Management Strategies

My Air Quality: Using Sensors to Know What's in Your Air

Northern California

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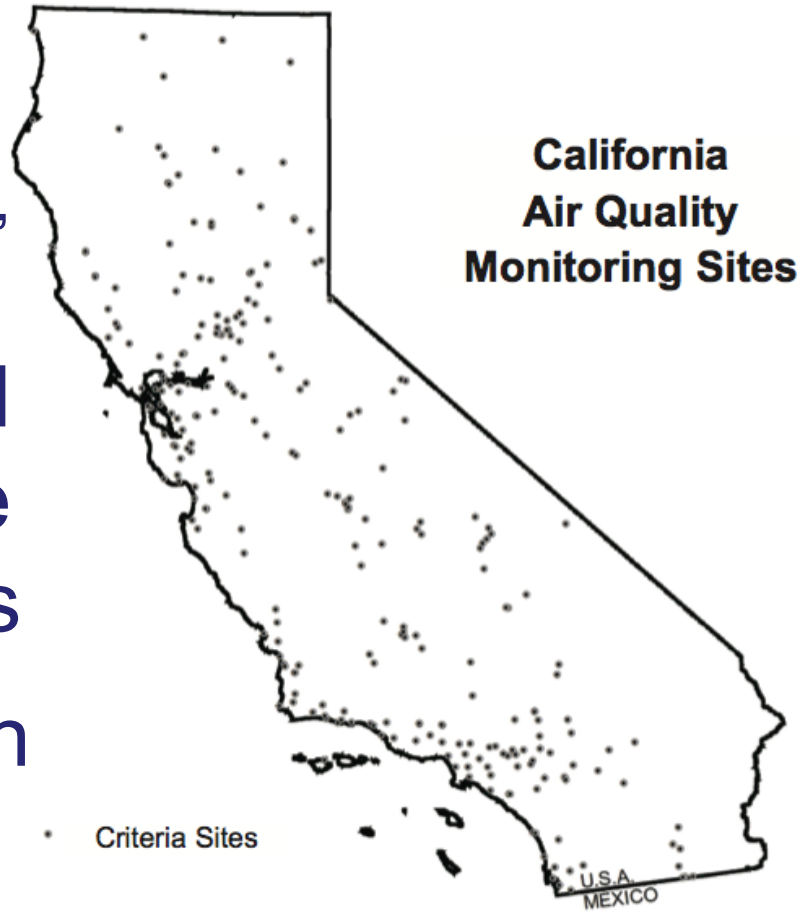
Evolving Air Pollution Management Strategies: Key Points

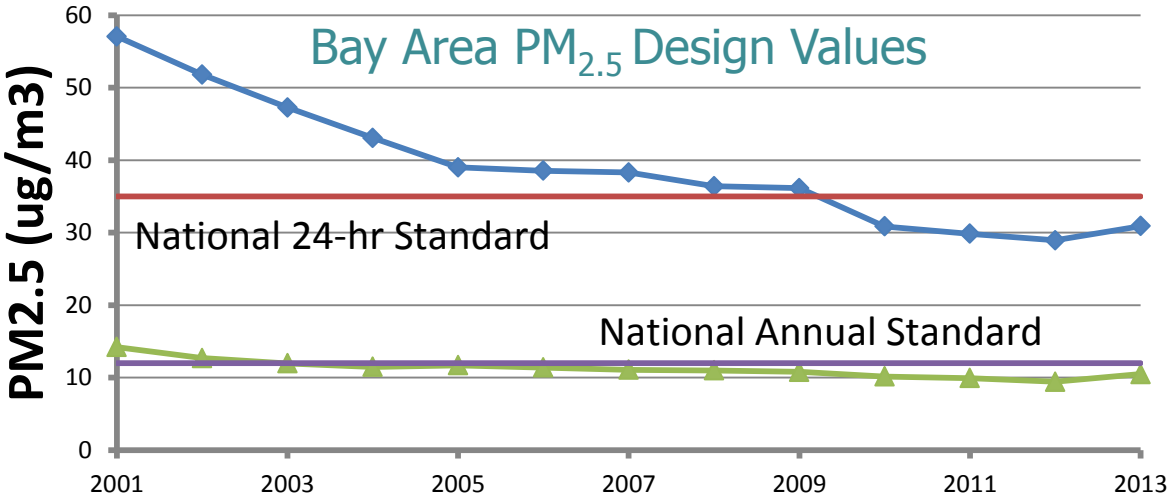
- Established management strategies
  - Reduce *regional air pollutants* to meet standards
  - Control *toxics* with source-specific technologies
- New approaches are also needed to
  - Protect *health*, in all communities
  - Reduce *climate forcing pollutants* to meet targets
- Dense, low-cost measurement networks may help evolve such new approaches

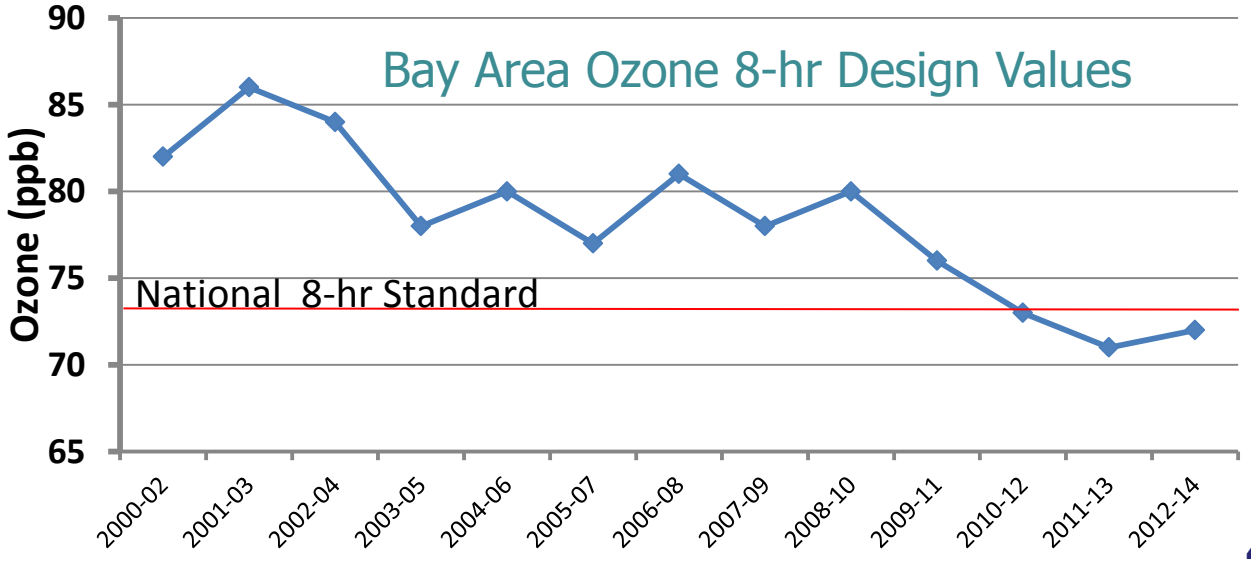
Established Control Strategies: 1 – Criteria Pollutants

- Six compounds:
  - fine particles ($PM_{2.5}$), ozone,
  - nitrogen dioxide, sulfur dioxide,
  - carbon monoxide, lead
- Measurements compared to standards to determine regional attainment status
- Clean Air Plans, based on regional monitoring and modeling



Criteria Pollutants: Below Standards



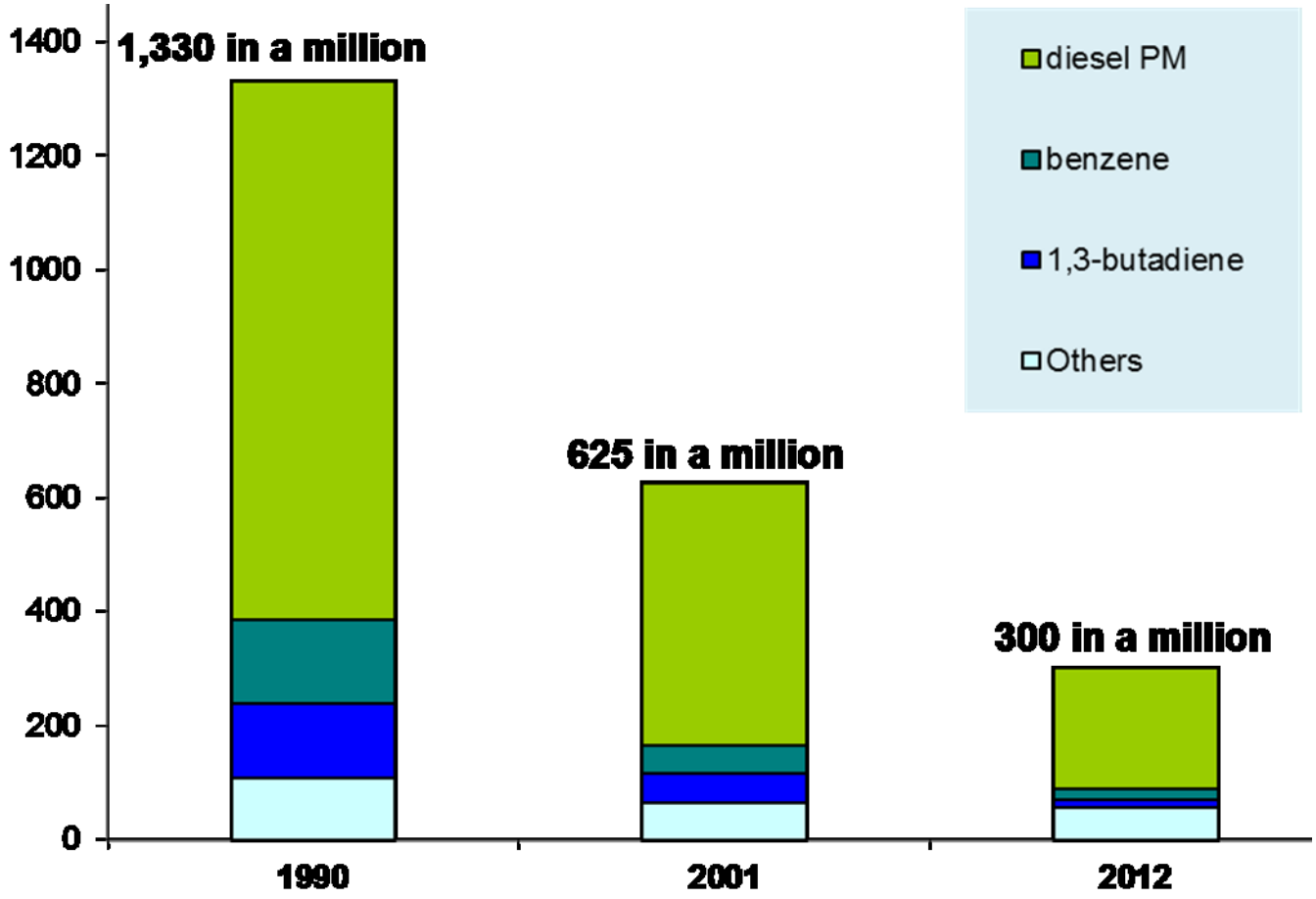


Established Control Strategies: 2 – Toxic Air Contaminants

- Over 200 compounds
- Site- or source-specific health risk assessments are conducted to determine impacts
- Regulated at the source by control technologies, permit conditions, and fuel requirements

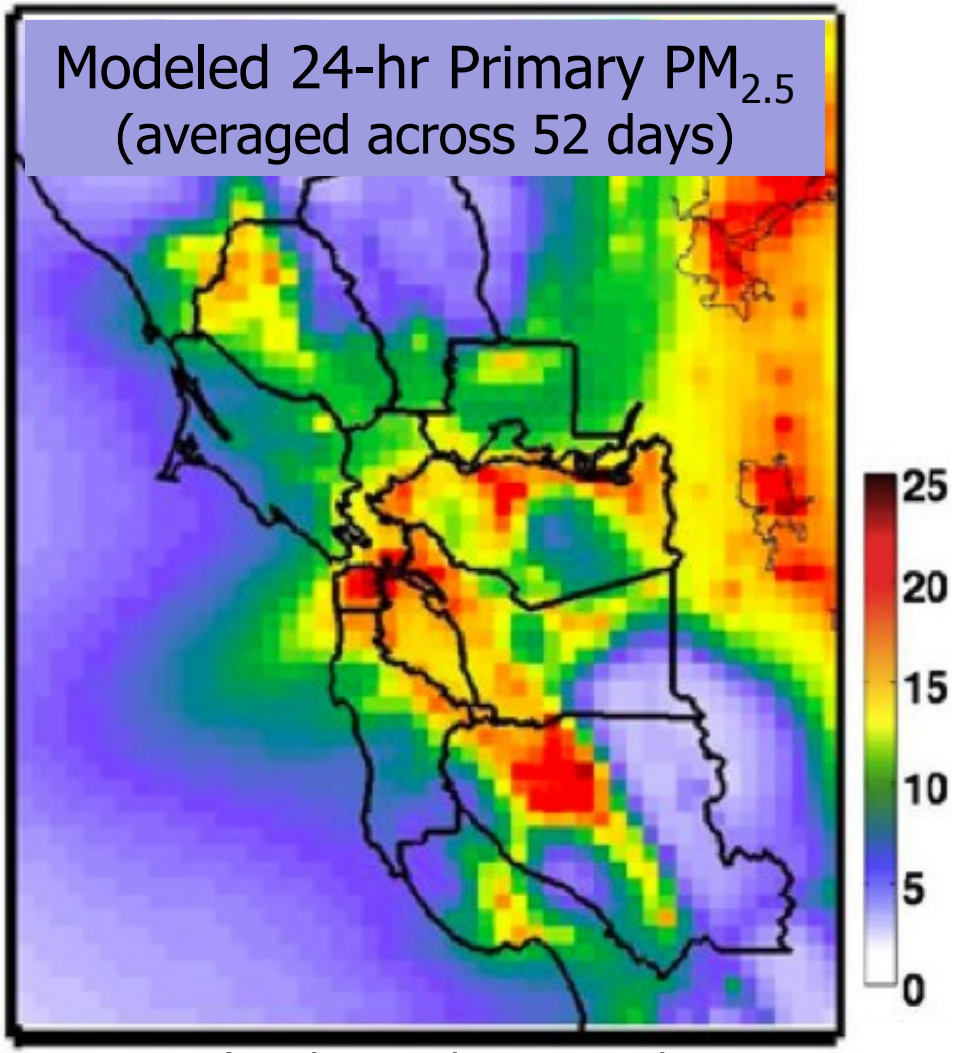
Toxics: Risk Levels Declining

Lifetime cancer risk from air pollutants (Bay Area)



BAAQMD (CARE Retrospect, 2014)

Air Quality Challenges Persist



BAAQMD (*Understanding Particulate Matter,* 2012)

- Episodes when PM and ozone and standards are not met
- Some communities have higher air pollution exposures and health impacts
- Health impacts are especially serious near sources of PM and toxic air contaminants

Highest Exposures and Health Impacts Occur Near Air Pollution Sources

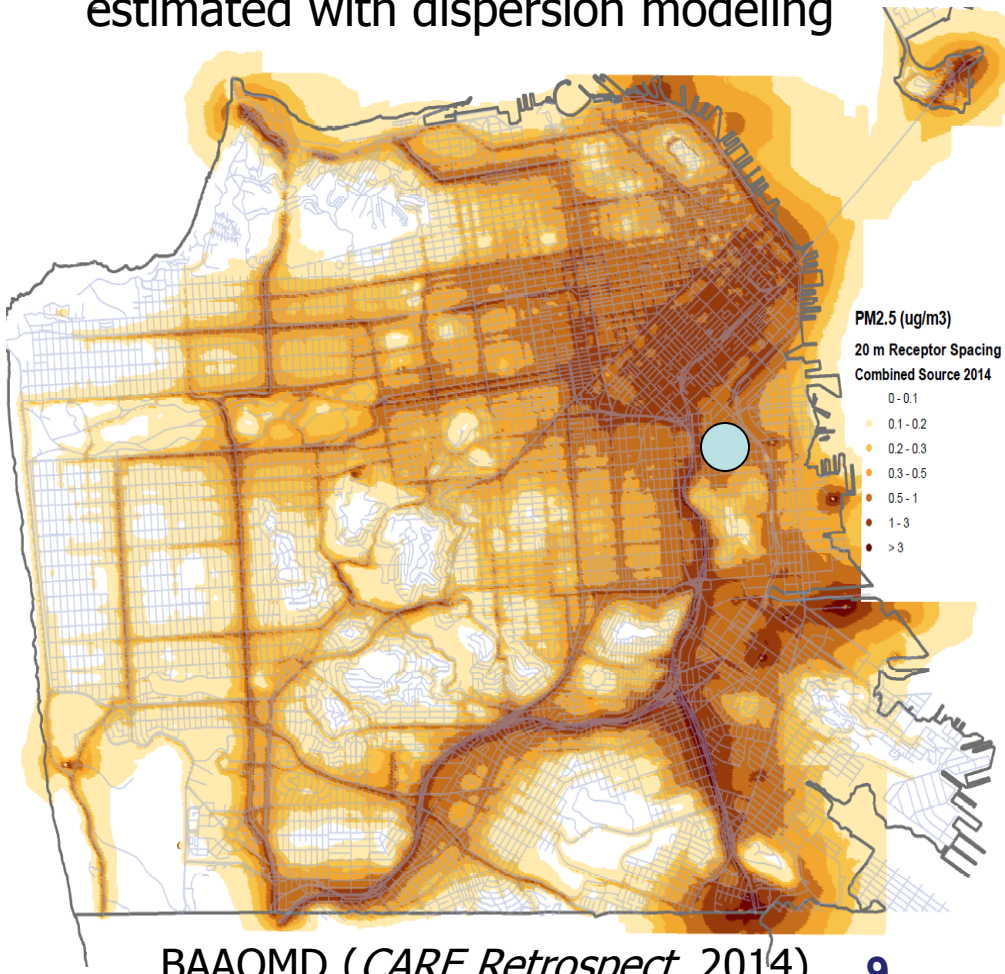
- Large health impacts associated with within-city gradients in $PM_{2.5}$ exposure
- Traffic-related air pollution associated with
  - Increased mortality
  - Asthma onset
  - Low birth weight infants
  - Childhood leukemia

- Ultrafine particles (<0.1 micrometers) linked to heart disease and other adverse health outcomes
- Such findings have prompted US EPA's new requirement for near-road monitoring

To Assess and Mitigate Health Impacts, New Analysis Tools Are Needed

- Estimate air pollution levels at a finer spatial scale to better assess exposures
- Support infill development while minimizing exposures
  - CEQA assessments
  - Technical assistance to local planners
  - Community Risk Reduction Plans

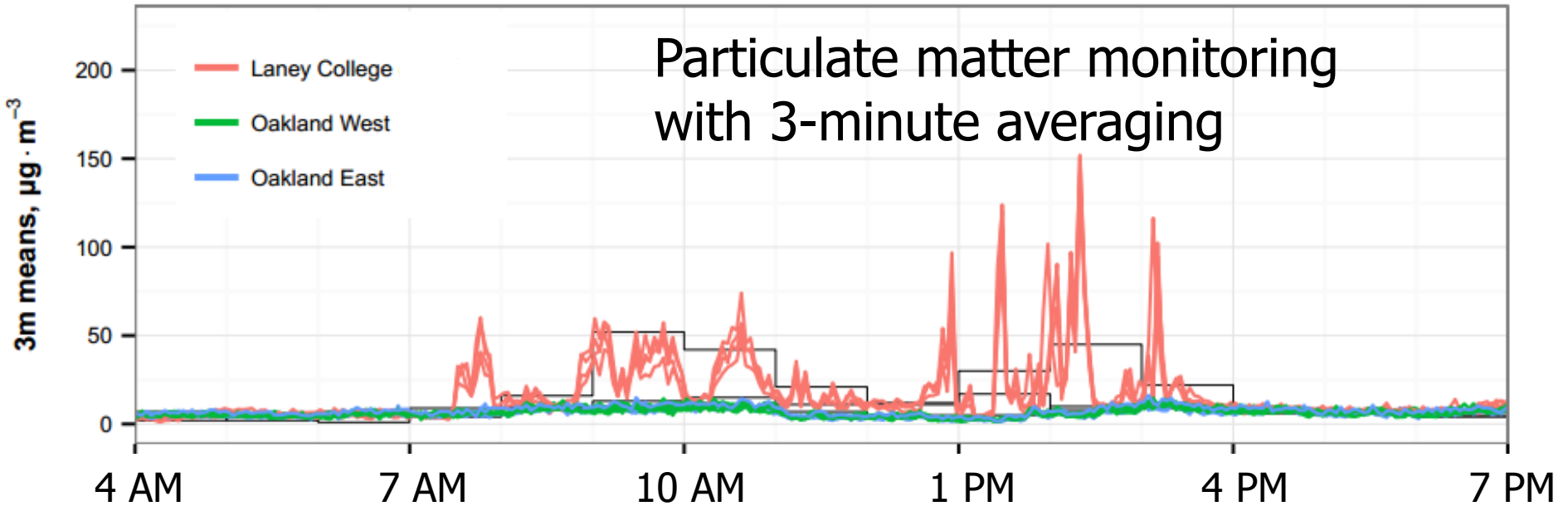
Direct $PM_{2.5}$ (2014) from local sources estimated with dispersion modeling



BAAQMD (*CARE Retrospect.* 2014)

Near-Source Monitoring May Provide New Insights to Exposure Patterns

- Substantial variations in fine particle concentrations are observed at a near-roadway site but not at standard monitoring sites

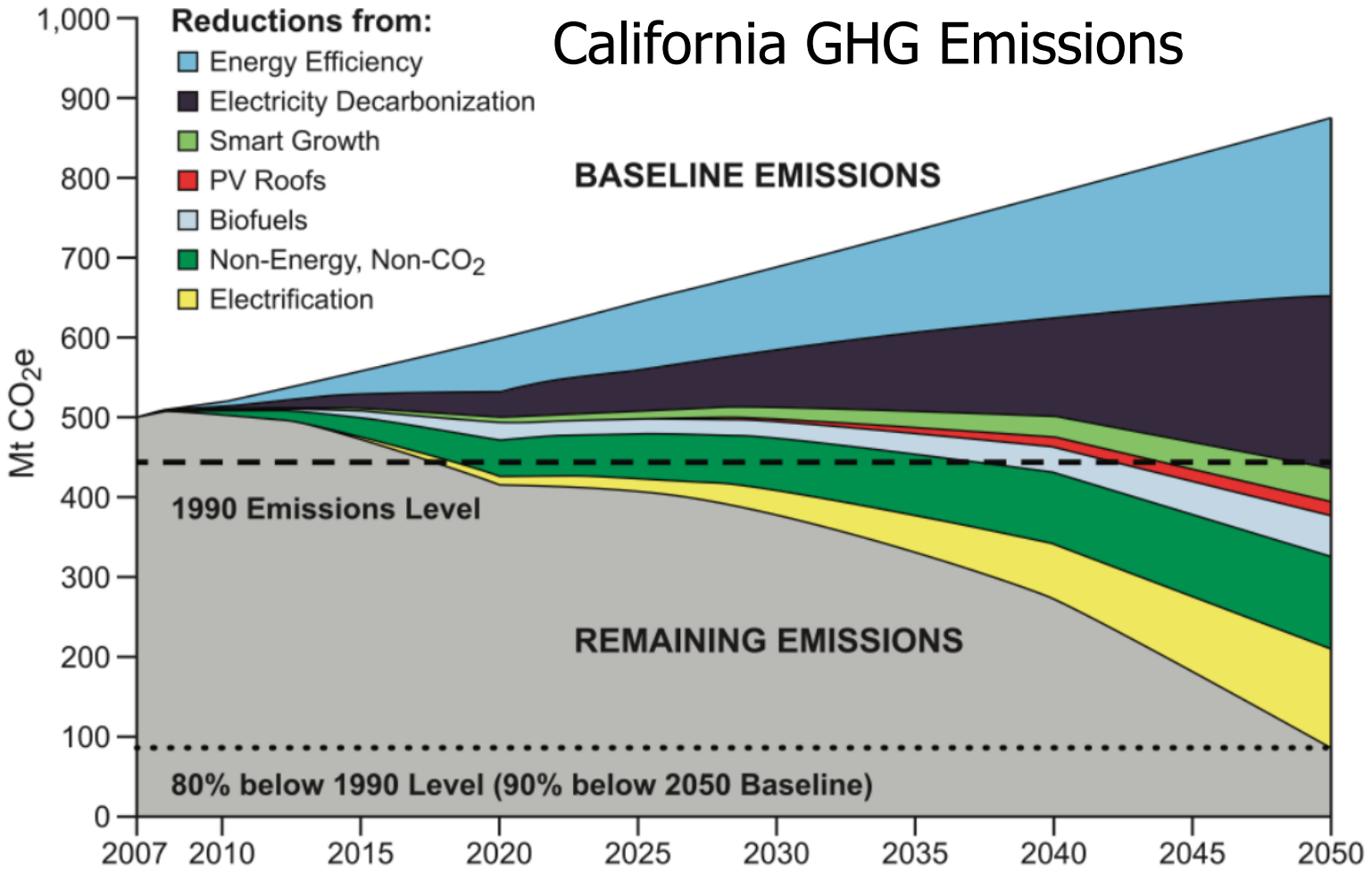


D. Holstius (*Monitoring Particulate Matter with Commodity Hardware,* 2014 PhD Thesis)

Commitments to Address Climate Change

- California has committed to aggressive reductions in greenhouse gases (GHGs)
- Local and regional agencies have adopted plans to support GHG reduction goals
- Measurement-based approaches are needed to evaluate GHG emissions and track reductions within regional and local jurisdictions

Measurement Methods are Needed to Track GHG Emissions Reductions



Williams et al. (*Science* 2012)

New Approaches, New Methods

- Air pollution agencies and their partners are investigating new approaches to manage air pollution that:
  - Complement established management strategies
  - Assess *health impacts*, *for all communities*
  - Address *climate change*
- Dense, low-cost measurement networks are a promising method to advance such new approaches