

NRC Air Quality Management Report: current AQM limitations

Despite substantial progress the Committee identified - in its comprehensive review of the Act - a number of limitations, for example:

- Inability to measure progress quantitatively to accurately confirm that goals are being met
- A single pollutant approach implemented through a cumbersome and often bureaucratic planning process
- Lack of focus on ecological effects (vs. health effects)
- Not certain that resources are being used to mitigate pollutants that pose the greatest risks

The Air Quality Management Process

ESTABLISH GOALS

- National Ambient Air Quality Standards (NAAQS)
- Regional Haze

DETERMINE NECESSARY REDUCTIONS

- Monitoring
- Inventories
- Data Analysis & Modeling

EVALUATE RESULTS

- Assess Progress
- Evaluate Effectiveness & Efficiency
- Revise Approach

Scientific Research

DESIGN CONTROL STRATEGIES

- National, Regional Rules
 - e.g. Mobile, NSPS
 - NOx SIP call, CAIR
- Develop State, Local, Tribal Plans

IMPLEMENT

- State Implementation Plans (SIPs)
- Permits
- Compliance & Enforcement

NRC: Challenges for Air Quality Management

- Meeting NAAQS for O₃ and PM_{2.5} and Reducing Regional Haze
- Designing and Implementing Controls for Hazardous Air Pollutants
- Protecting Human Health and Welfare in the Absence of a Threshold
- Ensuring Environmental Justice
- Assessing and Protecting Ecosystem Health
- Mitigating Intercontinental and Cross-Border Transport
- Maintaining AQM System Efficiency in the face of Changing Climate

Focus: PM – alone and with gases

- Significant effects associations:
 - Premature death from heart and lung disease
 - Aggravation of heart and lung diseases, including asthma
 - Cardiac arrhythmias and heart attacks
 - Coughing, wheezing and chronic bronchitis
 - And *possibly* lung cancer mortality, infant mortality
- Is PM composition important?
 - Probably, but likely multiple “bad” actors
 - A number of studies found effects of PM components, e.g. sulfate; few OC, many black carbon (i.e. black smoke)
- Implications for future NAAQS/Control approaches
 - Short-term (hours)/long-term/ composition-sources

Current review of the NAAQS

- Science assessment complete, staff and CASAC recommendations under considerations
- Proposed decision December, final September 2006

Visibility and quality of life



Urban Visibility - Secondary NAAQS



Urban: Winhaze model for Washington, DC. Top: Fine mass at the level of the current 24-hr NAAQS of 65 ug/m^3 5 mile visual range, 39 deciview. Bottom: ~ Natural conditions, 90 mile visual range, 12 deciviews, less than 2.5 ug/m^3 .



Class I Areas: Regional Haze



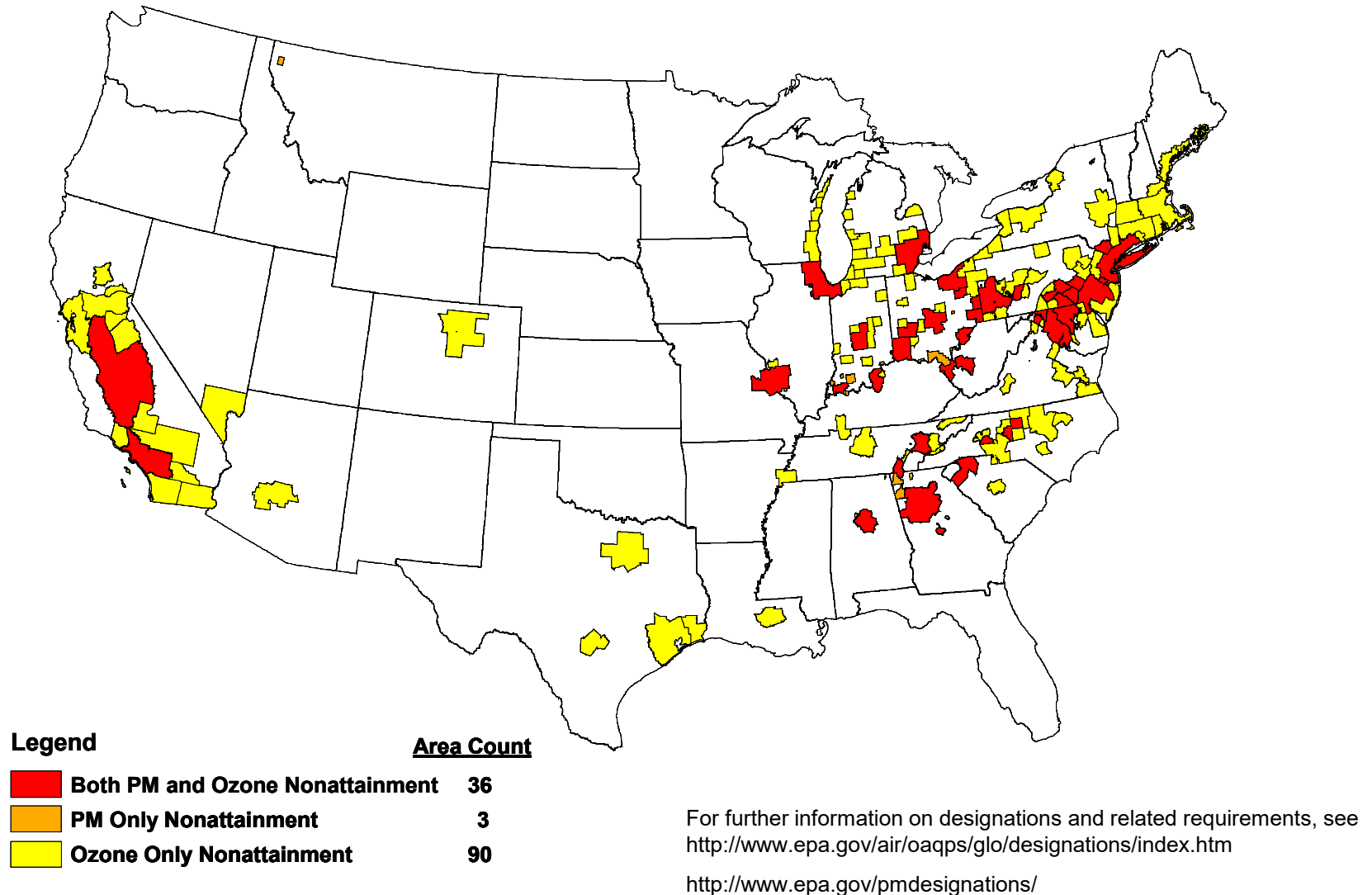
Emerging health effects evidence on ozone

- Premature mortality in elderly
- Relationship between ozone levels and respiratory hospital admissions in children
- Incidence of newly diagnosed asthma in children associated with outdoor activity & living in areas with high ozone exposures
- Higher ozone exposures related to increased school absenteeism

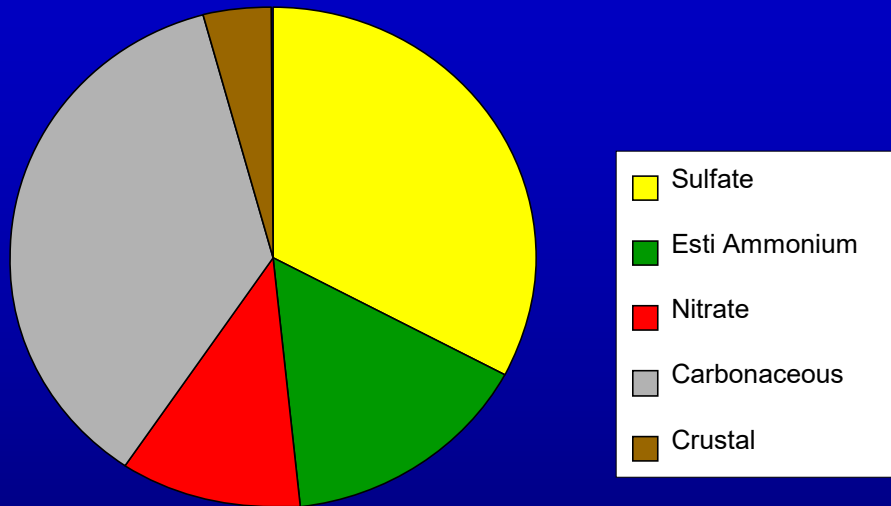
Current review of the NAAQS

- In early phases of review of the Ozone criteria and standards

Areas Currently Designated as Nonattainment for PM_{2.5} and/or 8-Hour Ozone



PM/Ozone – Multiple Pollutants, Sources



Pollutants contributing to PM2.5 and Ozone

SO₂ – Sulfate particles

NO_x – Nitrate PM, acid gases, formation of ozone and organic PM

VOC – formation of ozone and organic PM

VOC(C₆unsat) – secondary organic PM

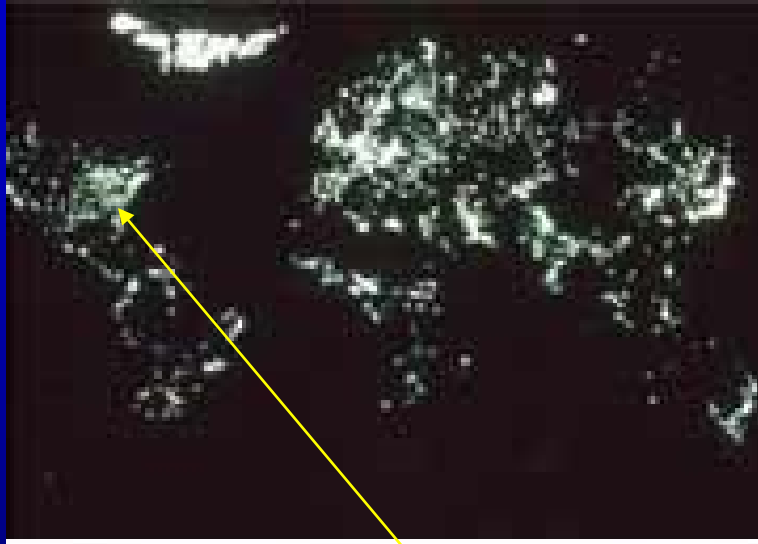
NH₃ – Ammonium

Direct emissions of carbonaceous PM, crustal materials, metals

CO – weak contribution to ozone formation

Overlap of source types, VOC/PM components and 'toxic' air pollutants

Air Pollution Scales of Influence



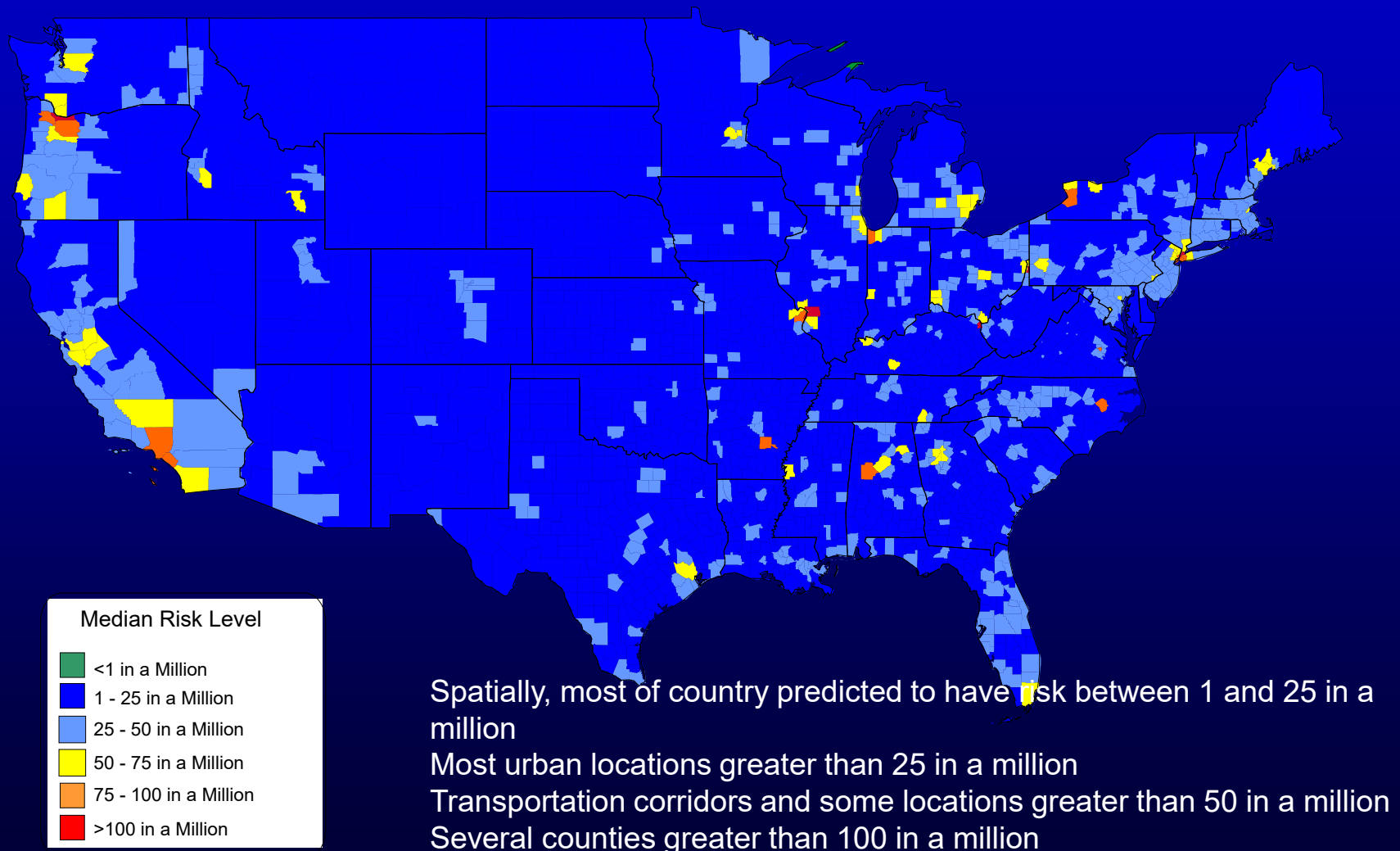
- Global – e.g. climate change, stratospheric ozone, persistent-bioaccumulative toxic pollutants (Hg, dioxins)
- Regional** – e.g. ozone, fine particles health, acid rain, visibility, nutrient loadings
- Local** –e.g. ozone, PM health, air toxics
- Personal – indoor air/outdoor penetration, asthma



Air Toxics - National Scale Assessment

1999 Predicted County Level Carcinogenic Risk

1999 NATA - National Scale Assessment
Predicted County Level Carcinogenic Risk



New findings on roadway pollution



**High exposure
to ultrafine
particles, CO,
other pollution
near roadway**

**Increased risk
near and on
roadways**

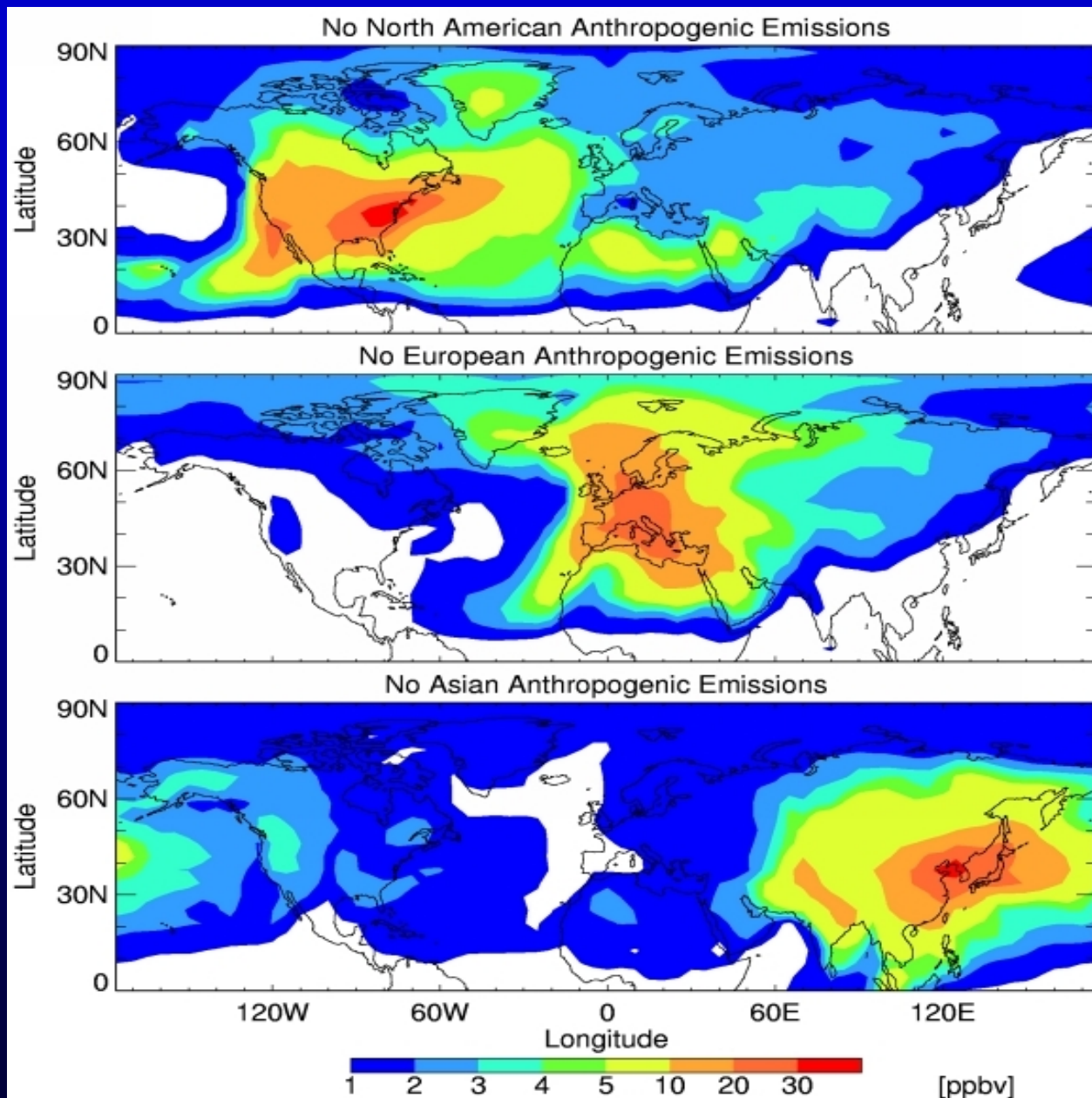


Assessing indirect strategies: “cool” cities

- Trees aren't just good to look at – they remove air pollution (ozone and PM)
 - They also emit VOC's
 - And cool the environment reducing evaporative emissions from manmade sources
- Air Policy Issue
 - Credit for enhancing tree cover
 - Penalty for eliminating trees?



International Transport of Air Pollution



GEOS-CHEM model,
July 1997

North America
(zero-out)

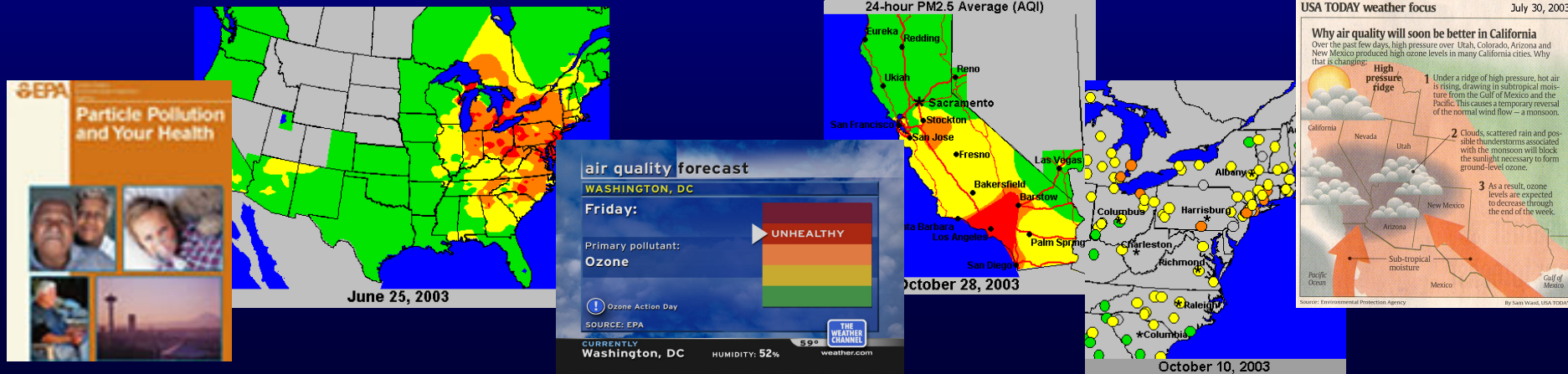
Europe
(zero-out)

Asia
(zero-out)

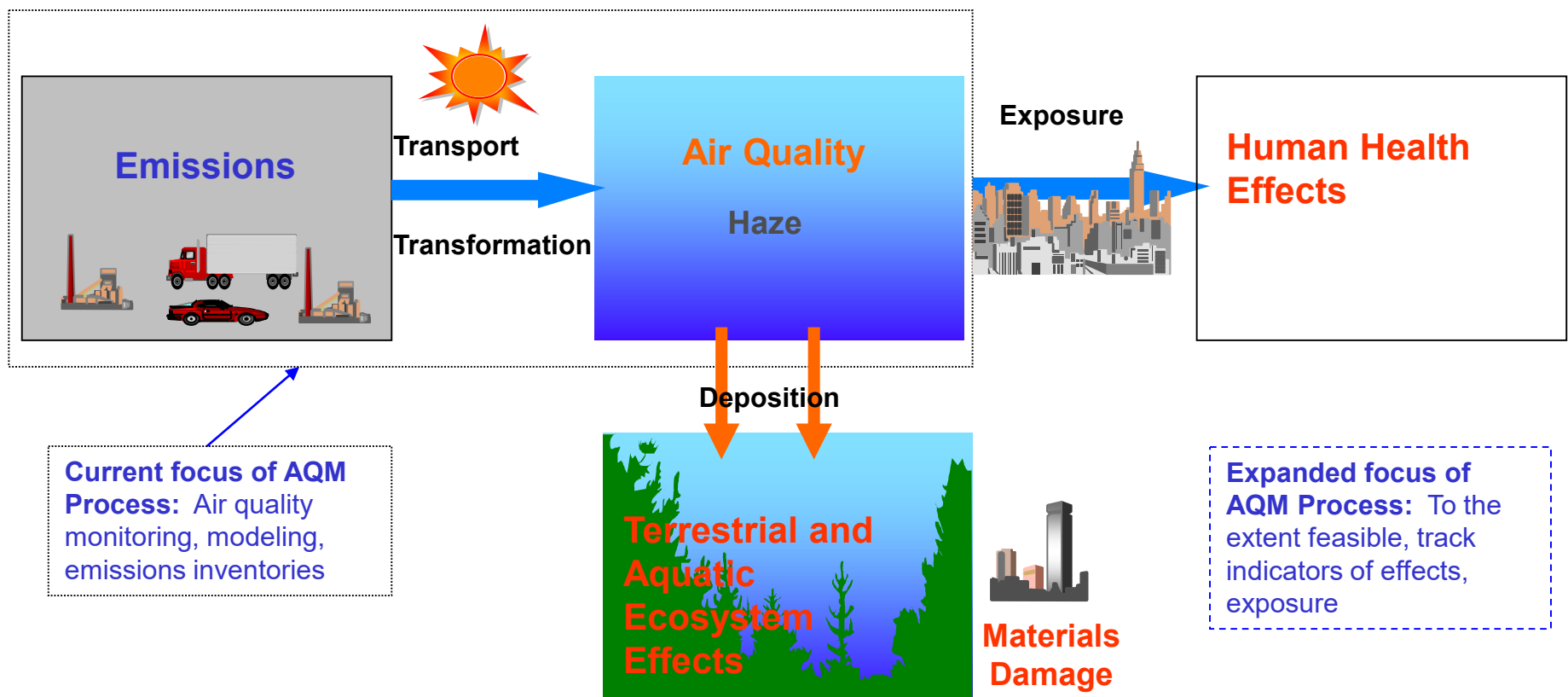
Li et al. [2001, JGR]

Communications: Air Quality Index

- Year Round 24/7 coverage/operations delivering real-time data (ozone & particles) for 46 States, 6 Canadian Provinces and all U.S. National Parks
- Next-day AQI forecasts for over 300 cities (summer) and over 150 cities (year-round)
- State-of-the-science information about air pollution health effects for the public, media and stakeholders
- Public/Private partnerships with The Weather Channel, USA Today, CNN, weather service providers, NOAA National Weather Service, EPA's Office of Env. Information



Expanding Accountability



CAAAC Recommendations to Strengthen Scientific and Technical Capacity

- **Improve emissions measurements and reporting**
- **Improve emissions factors and estimation methods**
- **Quantify & reduce uncertainty in emissions inventories and air quality modeling applications**
- **Promote & improve integrated, multipollutant monitoring**
- **Develop an overall framework for accountability**