Detroit Multipollutant Pilot Project

Overview & Update

January 16, 2008

Overview

- Detroit MP Pilot Project in context of OAQPS AQMP project
  - Deliverable: Detroit Project Report w/ references
- Background & Overview: Provide motivation on "Why?"
- General MP Framework: Description of analytical framework and relevant technical information
- Implementation of the MP Framework for Detroit: Example application of the MP framework to provide information for Pilot areas

Comprehensive Air Quality Management Plan

- OAQPS is partnering with 2-3 agencies (NY, NC, Ill/MO) to integrate criteria, air toxics and other air quality goals into a comprehensive plan:
  - Attainment/maintenance of all NAAQS
  - Sector based reductions
  - Risk reductions of hazardous air pollutants (HAPs)
  - Include visibility and ecosystems
  - More effective integration of land use, transportation, energy and climate
- OAQPS will assist on technical and policy issues and compare outcomes with the traditional approach

Project elements: Two parallel efforts

- Policy/Outreach Effort (AQPD/OID)
  - Define criteria and coordinate selection of partners for pilot studies
  - During pilot studies, work with partners to identify issues to overcome and potential incentives for areas to promote development of comprehensive AQMPs
- Technical Effort (AQAD/HEID/SPPD)
  - Complete current Detroit analytical work to . . .
    - follow through on commitments w/ project partners
    - provide valuable input and insights to selection of partners and design of pilot studies
    - Provide template for analytical elements of pilot studies
  - Provide technical input/consultation to partners during pilot studies (includes emissions, control measures & costs, AQ modeling, and exposure/benefits assessment)

Detroit Multipollutant Pilot Project

Purpose

Develop and test methods, tools, and framework for developing a multipollutant control strategy in Detroit to provide information for discussion with States and other partners.

Deliverables

Summary materials (e.g. presentations) to provide key insights from the pilot project and to allow for collaboration across technical & policy staff to improve future pilot projects. Final report documenting the MP analytical framework and results from the Detroit pilot.

Important Qualifier

Please note that ***no one*** has ever actually implemented a multipollutant air quality management effort from "beginning to end."

This makes the effort in Detroit especially interesting as it is an important test bed for implementing multipollutant, multiscale ambient data analysis, emissions inventory development, control strategy development and implementation, air quality modeling, risk and benefits analyses.

Detroit Multipollutant Report

- Chapter 1: Background & Overview – May08
  - Why are we doing this?
  - What is a MP framework?
- Chapter 2: Conceptual Model Development – May08
  - What is a conceptual model?
  - What are some examples?
- Chapter 3: General MP Framework (w/ Appendices) – May 08
  - Models, tools, data available to all areas
  - Examples of implementation of MP concepts
- Chapter 3: Implementation of the MP Framework for Detroit (with Appendices) – July 08 (Modeling currently in process)
  - Description of modeling and data analysis done specifically for Detroit project
  - Details on "lessons learned"

Chapter 1: Background & Overview

Why are we doing this?

Chapter 1: Background & Overview
Why are we doing this?

The NRC report recommends that the United States transition from a pollutant-by-pollutant approach to air quality management to a multipollutant, risk-based approach that emphasizes results over process, takes an airshed approach to controlling emissions, creates accountability for these results, and modifies air quality management actions as data on the effectiveness of these actions are obtained.

What the NRC says….

"Air pollutants occur in complex mixtures, and yet SIPs are constrained to address only individual criteria pollutants. As a result, the entire, relatively cumbersome SIP process must be undertaken for a pollutant such as O3 and then again for PM in a separate process and on a different timetable, despite the fact that the exposures are simultaneous, the sources are often the same, and the two pollutants share many common chemical precursors. . . . However, the major air pollution challenges today, which involve multiple emissions from common mobile and stationary sources, can be more effectively addressed using a multipollutant approach. Such an approach can simultaneously seek reductions of pollutants posing the most significant risks. It can also focus on achieving the most cost-effective mix of emission reductions of key pollutants from any one source rather than asking that source to separately address reductions of different pollutants at different times in response to different SIPs." (NRC, 2004; p. 130)

Why Multipollutant Approach?

- Because the current system ……
  - could be more efficient.
    - Many air quality problems share common precursors while current NAAQS requirements are focused pollutant-by-pollutant
    - Release, control, and chemical formation of pollutants are interrelated
    - An approach that takes these facts into account can simultaneously seek reductions of pollutants posing the most significant risks while receiving the greatest benefits and reducing administrative overhead!
  - of a least-cost approach for successively meeting each standard may not necessarily produce the most efficient strategy for meeting multiple air quality objectives or for obtaining the greatest health and environmental benefit for a given expenditure.

Multipollutant Framework

- Essential elements:
  - Multipollutant and multi-scale: ambient data analysis, emissions development and modeling, controls, air quality modeling, risk and benefits analysis
  - Sensitivity analyses: allows for iteration based on results to better inform policy development
  - Benefits/dis-benefits: Considers impact of control strategies on risk and benefits

Iterative Approach that Considers Impact of Control Strategy on Risk & Benefits

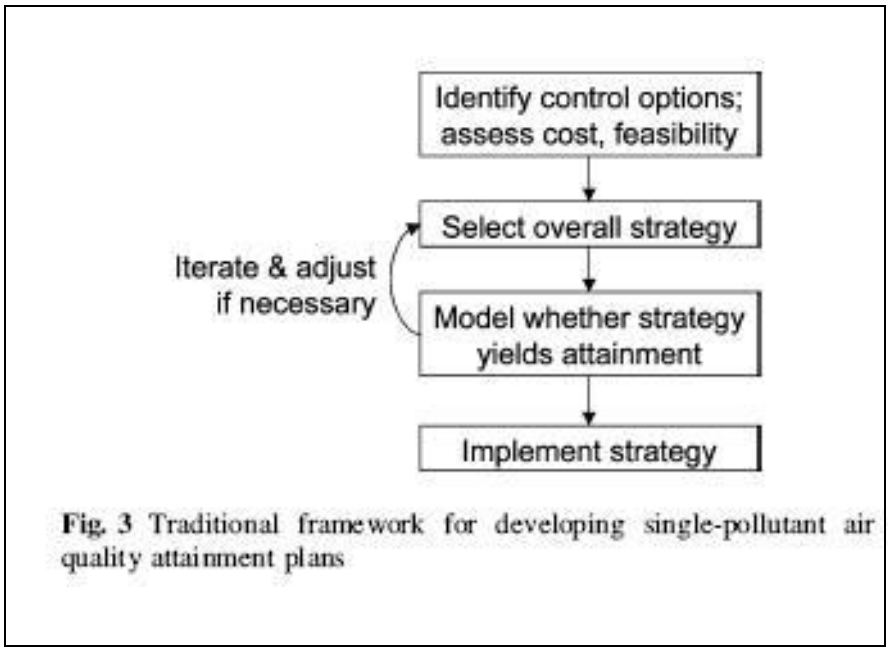


Fig. 3 Traditional framework for developing single-pollutant air quality attainment plans

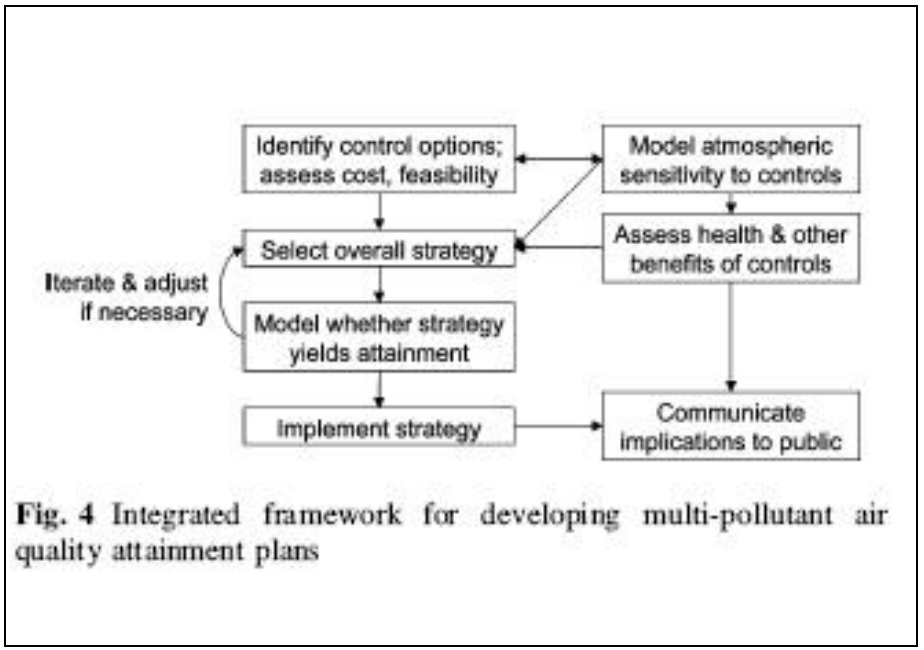


Fig. 4 Integrated framework for developing multi-pollutant air quality attainment plans

Figures from: DS Cohen, JW Boylan, A Marmur, MN Khan. (2007) "*An Integrated Framework for Multipollutant Air Quality Management and Its Application in Georgia*." EM, 40:454-554

Chapter 2: General MP Framework

A description of the analytical framework and relevant technical information

Chapter 2: General MP Framework

I. *Summary of Current Status*

II. *Develop Conceptual Model*

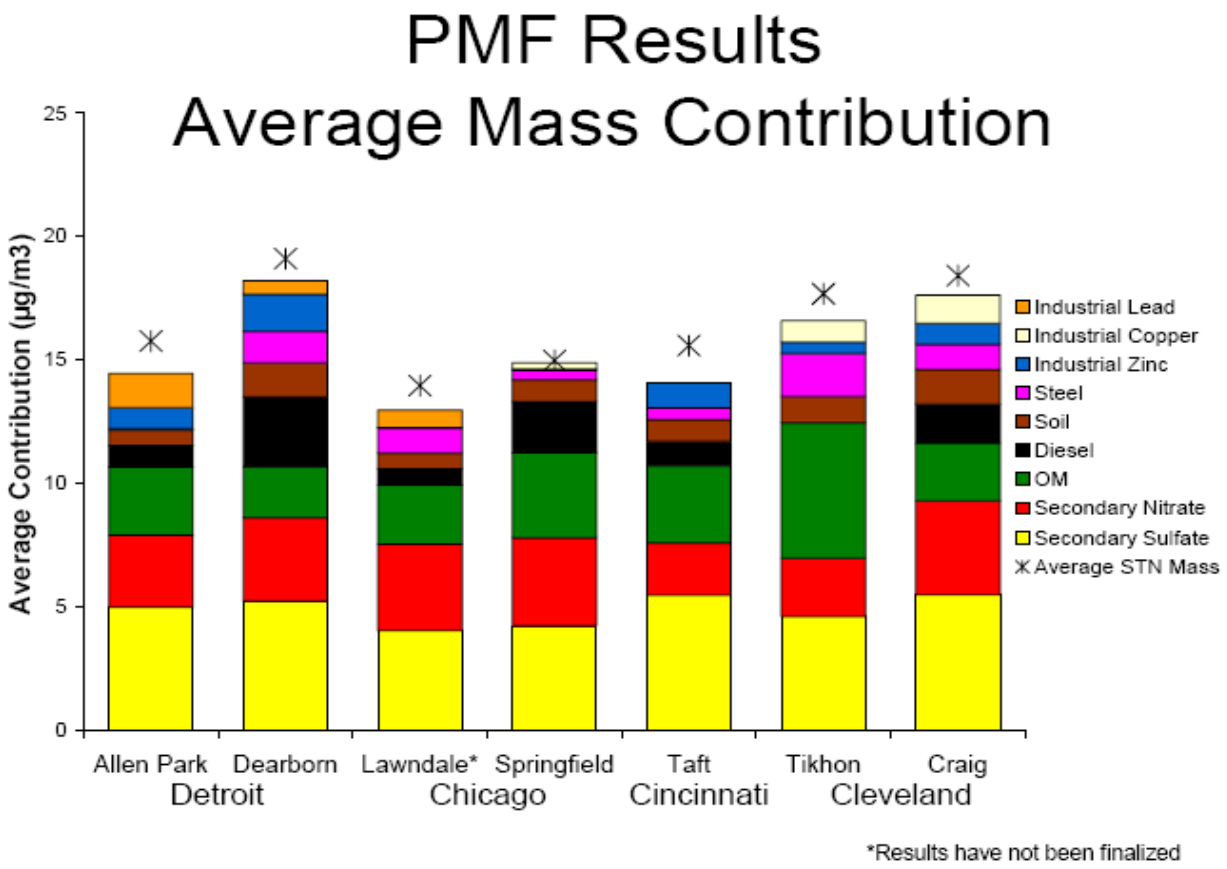
III. *Perform Multipollutant Analyses Needed to Determine Air Quality Management Strategy*

IV. *Multipollutant Control Measure Evaluation*

I. Current Status

- Understand the status of current non-attainment issues and toxics problems
  - PM2.5
  - O3
  - Toxics (which toxics are of concern and why)
  - Visibility
- Ambient Monitoring/Data Analysis
  - Current monitoring and special studies (discuss monitoring networks in Appendix)
    - PM & speciated data
    - O3 data
    - Toxics monitors
    - Special monitoring studies
  - Data analysis studies
    - Ambient data analysis
    - Receptor modeling

I. Current Status: Example of Receptor Modeling Analysis (Kenski, 2007)



I. Current Status (cont.)

- Emissions analyses
  - Need to understand source "layout"
    - What are the important point, mobile, and area source contributors?
    - Are emissions dominated by a few source types or more widely distributed throughout the source population?
    - What is the anticipated effect of future controls (e.g. CAIR, mobile source standards, upcoming SIP controls)?
- Current/Past modeling (Control responsiveness & source contribution)
  - National/Regional Modeling
    - EPA
      - NATA 99 (http://www.epa.gov/ttn/atw/nata1999/)
      - PM RSM (http://www.epa.gov/scram001/reports/pmnaaqs_tsd_rsm_all_021606.pdf)
      - PM NAAQS (http://www.epa.gov/air/particlepollution/actions.html)
  - Academic studies
  - RPO/Regional Modeling
  - Area specific modeling

I. Current Status (cont.)

- Current status should also describe status of other important factors & programs influencing current & future air quality:
  - Economic & population growth
  - Transportation planning
  - Land-use planning & “smart growth” initiatives
  - Energy programs (renewable portfolio standards, other initiatives)
  - Climate change/greenhouse gas programs

II. Conceptual Model Development

- A conceptual model is formed based on the best current understanding of the atmospheric environment of an area.
- It can then be used to guide & focus technical efforts :
  - to define the important elements of an AQMP for effective control of key pollutant concentrations by identifying limiting processes,
  - guide data collection to characterize important processes and to fill key knowledge gaps, and
  - point out where opportunities may exist to maximize multi-pollutant control opportunities and minimize potential counterproductive copollutant interactions.

II. Conceptual Model Development

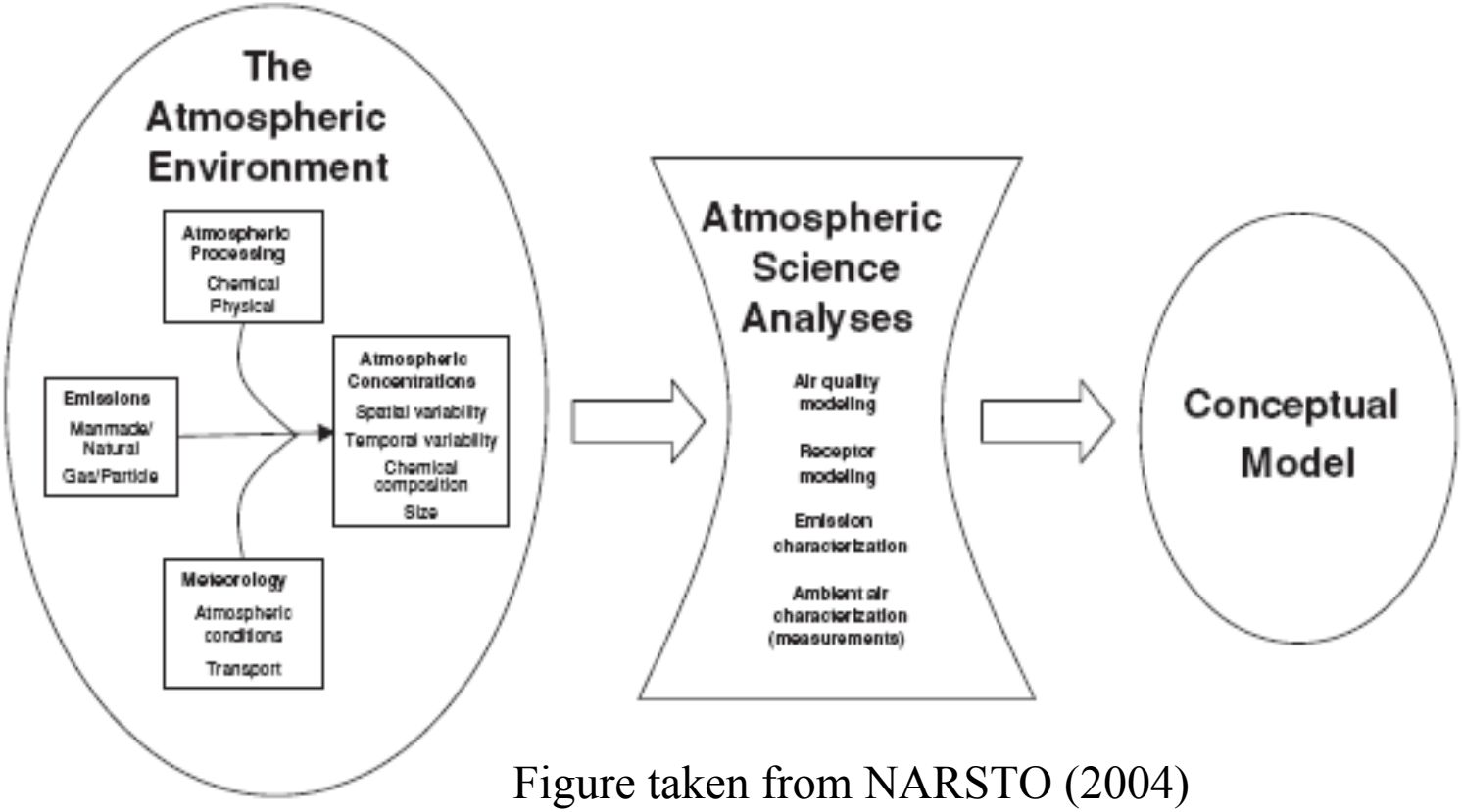
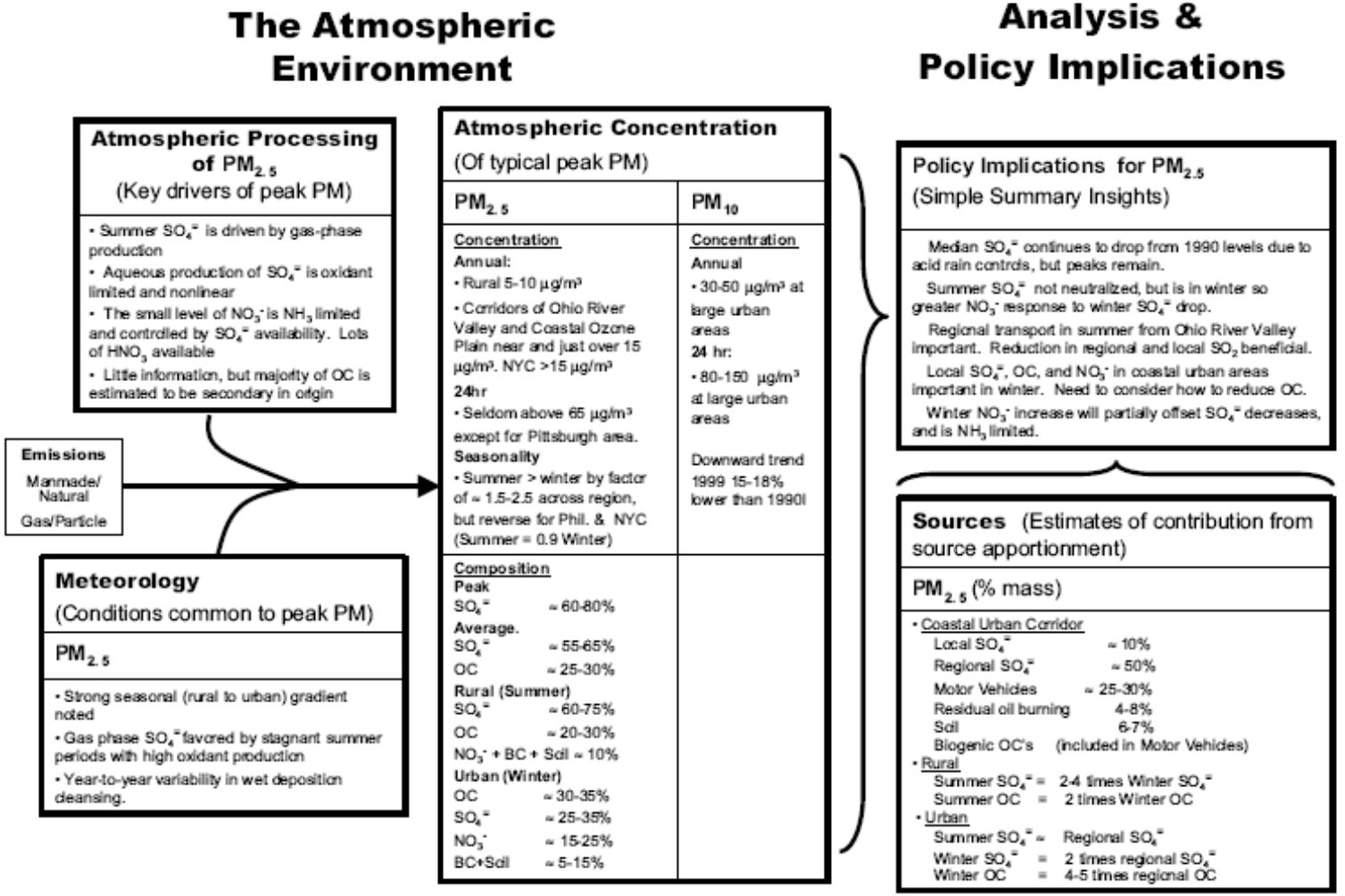


Figure taken from NARSTO (2004)

II. Conceptual Model Development: NEast example for PM (NARSTO, 2004)



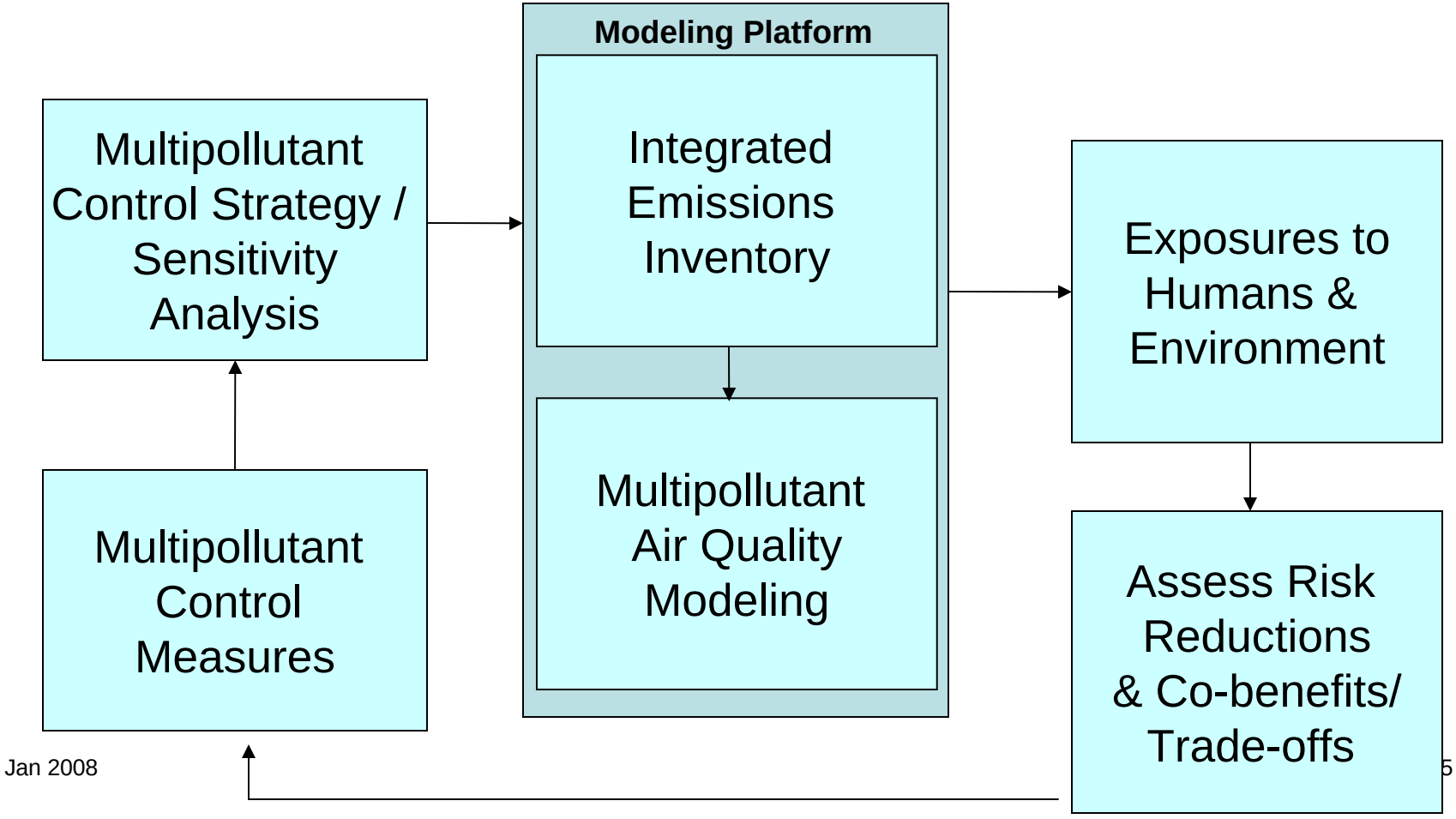
III. Perform Multipollutant Analyses Needed to Determine Air Quality Management Strategy

- The next steps would be to conduct an integrated, multipollutant analysis of candidate air quality management strategies:
  - What are potential control measures for point, area, and mobile sources?
  - What are important environmental indicators and targets and what is the approach to prioritizing the list of indicators and targets?
  - What control measures have the greatest effect, overall, on meeting the prioritized list of indicators and targets?
  - How can non-routine items (such as transportation and land-use planning) be integrated into the air quality management plan?
- Answering these questions might require collection of additional data or conducting additional analyses and should help complete any gaps in the conceptual model (including potential refinements in data and/or tools).

Preliminary control strategy selection and sensitivity analyses

- Example probing tools/analyses and/or additional modeling that could be used to assess:
  - Source contributions
    - Air Quality Modeling
      - PSAT/OSAT & PPTM/OATM
      - Dispersion & hybrid modeling
      - PiG/PinG
    - Emissions & Ambient Data Analysis
      - Receptor Modeling
      - Nonparametric regression
  - Atmospheric responsiveness to emissions changes
    - DDM, RSM, ADJOIN, process analyses (photochemical modeling tools)

Analytical Framework for a Multipollutant Analysis



Analytical Components of an Integrated, Multipollutant Assessment

- Emissions Inventory and Emissions Modeling (SMOKE, CONCEPT, COST/EMF)
  - Spatial quality (e.g. point source locations, spatial surrogates, refined link-based mobile emissions)
  - Accuracy (e.g. update inventory of current & future controls, speciation/emissions factors, and/or magnitude of emissions)
- Control Strategies
  - Are there new controls available for consideration?
  - Need to quantify costs and all emissions changes
- Air Quality Modeling
  - Meteorology – possible refinements for local-scale
  - Internal model refinements for multipollutant & multi-scale modeling
- Benefits/risk Assessment
  - Refined population data
  - Local health data
  - More local epidemiology studies

→ Focus these changes on sources & pollutants of most importance for area

Challenges: Dealing with Multiple Pollutants and Resolution

Multipollutant (integration of HAPS & CAPS (criteria air pollutants)) and ***multi-resolution*** (regional and local scales) provide a challenge for all analytical components:

- Emissions Inventory: include CAPS & HAPS and support regional and local scale modeling
- Control Information: multipollutant for implementation into control strategies or sensitivity analyses
- AQ modeling: account for primary & secondary aspects of criteria and toxic pollutants and assess regional and local concentrations and source contributions
- Exposure/risk/benefits assessment: provide information on benefit of pollutant reductions at regional and local scales for criteria and toxic pollutants

Preliminary control strategy selection and sensitivity analyses: Example by Cohan et al (2007)

- Cohen et al (2007) illustrates a "real life example" of how analytical work can provide input into the policy choices and determination of control strategies. Though this work did not directly include toxics (other than through regional VOC reductions), it illustrates some important considerations in selecting a multipollutant control strategy.
- GA EPD conducted emissions sensitivity early in the process, in parallel with the identification and cost assessment of control options because
  - Recognized the shortcomings of the traditional approach and facing SIP deadlines for multiple pollutants and nonattainment regions
- Georgia EPD, performed episodic emission sensitivity analysis in order to quantify the response of ozone, PM2.5, and regional haze to emissions reductions from various sources.
  - ''Regional'' sensitivities for nitrogen oxides (NOx), VOCs, SO2, ammonia, or primary organic and elemental carbon particles (PC) in a given region.
  - EGU sensitivities with emissions reductions of 65% and 95% NOx and SO2

Preliminary control strategy selection and sensitivity analyses: Example by Cohan et al (2007)

- Findings of Sensitivity Analysis
  - Ozone shown to be far more responsive to NOx than to VOCs, indicating that Atlanta is in a NOx-limited regime.
  - Atlanta ozone responsive to SCRs at two of the major power plants, one located inside & the other larger one located outside of the 20-county Atlanta non-attainment area, while controls at other plants showed substantially less impact on ozone.
  - For PM2.5, the largest benefits seen from additional controls of regional PC from Atlanta. Controls of regional SO2, NOx, and VOCs have a much smaller benefit. Atlanta PM2.5 was also responsive to the installation of scrubbers at all major power plants in Georgia.
- In addition, sensitivity analysis indicated that local ammonia emissions contribute strongly to wintertime PM2.5, which prompted an intensified search for control options, though no new ammonia controls were identified as being cost effective.

→ This study is an example of how sensitivity analyses can be used to aid the selection of controls by providing information about the general responsiveness of the atmosphere to certain emissions reductions.

Environmental Indicators – Prioritizing Across Pollutants and Informing Decisions

- With the "least-cost" approach to determine controls, social and ecological factors have to be filtered by an economic perspective to be considered.
  - Criteria that are difficult or impossible to monetized are often excluded from consideration.
- Multicriteria decision analysis framework is required that
  - (1) brings together technical knowledge & social values &
  - (2) fosters learning & seeks a consensus solution.
- One possible approach is Multi-Criteria Integrated Resource Assessment (MIRA) (Stahl et al. 2002).
  - This tool seeks to introduce technical knowledge and value judgments into environmental decisions without presuming a particular relationship between them.
  - EPA Report (August 2002): "MIRA is a decision making methodology that documents stakeholders' interests and can assess the impacts of a given set of criteria simultaneously".

Environmental Indicators: MIRA Alternative Fuels Case Study Example (Stahl et al, 2002)

Primary Level		Secondary Level		Tertiary Level		Quaternary Level	
Drinking Water Odor	0.25						
Economics	0.25	Cost at pump (CA process)	0.25				
		Cost to remediate spills ($/release)	0.25				
		Cost to install double wall USTs	0.25				
		Cost to increase UST inspections/enforcement	0.25				
Air Quality Criteria Pollutants	0.25	Tailpipe Emissions	0.5	CO	0.33		
				NOx	0.33		
				VOC	0.33		
		Evaporative Emissions	0.5				
Toxicology	0.25	Air Pathway	0.5	Benzene	0.25		
				1,3 butadiene	0.25		
				Formaldehyde	0.25		
				Acetaldehyde	0.25		
		Drinking Water Pathway	0.5	Inhalation	0.5	Benzene	0.33
						MTBE	0.33
						Ethanol	0.33
				Ingestion	0.5	Benzene	0.33
						MTBE	0.33
						Ethanol	0.33

This figure illustrates the hierarchal nature of the thought process central to the MIRA approach. This type of logic could be useful in prioritizing environmental indicators for an area.

IV. Multipollutant Control Measure Evaluation

- Identify candidate control strategies (use conceptual model & sensitivity analyses to inform process)
- Perform multipollutant air quality modeling and assess risk/benefits for all pollutants and indicators of concern
- Iterate process if needed to:
  - achieve attainment
  - meet targets for environmental indicators
  - improve benefits
  - Revise selection of environmental indicators
- Make recommendations on control strategy to be implemented
- Use information from process (including benefits of control strategy implementation) to inform public

IV. Multipollutant Control Measure Evaluation

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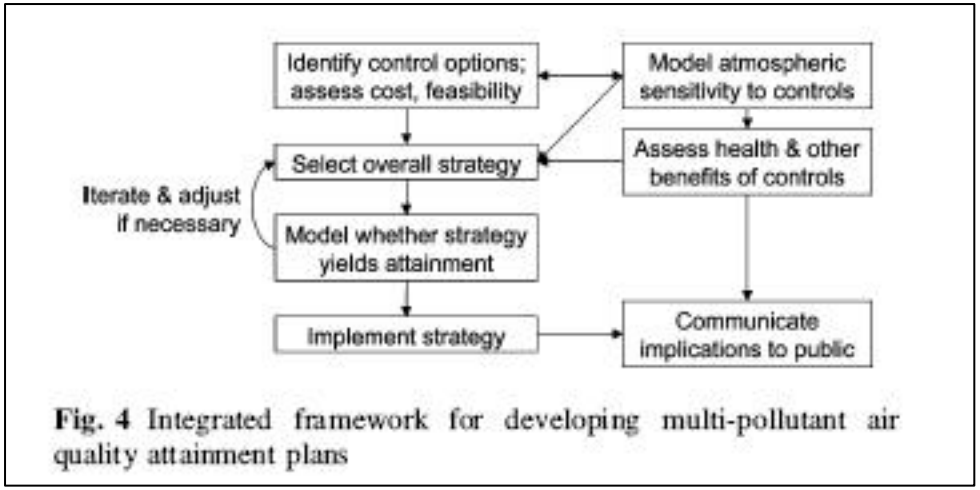


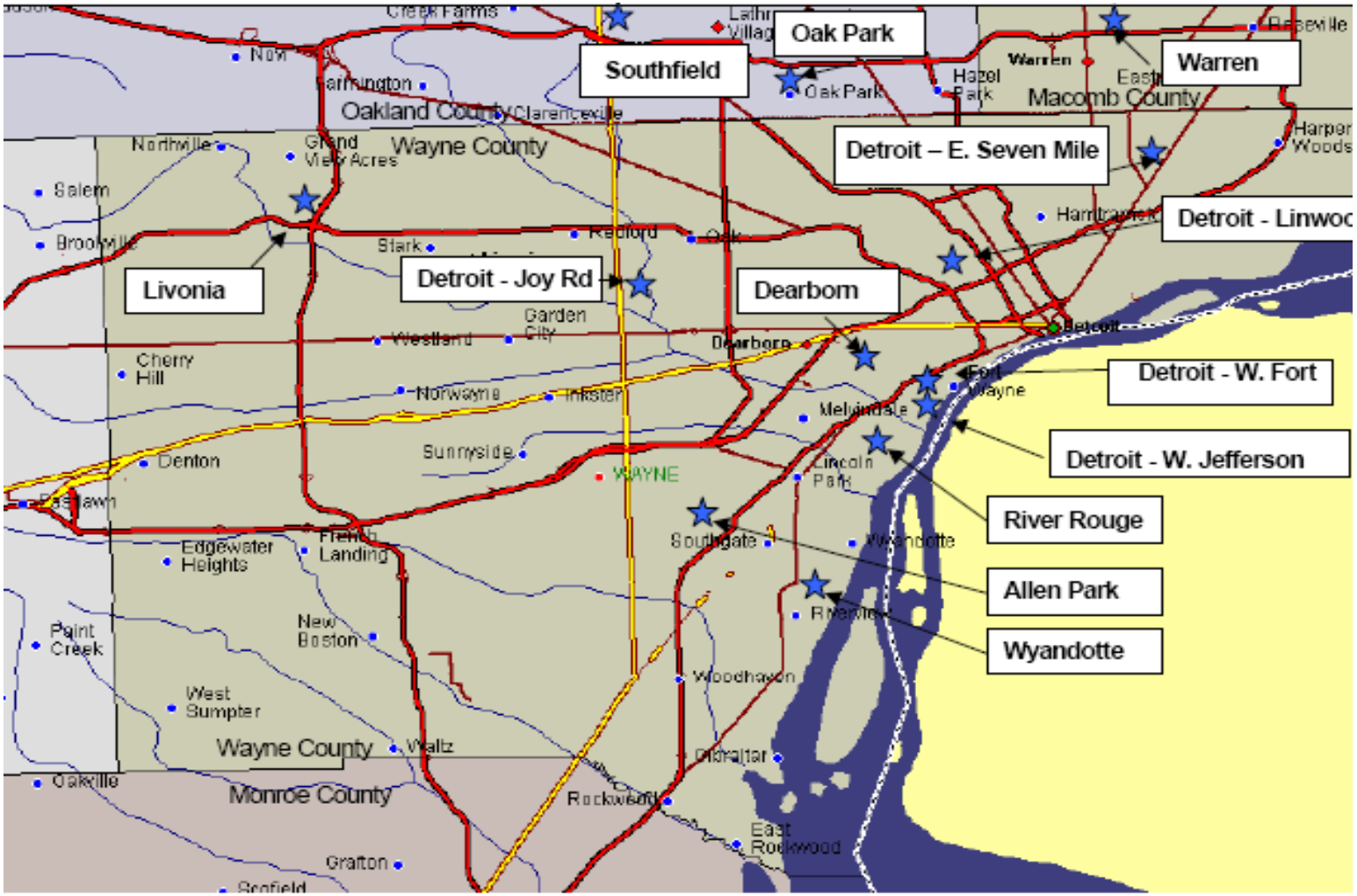
Fig. 4 Integrated framework for developing multi-pollutant air quality attainment plans

- Make recommendations on control strategy to be implemented to achieve stated goals
- Use information from process (including benefits of control strategy implementation) to inform public

Chapter 3: Implementation of the MP Framework for Detroit

Example of the application of the MP framework to provide information for Pilot areas

Chapter 3: Implementation of the Multipollutant Framework for Detroit

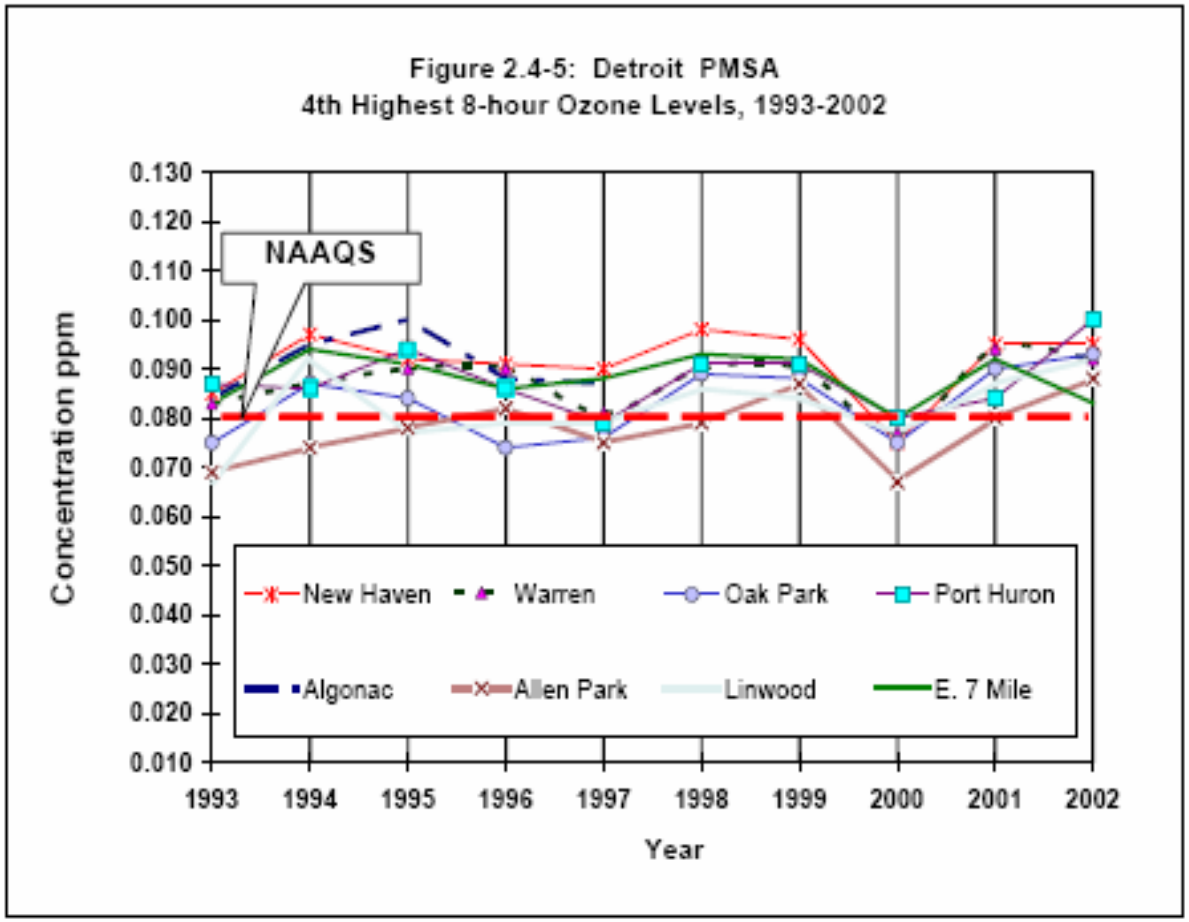


Chapter 3: Implementation of the MP Framework: Why Detroit?

Detroit provides an excellent test bed because:

- There are multipollutant issues
  - Ozone
  - PM2.5
  - Toxics
- Rich in technical data, research and analyses
  - LADCO, Region 5 and Michigan DEQ
  - Detroit Air Toxics Initiative (DATI)
  - Detroit Exposure and Aerosol Research Study (DEARS)
  - PM National Ambient Air Quality Standards RIA

I. Current Status for Detroit Ozone: Marginal Non-attainment



MDEQ: 2003 Annual Air Quality Report

Current Status for Detroit PM2.5: Non-attainment

Monitor	2002 Annual Mean PM2.5 Concentration
Allen Park	15.9 $\mu g/m^3$
Dearborn	19.8 $\mu g/m^3$
E. Seven Mile	15.6 $\mu g/m^3$
Linwood	15.6 $\mu g/m^3$
Southfield	17.6 $\mu g/m^3$
W. Fort St.	17.4 $\mu g/m^3$
Wyandotte	16.3 $\mu g/m^3$

MDEQ: 2002 Annual Air Quality Report

Southwest Detroit: Local PM Influences

Dearborn Monitor, MI Source: Photo from Jim Haywood, Michigan DEQ

Southwest Detroit: Local PM Influences

Dearborn Monitor, MI Photo from Jim Haywood, Michigan DEQ

I. Current Status for Detroit for Toxics: Multiple HAPs of Concern

- DATI project monitored over 200 componds from April 2001 – April 2002.
  - Analysis identified 13 chemicals as highest concern: Methylene chloride, naphthalene, benzene, acrylonitrile, formaldehyde, 1,4-dichlorobenzene, arsenic, carbon tetrachloride, 1,3-butadiene, acetaldehyde, cadmium, nickel, and manganese
  - Acrolein important toxic to consider based on DEARS
  - Diesel exhaust may be important pollutant to focus on for mitigation of air toxics health risks

Potential Sources: DATI Report

SITE (AIRS ID)	POINT AND AREA SOURCES	MOBILE SOURCES
Houghton Lake (261130001)	Fire places/wood stoves, Christmas tree farming, oil and gas production	U.S.-127, boating, snowmobiling
Southfield (261250010)	Paint Manufacturing, metal heat treating, machine shop, auto paint shop, asphalt, ready-mixed concrete	I-696, Telegraph, and Lodge
Ypsilanti (261610008)	Equipment manufacturing, WWTP, commercial printing, plastic products, power generation plants	I-94
Allen Park (261630001)	Bulk petroleum stations, refuse services, quarry, metal fabrication, chemical manufacturing/processing, power generation plants, plastic resin manufacturing	I-75
River Rouge (261630005)	Steel plant, drywall manufacturing, WWTP, sewerage incinerator, asphalt plant, oil refinery, coke batteries, coke-by-product production facility, power generation plants, coal and oil fired combustion, paint shops, assembly plants (heavy industrial)	I-75
N. Delray (261630015)	2 steel mills, used oil reclamation plant, asphalt plant, oil refinery, coke batteries, coke-by-product production facility, WWTP, sunroof manufacturer, power generation plants (heavy industrial)	I-75
N.E. Detroit (261630019)	Automotive manufacturing and stamping, chemical preparations, power generation plants, foundry, metal coating, refuse systems	I-94
S. Delray (261630027)	Coke battery , asphalt plant, oil refinery, coke-by-product production facility, steel mill, power generation plants, (heavy industrial)	I-75
Dearborn (261630033)	Auto & steel manufacturing, power generation plants, asphalt plant, oil refinery, coke batteries, coke-by-product production facility, (heavy industrial)	Between I-75 & I-94

Ambient Data Analysis – Seasonal Variability: STI Report to EPA, 2006

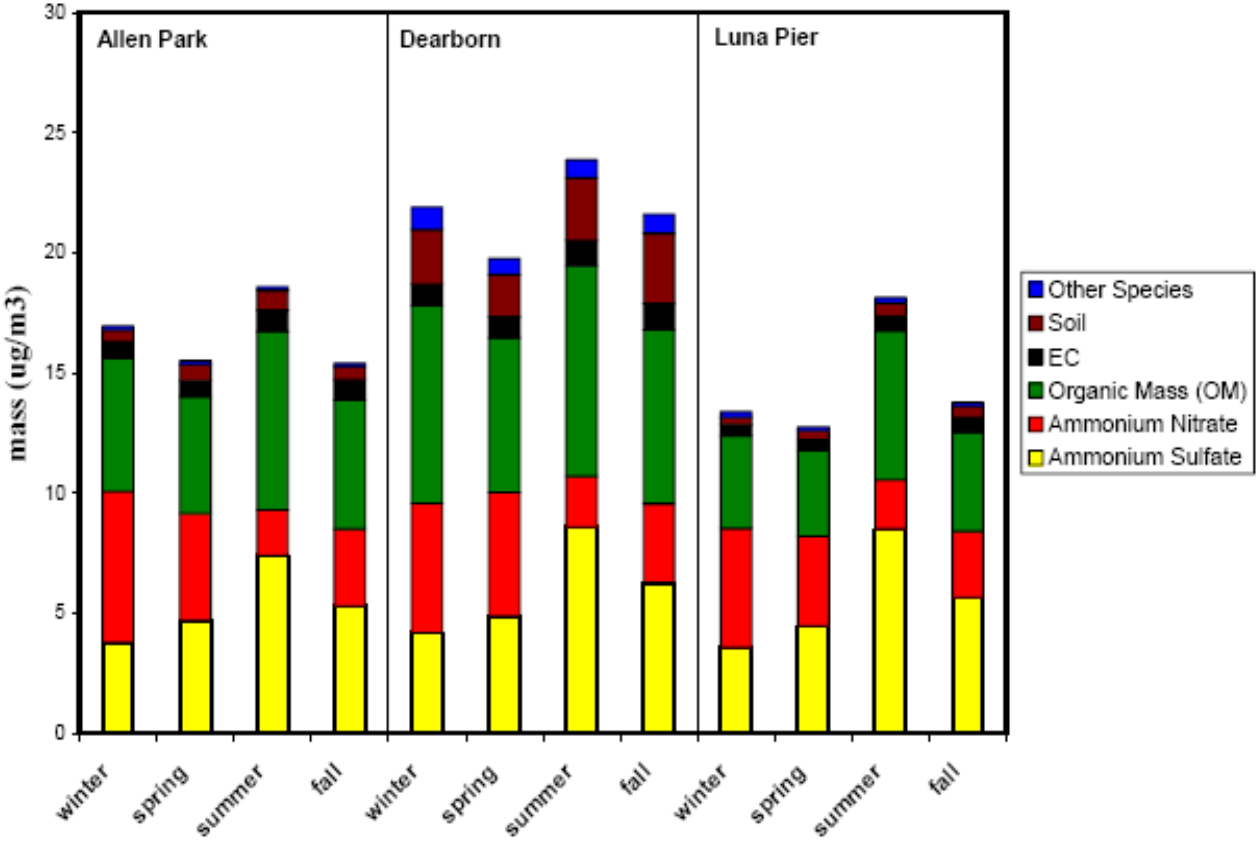
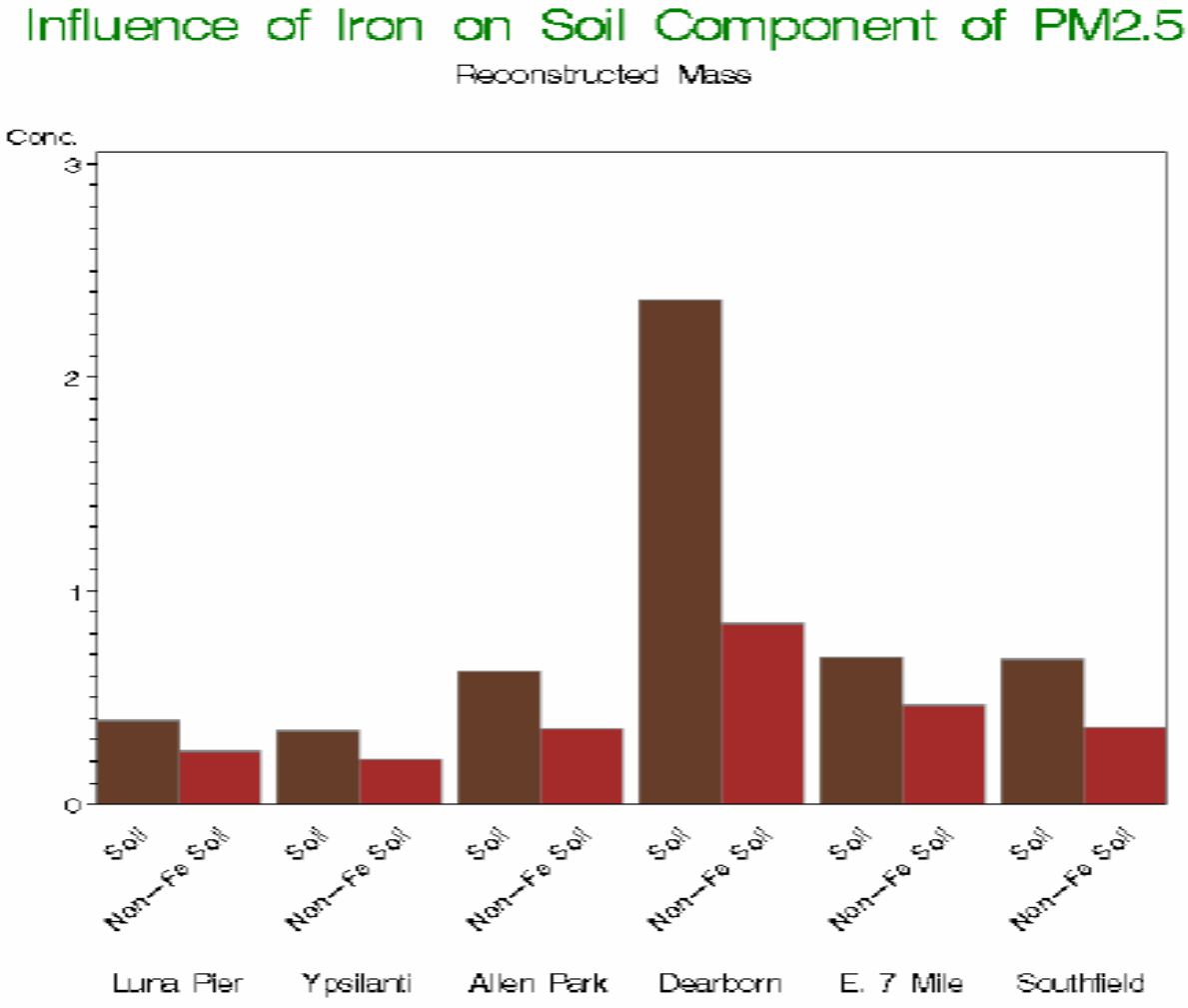
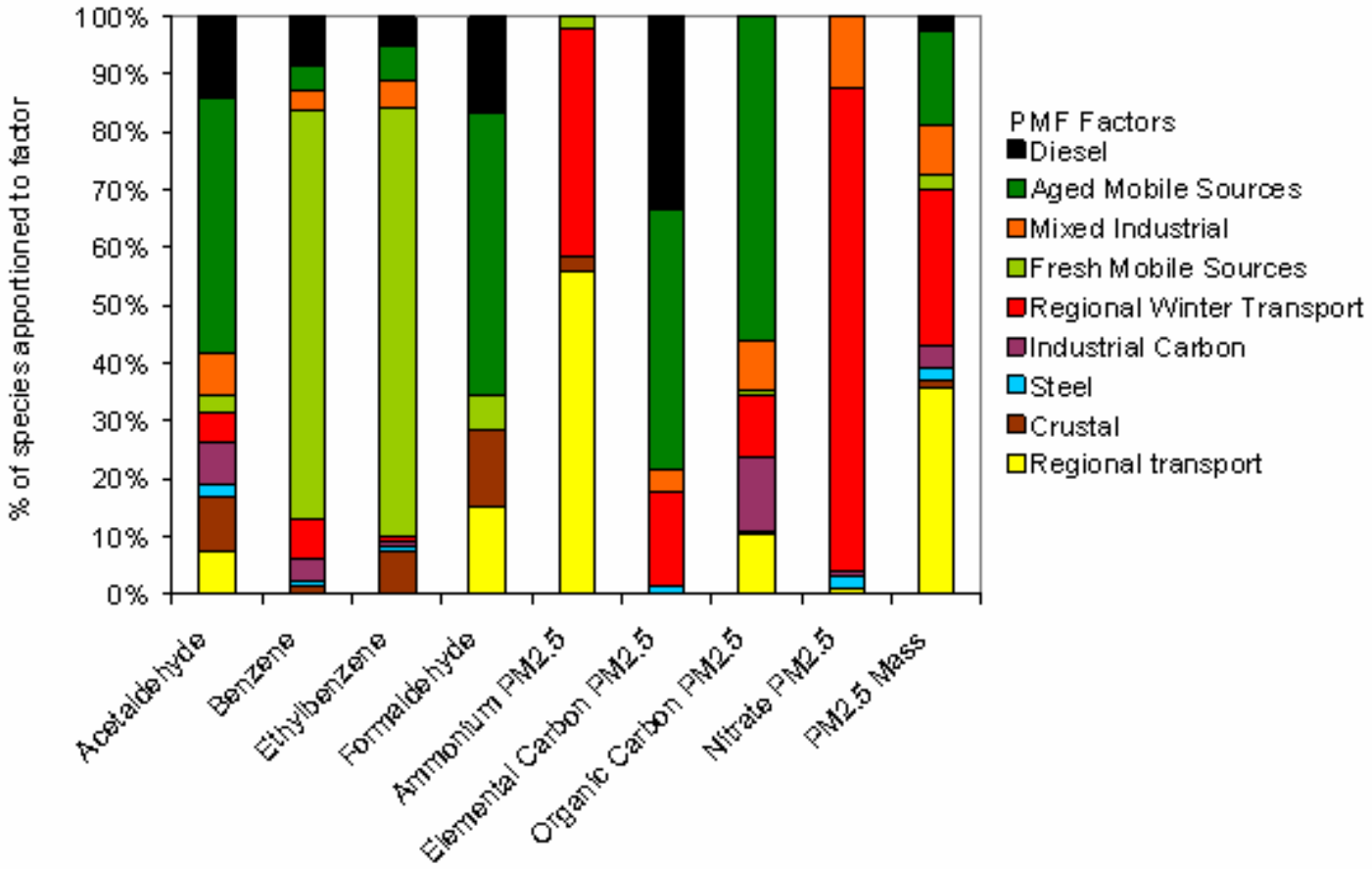


Figure 3-5. Seasonal ambient $PM_{2.5}$ composition for STN data at Allen Park, Dearborn, and Luna Pier (Allen Park: December 2000 through December 2005, Dearborn and Luna Pier: May 2002 through December 2005).

Ambient Data Analysis – PM2.5 Soil Component: Kenski, 2007



Dearborn Source Apportionment: PMF



Apportionment of selected air toxics and STN PM2.5 species by PMF factor at Allen Park, 2001-2005. *Source: STI exploratory work*

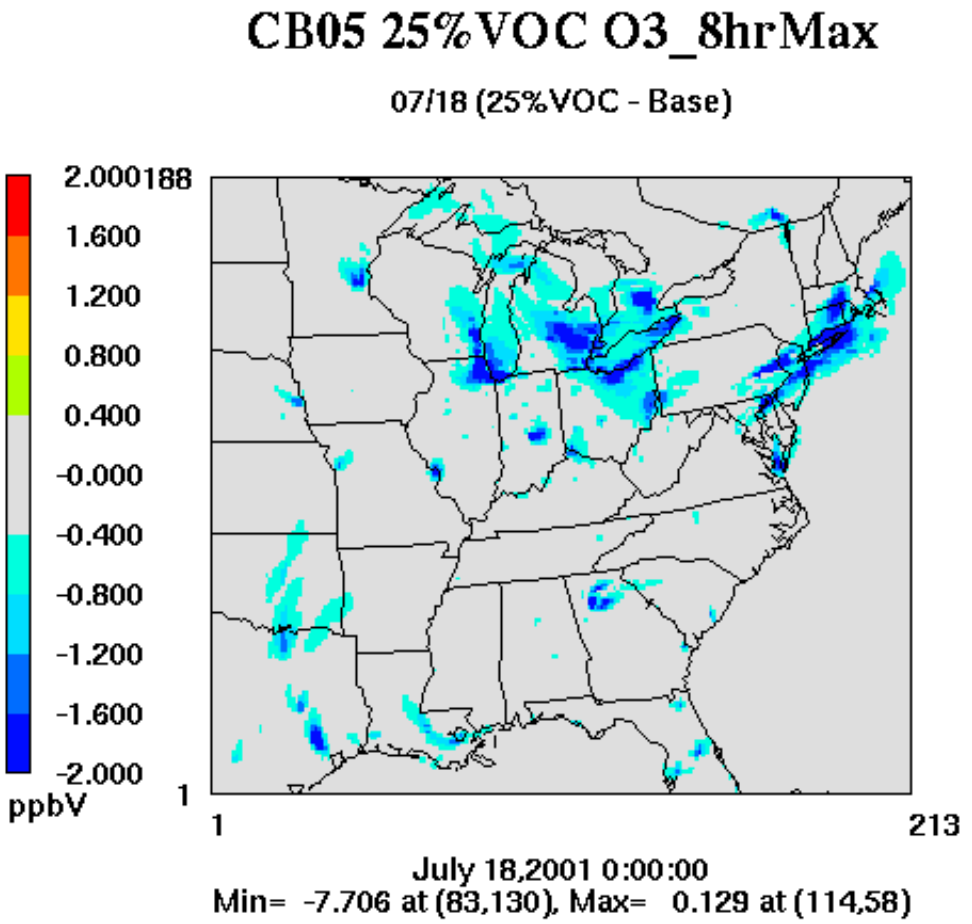
PM NAAQS RIA, Appendix B: Local-Scale Assessment of Primary PM2.5 for Five Urban Areas

Table 17. Summary of Modeled Source Contributions of Primary PM2.5 to Monitors with Potential Annual Exceedences in Detroit: 2015

Source Sectors	Primary PM2.5 Emissions (ton/yr)	Model Predicted Annual Concentrations (ug/m3)			
		Primary PM2.5 Contribution	15/65 Control Scenario	15/35 Control Scenario	14/35 Control Scenario
	Wayne County Monitor #261630033, Annual DV = 17.4				
Other industrial sources	1,375	0.712	0.171	0.000	0.222
CMV, Aircraft, Locomotive	638	0.540	0.191	0.000	0.000
Metal Processing	852	0.484	0.037	0.000	0.000
Onroad (gasoline and diesel)	1,187	0.336	0.000	0.025	0.025
Commercial cooking	984	0.271	0.050	0.000	0.000
Area fugitive dust	10,270	0.237	0.000	0.000	0.000
Power Sector	18,016	0.233	0.059	0.000	0.014
Other area	888	0.210	0.000	0.000	0.168
Nonroad (gasoline and diesel)	1,603	0.197	0.033	0.019	0.019
Natural gas combustion	119	0.034	0.000	0.000	0.000
Residential wood burning	703	0.026	0.005	0.000	0.000
Residential waste burning	1,741	0.015	0.000	0.000	0.007
Glass Manufacturing	334	0.010	0.000	0.000	0.000
Cement Manufacturing	700	0.009	0.009	0.000	0.000
Auto Industry	413	0.005	0.000	0.000	0.000
Prescribed/open burning	444	0.004	0.000	0.000	0.003
Point fugitive dust	15	0.001	0.000	0.000	0.000
Wildfires	51	0.001	0.000	0.000	0.000
Total, All Sources	40,333	3.324	0.556	0.043	0.459

Regional Sensitivity Analyses: Detroit

- Performed sensitivity runs: reduced emissions of VOC and NOx
- Indicated that the urban area of Detroit was more responsive to VOC reductions that NOx cuts, indicating that Detroit is in a VOC-limited regime.
- Indicates a possible ozone dis-benefit from large reductions in NOx



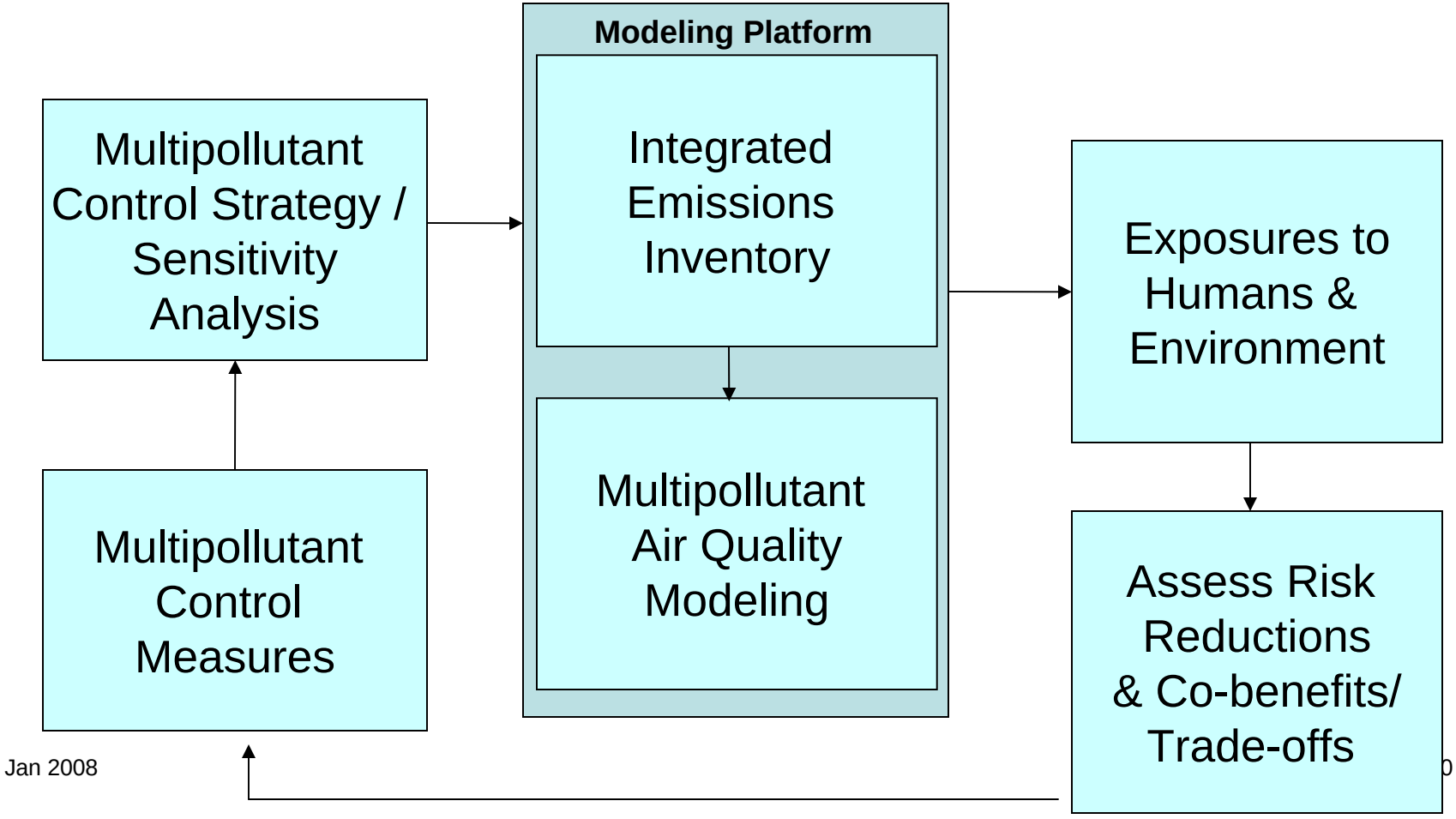
II. Develop Conceptual Model specific to Detroit MP problems

- VOC-limited regime → suggests focus on VOC controls for ozone reductions
- Important sources of PM2.5 in Detroit: metal processing, commercial cooking, residential wood burning, cement manufacturing → suggests implementing controls on these sectors
- Many problem sources are emitting PM2.5 and toxics of concern (e.g. steel mills, cement manufacturing, woodstoves) → suggests potential co-control opportunity
- High PM soil (primary) component at Dearborn and Allen Park → suggests focus on controlling local sources
- Large mobile source component contribution suggested by receptor modeling → suggests implementing potential controls (could have co-benefits for O3, PM, & toxics (e.g. benzene, formaldehyde))

Chapters III & IV: Detroit Analysis

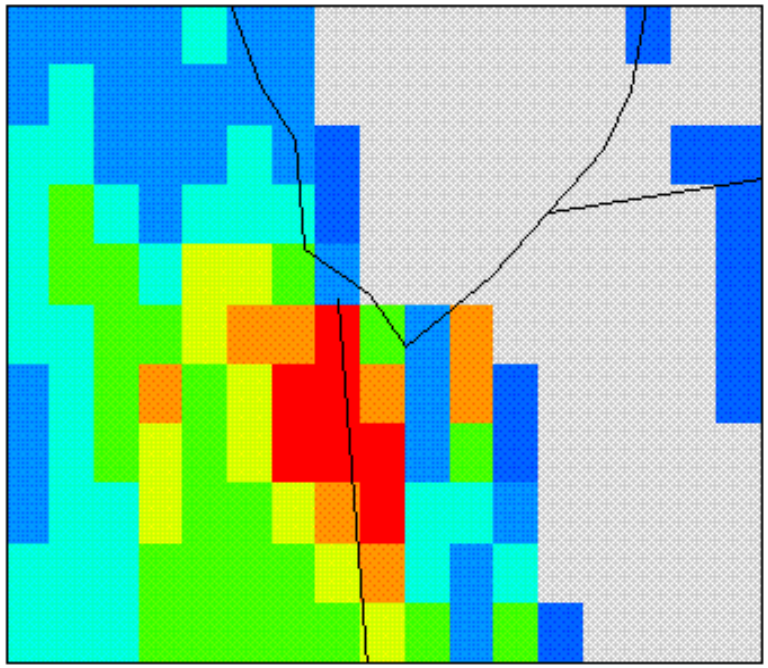
- Because this is a illustrative example with focus on the technical aspects of a AQMP, the following slides discuss the ongoing implementation of the multipollutant technical framework
  - Components of the framework
  - Improvements of tools
  - Improved data collection
  - Control strategy selection and analyses
  - Risk and benefits assessment
- When this work is completed, we will use a set of environmental indicators to compare and contrast the different control strategy implementations based on:
  - Air quality (taking into account predicted AQ at monitored locations, as well as AQ with respect to population)
  - Change in benefits for O3, PM, & benzene
  - Risk Assessment
  - Economics
  - Additional environmental benefits (e.g. deposition, ecology, etc.)

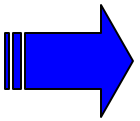
Analytical Framework for a Multipollutant Analysis

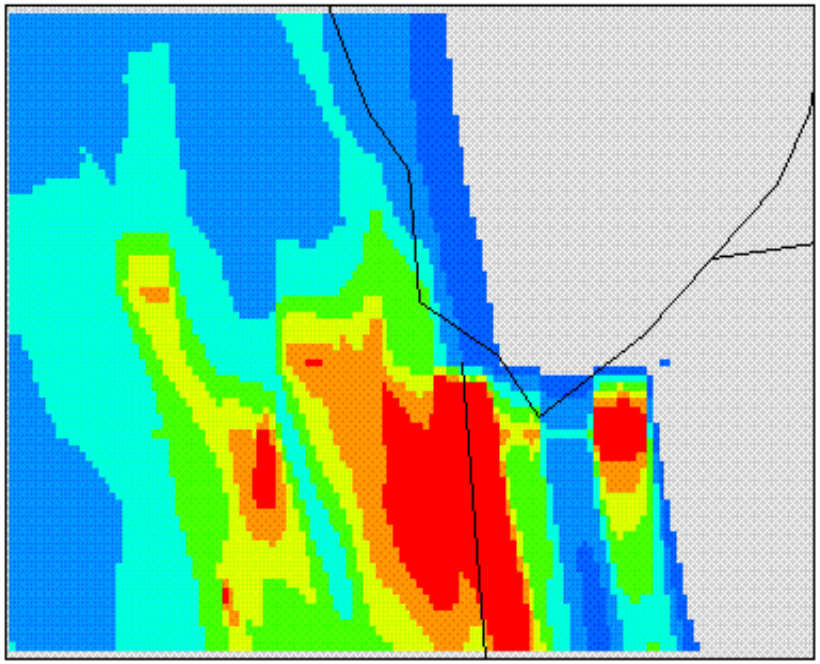


Air Quality Modeling: Fine-scale Resolution

Potential important hotspots are missed in regional-scale model run







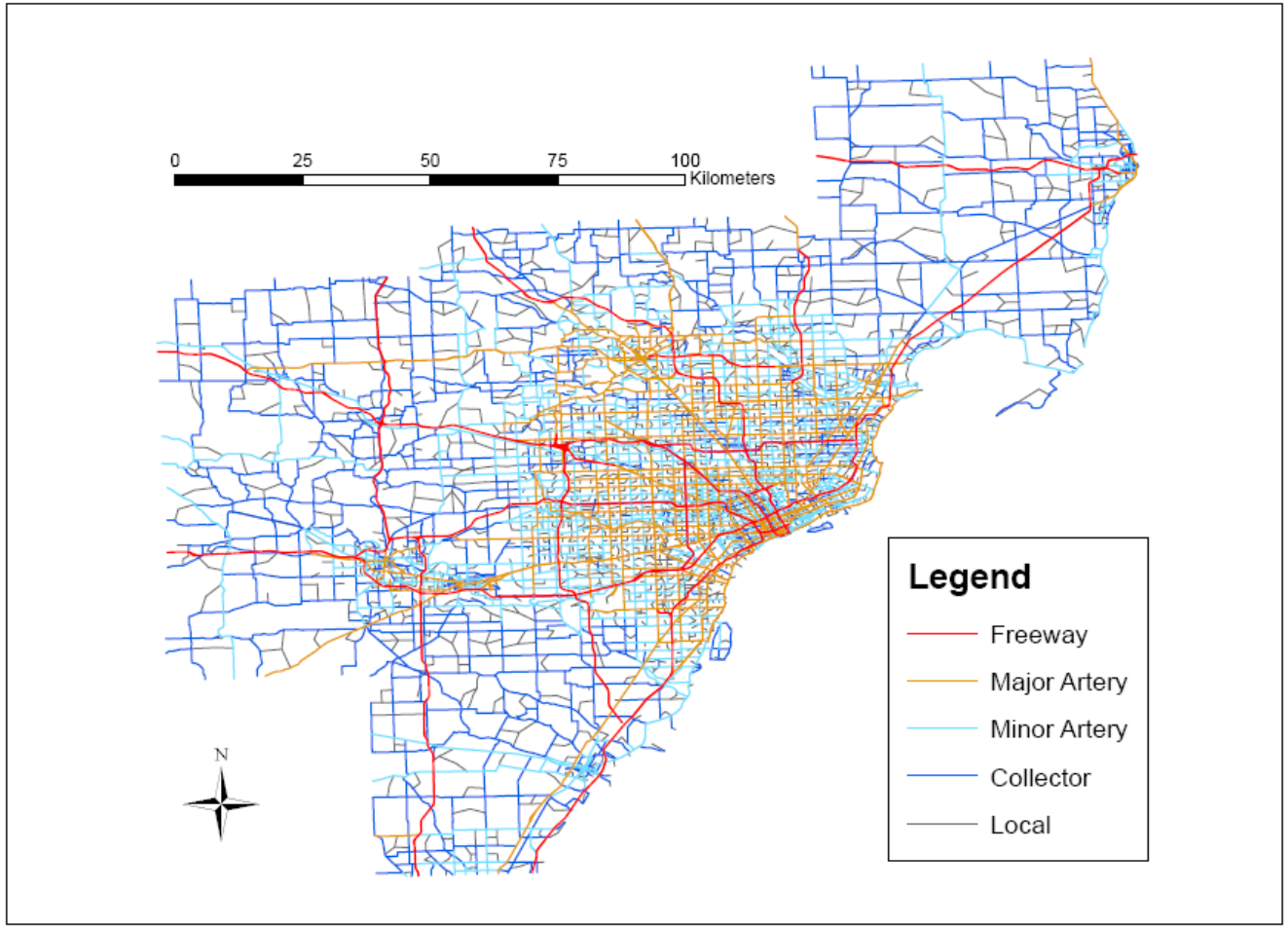
Regional-scale:12 km grids

Local-scale:1 km grids

Emissions Inventory & Processing

- Purpose/Goal
  - Provide 2002 integrated EI (criteria & toxics) that can be used for regional & local-scale AQ assessments.
- Plans
  - 2002 NEI: Integrated CAPs & HAPs
  - v3.0 with Detroit improvements (including emissions & control data from Detroit Steel Mill Study)
  - Link-based mobile emissions for criteria & toxics using CONCEPT (Generates gridded, hourly, link-level emissions by vehicle class using highly resolved temporal profiles for traffic volume and VMT mix)
  - 1 km spacial surrogates and other improved land use based inventory data

Link-based mobile Emissions for Detroit Area: SEMCOG Network

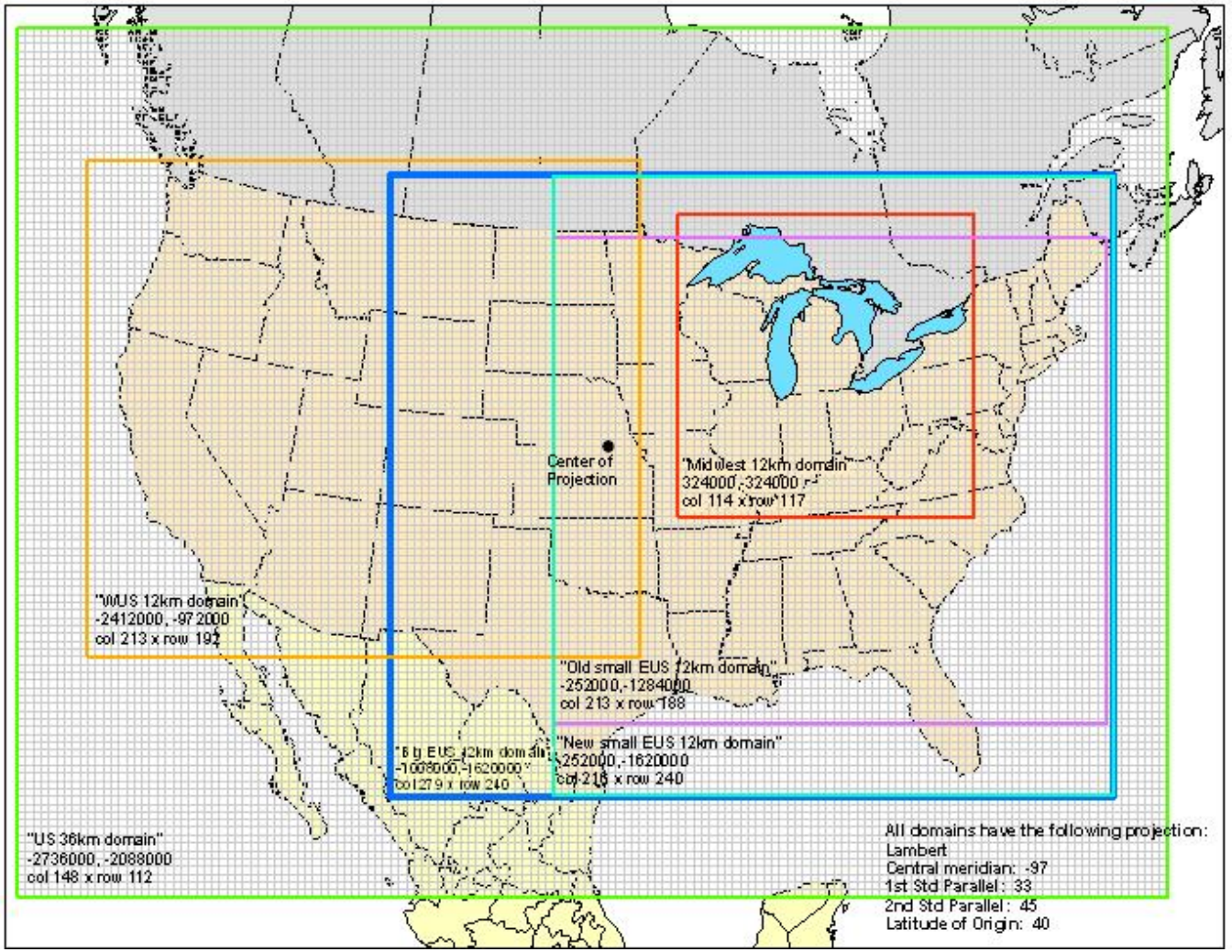


Source: Alison Pollack of ENVIRON International Corporation

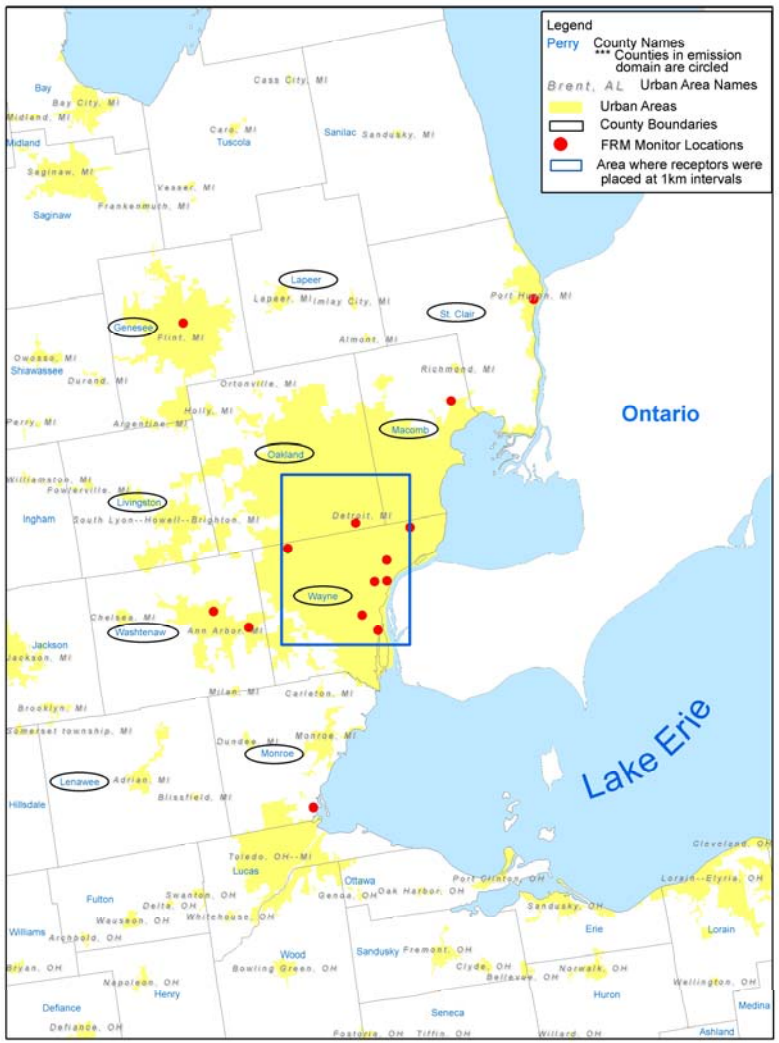
Air Quality Modeling

- Purpose/Goal
  - Assess regional- and local-scale air quality for criteria and toxics pollutants in "one-atmosphere" manner for Detroit area
- Plans
  - Produce multi-resolution (12km & 1km) modeled output of criteria and toxic pollutants
  - Use "one-atmosphere" version of CMAQ released by ORD to model criteria and ~ 40 toxics
  - Analyze local impact of selected toxics and direct PM using AERMOD dispersion model to better understand & account for contribution of local sources
  - Use "hybrid approach" to combine CMAQ and AERMOD results for 2002 and evaluate performance

CMAQ 36 & 12km Domains

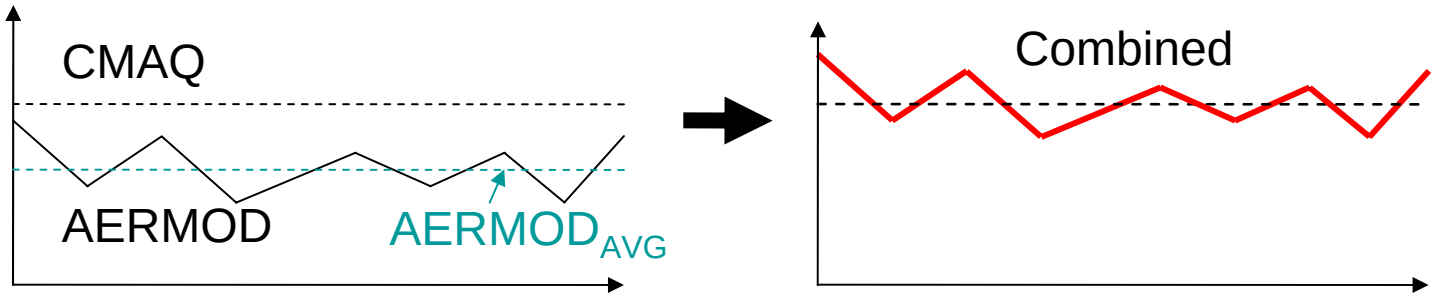


AERMOD Receptor Domain

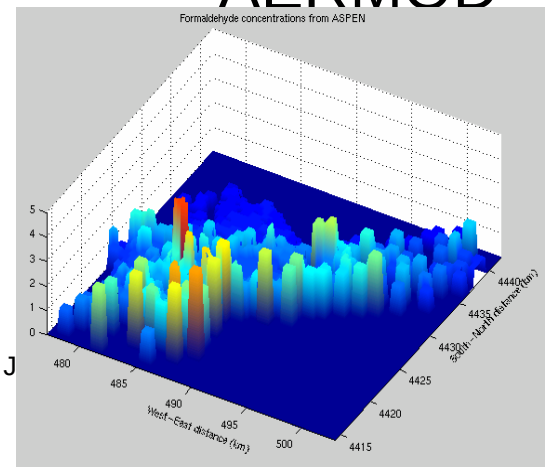


Air Quality Modeling: "Hybrid approach"

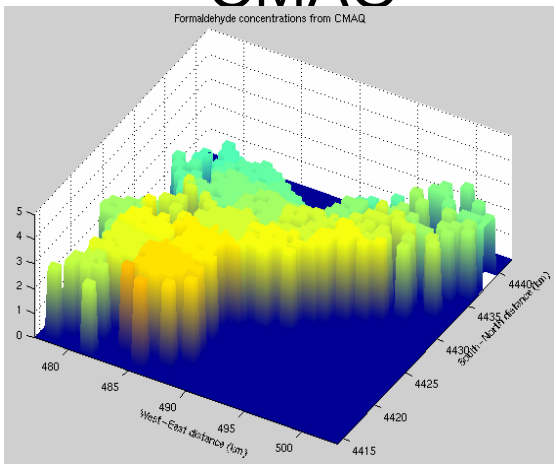
- Allows preservation of the granular nature of AERMOD while properly treating chemistry/transport offered by CMAQ.
- Generates local gradients incorporating the advantages of both the dispersion & photochemical models into one combined model output (via post-processing)



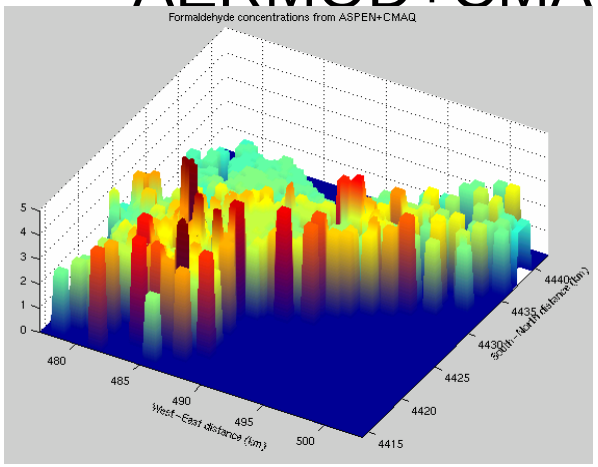
AERMOD



CMAQ



AERMOD+CMAQ



Control Strategy: Control Database

- Purpose/Goal
  - Provide control database with multipollutant control information and use this information to populate Control Strategies
- Plans
  - Use control data available in AirControlNet
  - Worked with EPA source-specific engineers to "multipollutanize" the control database needed for Detroit
  - Data will eventually go into the Control Strategy Tool (CoST), which will be a tool for integrated emissions and control strategies analysis and will include multipollutant control and cost information
  - Develop Control Strategies 1 & 2 (Defined on next slide)

Control Strategy: Sensitivity Analysis

- Purpose/Goal
  - Assess the sensitivity and responsiveness of modeled predictions to the implementation of specific multipollutant control scenarios for Detroit area in "one-atmosphere" manner
- Plans
  - 2020 with national rules
  - Control Strategy 1: "Status Quo"
    - Use controls for Detroit from illustrative NAAQS 2015 PM2.5 15/65 control scenario as presented in the recent PM2.5 RIA
    - Use list of controls consistent with those provided in Detroit O3 SIP Strategy Plan
  - Control Strategy 2: "Multipollutant Based"
    - Develop a multiple pollutant control strategy based on available "multipollutanized" PM2.5 & O3 control measures and knowledge of AQ issues in the Detroit area
    - This strategy should achieve PM2.5, O3, and air toxic reductions.

Exposure/Risk/Benefits

- Purpose/Goal
  - Provide information to quantify "co-benefits" and make decisions in multipollutant context
  - Evaluate impacts of specified control scenarios with existing risk and benefits approaches
  - Allow for consideration of toxics and criteria pollutant "effects" (i.e., co-benefits and trade-offs) as part of multipollutant control strategy development
- Plans
  - Not able to aggregate and/or compare air quality changes in O3, PM, and HAPs so need to define metrics from exposure/risk/benefits assessment
  - Define tools and approach needed to identify and evaluate health benefits from criteria pollutant reductions and risk reductions from air toxics in order to evaluate 'trade-offs'
    - Health benefits: BenMAP
    - Exposure/risk tools: HEM, HAPEM
    - Work to add eco-systems, deposition

Summary

- Detroit project will provide a report detailing the application of the MP framework to this area and illustrating how this information can support development of a MP AQMP
- Steps in a MP AQMP
  - Start by putting together a current summary of AQ issues – This may seem an elementary activity but rarely are all AQ data summarized in one location and discussed relative to one another
  - Using the AQ data summary, identify key AQ "facts" for your area – use these data to form a conceptual model for the area detailing the implications of these "facts" on policy options
  - Based on this foundation of technical and policy-related information, determine and perform additional analyses which are needed to define the Air Quality Management Strategy for your area
  - Select and evaluate applicable multipollutant control measures – this task would conclude when a final set of control measures are selected that achieve "stated" air quality goals

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