Regional Air Quality Management in the US and California

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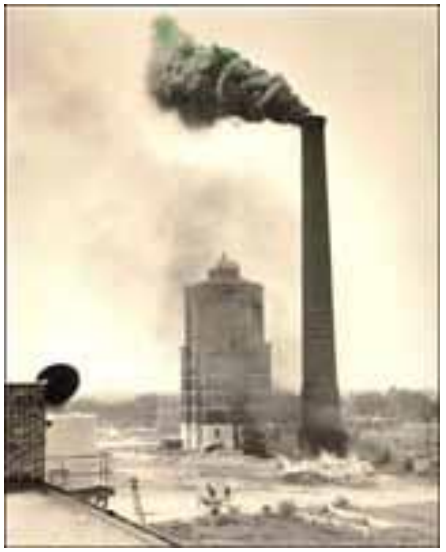
International Air Quality Consultant

Pre-1940's

- Air pollution a "nuisance"
- Local government starts to regulate
  - **Fireplace chimneys**
  - **Backyard trash incinerators**
  - **Smoke stacks**



After World War II

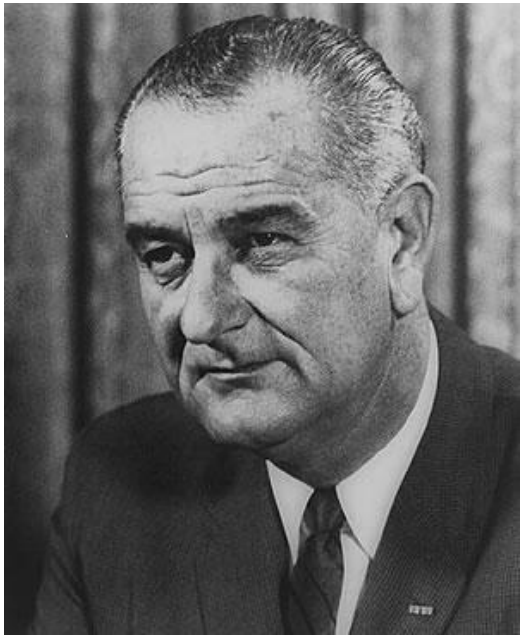
- London smog episode (1952)
- Los Angeles ozone episodes (1954–55)
- New rules adopted for dust, smoke, and fumes

1950's: Ozone Discovered

- NOx and VOC reacts in sunlight = ozone
- Vehicles and fuels biggest source
- Call for mobile source regulations

1960's: Congress Steps In

- First Clean Air Act
- Authority to set national vehicle standards
- Meanwhile, California already regulating cars



President
Lyndon B. Johnson

1970's: The People Rise Up

- 20 million Americans protest
- US EPA created
- Standards and deadlines set for clean air

"All the News That's Fit to Print"

The New York Times

LATE CITY EDITION

VOL. CXIX... No. 40,597 NEW YORK, THURSDAY, APRIL 23, 1970 10 CENTS

PRICES CLIMB 0.4% BUT RATE OF RISE APPEARS TO SLOW

Gain in the Consumer Index for March Lags Behind the 4 Previous Months

INCREASE IS STEEP HERE

Medical Care and Mortgage Interest Are the Major Elements in Changes

By EDWIN L. DALE Jr.

WASHINGTON, April 22—

Millions Join Earth Day Observances Across the Nation

Throngs jamming Fifth Avenue yesterday in response to a call for the regeneration of a polluted environment. View is south from 43d Street, with Central Park in background.

CAMBODIAN CRISIS GROWS AS TROOPS SEEM TO FALTER

With Reds Near, Pnompenh Is Gloomy Over Limited Response to Aid Pleas

CIVIL AVIATION CURBED

Aide Declines to State How Long Army Can Hold Out With the Arms It Has

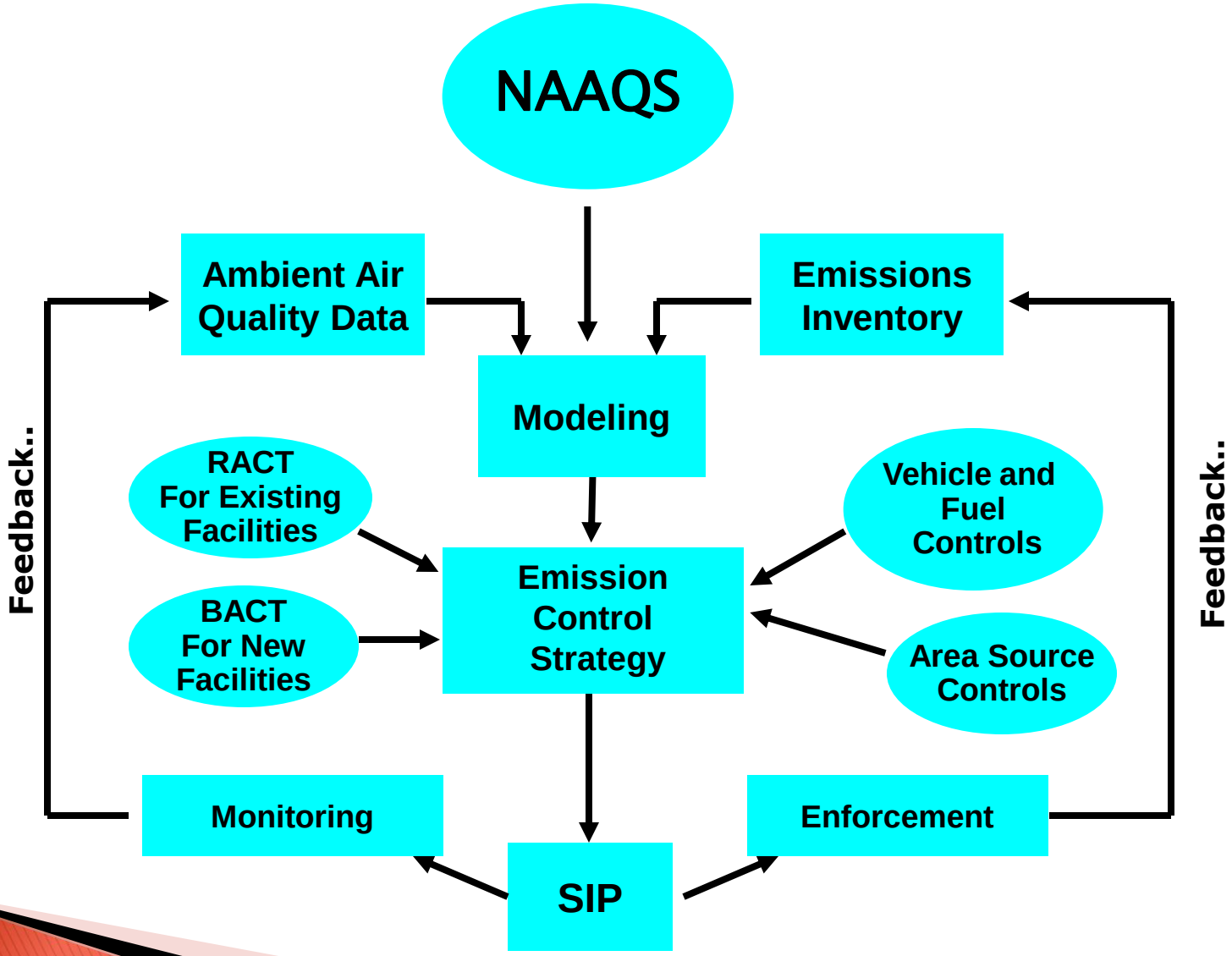
By HENRY KAMM

New Legal Framework

US EPA	50 States	Locals
Adopts NAAQS	Write plans	Write plans
Issues guidelines	Conduct technical analyses	Demonstrate attainment
Controls vehicles, trains, ships, aircraft	Control fuels, paints, consumer products	Control industrial facilities and small area sources
Enforces all laws	Enforces all laws	Enforce all laws

*California also regulates motor vehicles

Air Quality Planning Process

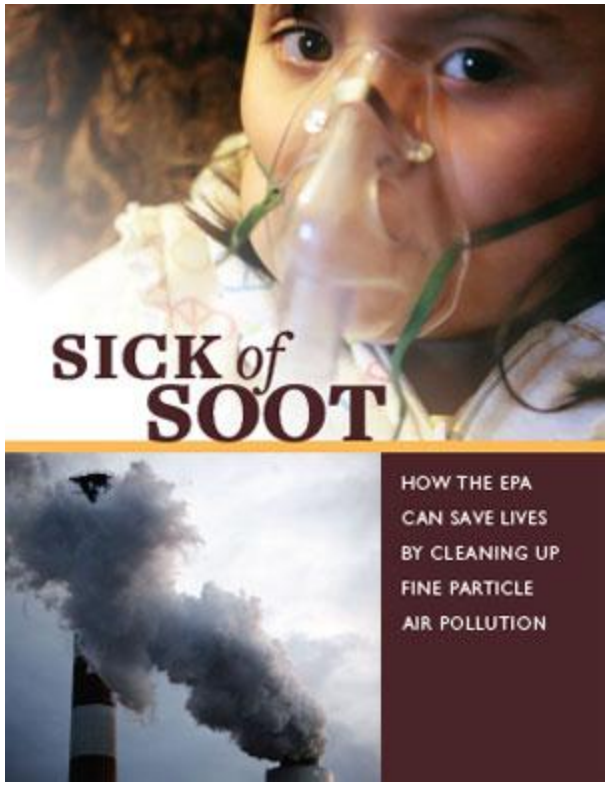


1980's: Air Toxics Regulated

- Goal: reduce cancer risk to less than 1 per million
- Industry required to disclose emissions
- Caused stronger VOC rules and diesel controls

1990's: PM2.5 Threat Identified

- Health researchers discover link between $PM_{2.5}$ and fatal heart attacks
- PM2.5 replaces ozone as highest regulatory priority
- Diesel vehicles targeted for stringent controls



Unfinished Business

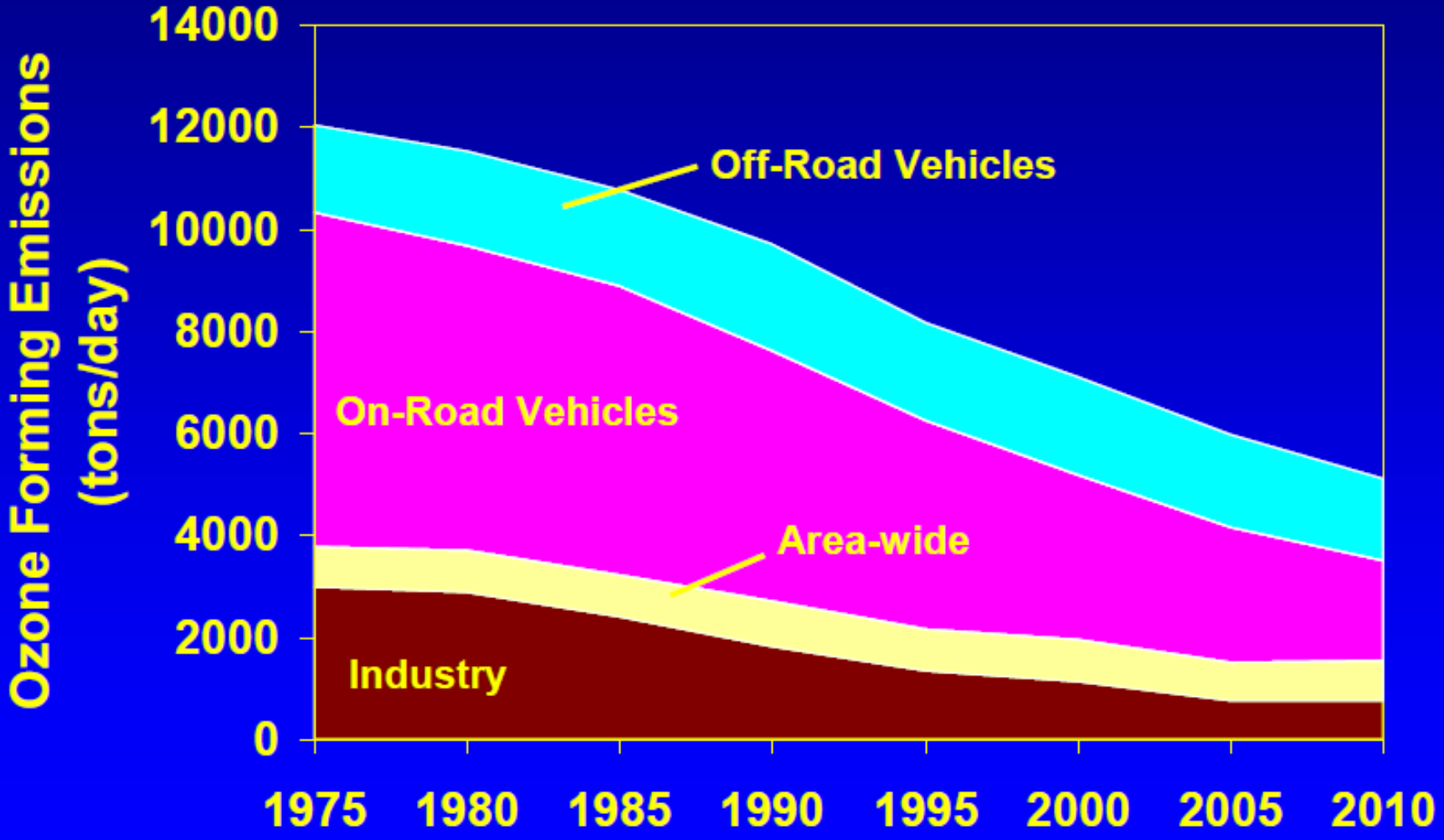
- Aircraft controls
- Marine vessel controls
- Small point sources (boilers)
- “Grandfathered” facilities
- Non-motorized transport
  - Get people back on bikes
  - Make it easier to walk

California Success Story
+
Best Available Control Technology (BACT)

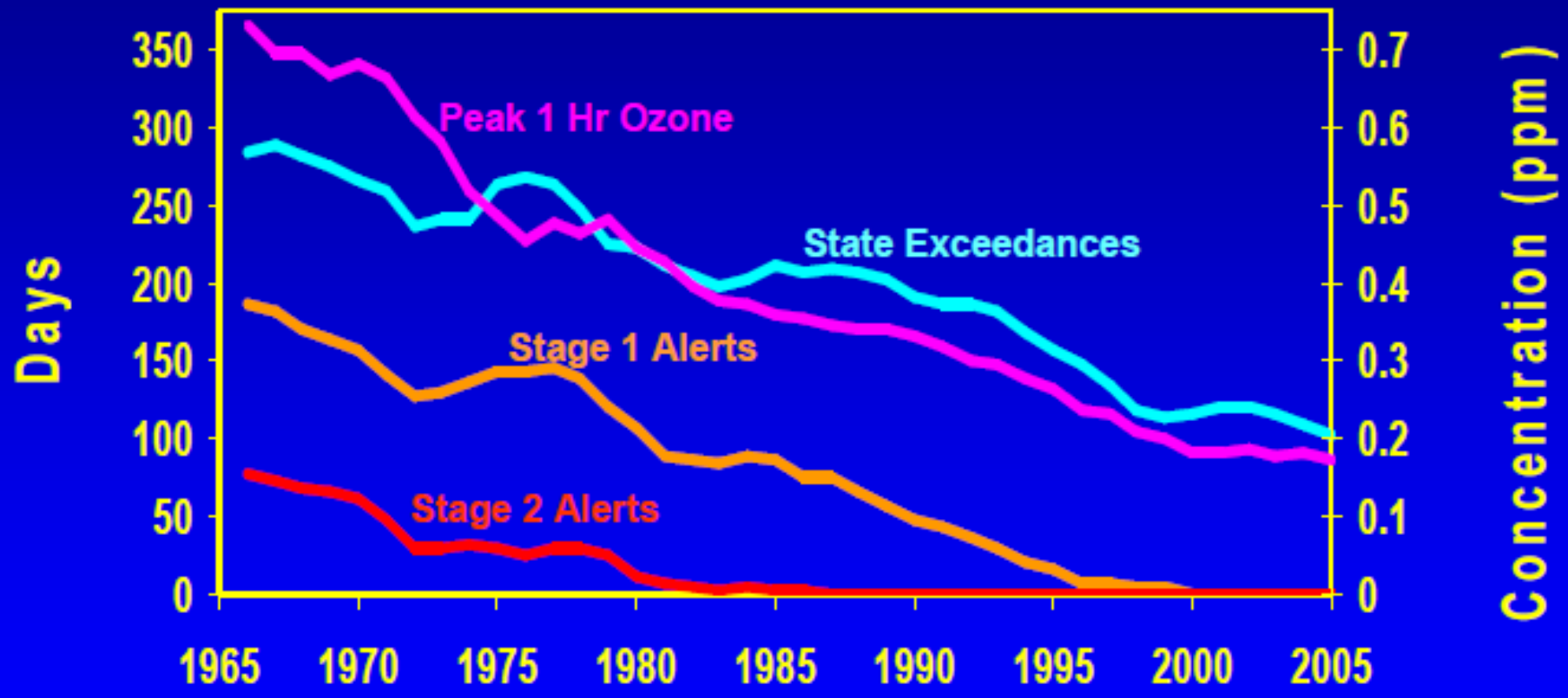
What BACT Achieved

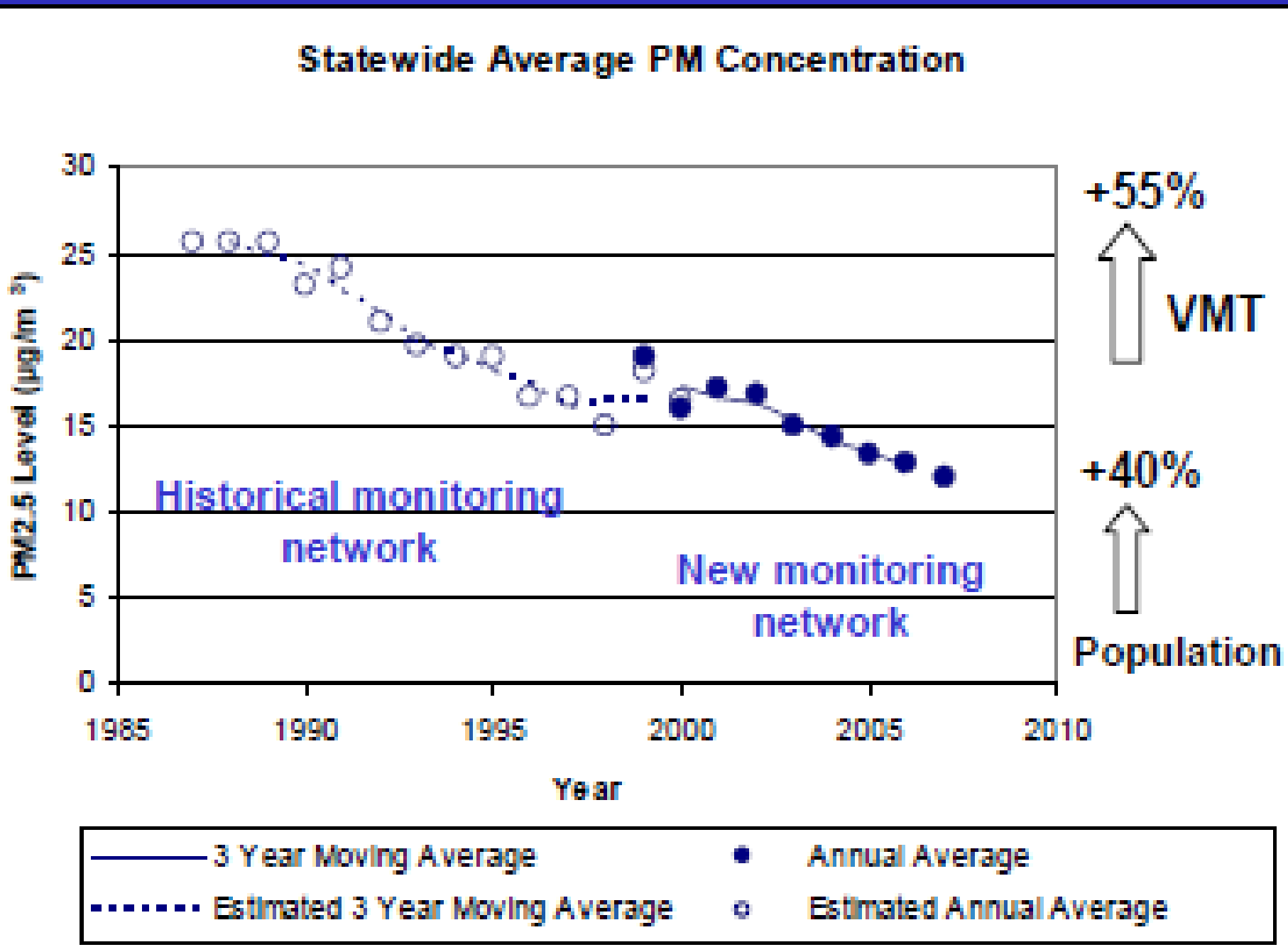
- Gasoline vehicles >99% cleaner
  - Advanced catalysts; on-board diagnostics; durable parts, and low volatility fuel
- Diesel vehicles >98% cleaner
  - Exhaust gas recirculation, particle filters, adsorbers, and low sulfur, low aromatics fuel
- Stationary sources 80-90% cleaner
  - Low-NOx burners, selective catalytic reduction, SOx scrubbers, electrostatic precipitation, switch-over from heavy fuel oil to natural gas
- Area Sources 75% cleaner
  - Vapor recovery, VOC limits for consumer products, chemical reformulation of paints, coatings

Statewide Emissions Trends

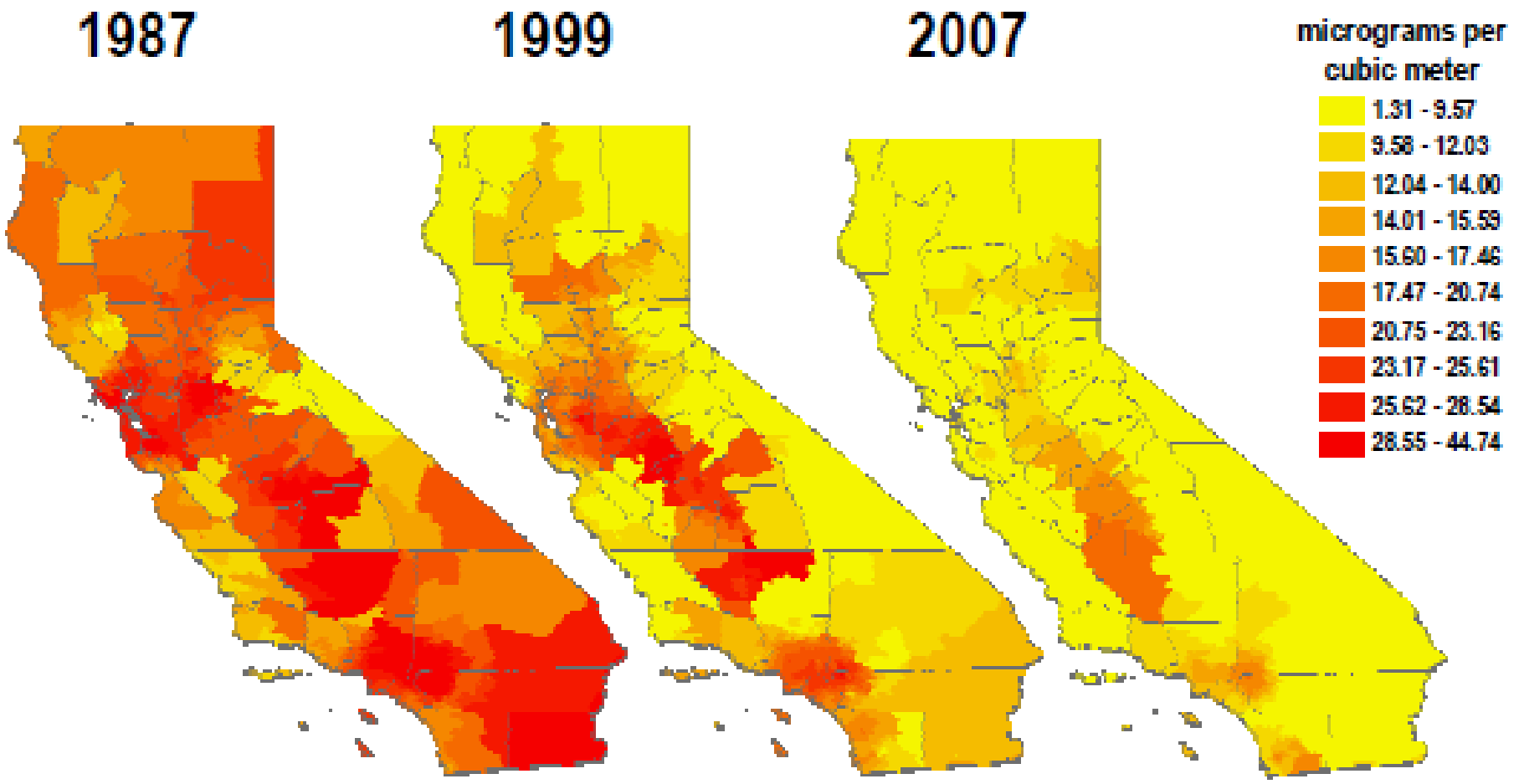


Ozone Trends in the South Coast




Statewide Average PM Concentration
PM2.5 Level (µg/m³)
30
25
20
15
10
5
0
1985
1990
1995
2000
2005
2010
Year
Historical monitoring network
New monitoring network
+55%
VMT
+40%
Population
3 Year Moving Average
Estimated 3 Year Moving Average
Annual Average
Estimated Annual Average

Change in PM2.5 Exposure



Change in Black Carbon

- 50% drop in ambient BC concentrations
  - 0.46 mg/m^3 in 1989
  - 0.24 mg/m^3 in 2008
- 25% drop in climate forcing
  - Regional cooling of 1.4 W/m^2

Huge Visibility Improvement

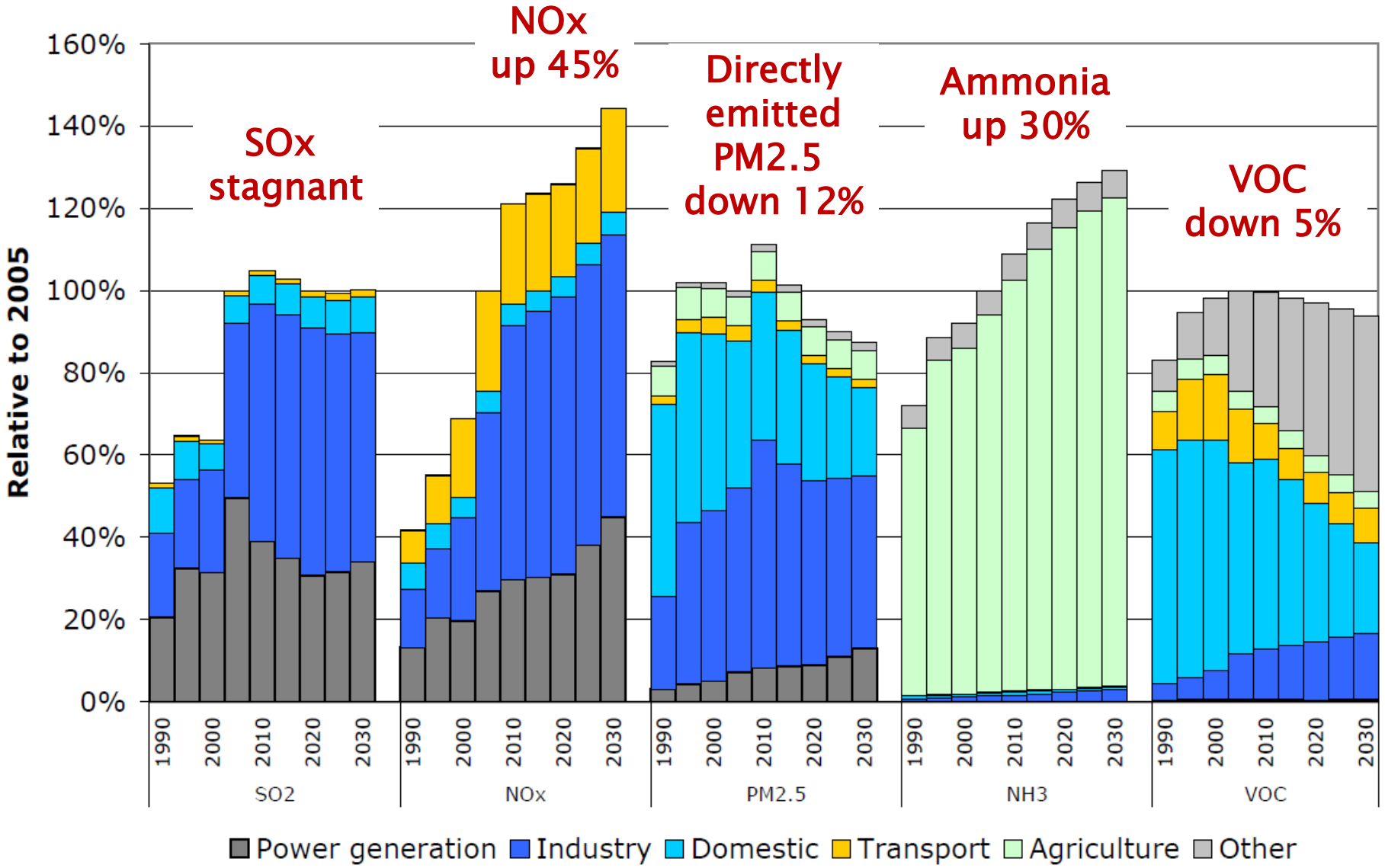
Enforcement Critical

- New cars models subject to recall
- Smoking trucks impounded
- Stationary sources regularly inspected
- Mandatory warranties
- Maximum penalties
  - Individual $250,000 per day
  - Corporate $1 Million per day

China's Starting Point

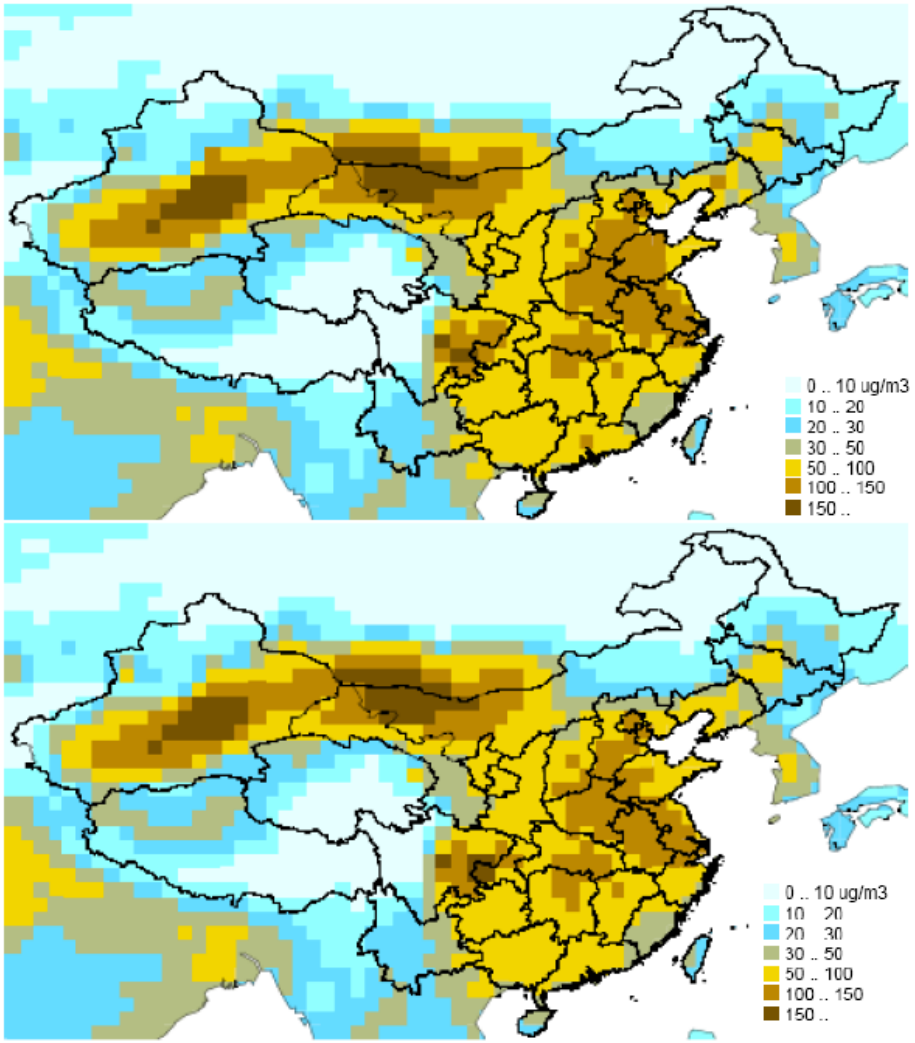
GAINS 2030 Emission Forecast for China

Scaled Against 2005 Emissions (at 100%)



GAINS Forecast of Ambient PM2.5

- Unchanged from 2005 (top) to 2030 (bottom)
- Death rate worsens as population ages



Questions to Ask

- Can you identify all emission sources?
- How many facilities must be closed or retrofitted to meet NOx and SOx targets?
- Are you regulating VOC and ammonia?
- Can you leapfrog to BACT?
- Who is responsible for each control?
- How will you enforce?

Conclusion

US has spent 60 years and billions of dollars cleaning up its air pollution.

China has a long road ahead
but an opportunity to do even better.