

# Proposed Regulatory Framework Kentucky Air Toxic Program

---

Presentation to:  
Air Toxics Workgroup  
September 23, 2005

Environmental & Public Protection Cabinet  
Department for Environmental Protection  
Division for Air Quality



*To Protect and Enhance Kentucky's Environment*

# Overview of Today's Presentation

---

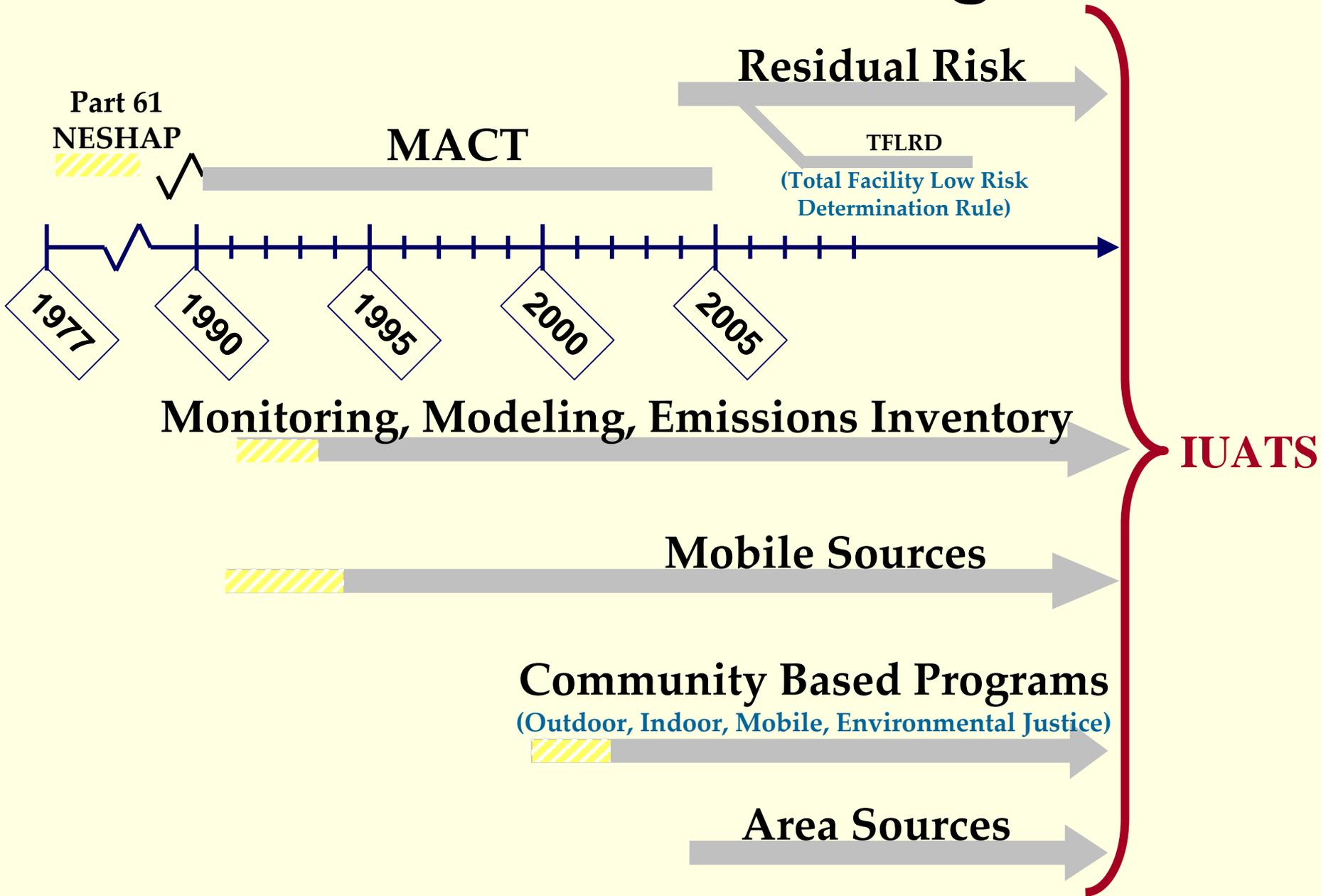
- # National Control Strategy
- # Kentucky's Current Air Toxics Program
- # Proposed Air Toxics Regulatory Framework
  - Applicability
  - Toxic Air Pollutants of Concern (TAPs)
  - Development of Benchmark Concentrations
  - Screening/Modeling/Risk Assessment Process
  - Air Toxics Risk Assessment Reference Library
  - Safety Net Program
  - Science & Technology Advisory Panel
  - Voluntary Program

# Kentucky Air Toxic Program

---

## National Control Strategy

# Federal Air Toxics Programs



# Integrated Urban Air Toxics Strategy (IUATS)

---

- ✦ Complements the existing national efforts by focusing on achieving further reductions in air toxics emissions in urban areas.
- ✦ Outlines actions to reduce emissions of air toxics, as well as assessment activities to improve EPA's understanding of the health and environmental risks posed by air toxics in urban areas.
- ✦ Includes a list of 33 air toxics (a subset of the 188 HAPs listed in CAA §112(b)) that pose the greatest potential health threat in urban areas.

# Integrated Urban Air Toxics Strategy (IUATS)

---

- ✦ Draws on the National Air Toxics Assessment (NATA), EPA's ongoing comprehensive evaluation of air toxics in the U.S.
- ✦ Includes implementation of State/Local/Tribal involvement.
- ✦ Uses of the term "urban" broadly as the Strategy impacts many "rural" areas in addition to urban.
- ✦ Is the most comprehensive data estimates developed to date.

# Kentucky's Current Air Toxics Program

---

+ 401 KAR 63:020

+ 401 KAR 63:021

# Kentucky's Current Air Toxics Control Strategy

---

- ✦ The Cabinet ensures that Kentucky industries comply with the limits on HAP emissions established under the Clean Air Act.
- ✦ A source that is subject to a Part 61 /Part 63 NESHAP must comply with the federal standard but is exempt from 401 KAR 63:020 for the pollutants that are covered by the NESHAP.
- ✦ Under 401 KAR 63:020, DAQ may require sources to model air toxic emissions to demonstrate that the source does not cause an increased cancer risk greater than  $1 \times 10^{-6}$ .
- ✦ 401 KAR 63:021 contains anti-backsliding provisions.

# Kentucky Air Toxic Program

---

## Proposed Air Toxics Regulatory Framework

## Q: What is included in the proposed program?

---

- ✚ Risk screening/evaluations for 33-HAPs
- ✚ Enhanced reporting/recordkeeping for all 188-112(b) HAPs
- ✚ Carcinogens and non-carcinogens
- ✚ Safety Net Program (*includes much of the authority the Cabinet previously exercised under 401 KAR 63:020*)
- ✚ Air Toxics Science & Technology Advisory Panel (KSTAP)
- ✚ Leadership Program (voluntary measures)

## Q: What is **NOT** included in the proposed program?

---

- ✦ Non-inhalation exposures, such as ingestion and dermal exposures
- ✦ A geographic initiative to evaluate risks from multiple sources on a local/regional level – (*except as provided in the Safety Net Program on a case-by-case basis*)
- ✦ Inhalation exposures associated with indoor sources of air toxics
- ✦ Grandfathering of existing sources
- ✦ New Fees (*funding from Title V & General Fund monies*)

# Overview of Today's Presentation

---

- ✚ National Control Strategy
- ✚ Kentucky's Current Air Toxics Program
- ✚ Proposed Air Toxics Regulatory Framework

- **Applicability**

- Toxic Air Pollutants of Concern (TAPs)
- Development of Benchmark Concentrations
- Screening/Modeling/Risk Assessment Process
- Air Toxics Risk Assessment Reference Library
- Safety Net Program
- Science & Technology Advisory Panel
- Voluntary Program

# APPLICABILITY

---

- ✚ New sources, existing sources, and significant modifications at existing sources are subject to the proposed program.
  
- ✚ Applicability is based on the source-wide air emissions from on-site equipment at each source. Fugitive emissions will be included if quantifiable.
  
- ✚ Sources will be evaluated to determine whether their emissions exceed an established acceptable risk for the 33 TAPs (and additional TAPs as added to the list) and for HAPs at identified safety net sources.

# APPLICABILITY

---

A source that is subject to this program is any source that:

- 1) Emits a toxic air pollutant;
- 2) Is permitted or otherwise covered by a regulation in 401 KAR Chapter 52; and
- 3) Is not excluded for evaluation.

## Exclusions

- 1) Source that is subject to a MACT/federal residual risk rule for the covered pollutant(s) – unless covered by the safety net program; and
- 2) Source with de minimis level emissions (specific to each TAP).

# APPLICABILITY

---

## Significant Modification

Physical change in, or change in the method of operation of, a source, which:

- (1) Increases the emissions of a toxic air pollutant so that the emissions at the source are above the de minimis level;
- (2) Increases the amount of a toxic air pollutant emitted into the atmosphere for a source that is already over the de minimis level;  
or
- (3) Results in the emission (above the de minimis) of a toxic air pollutant into the atmosphere not previously emitted.

# Tiering of Requirements

---

- 1) Exempted sources
- 2) Exemption of de minimis sources and insignificant/trivial activities
- 3) Screening with look-up tables & approved inhalation models
- 4) Inhalation Risk Assessment for sources exceeding a benchmark concentration
- 5) Sources with Risk below  $10^{-6}$ /HQ-1 exit with reporting/recordkeeping
- 6) Sources with Risk between  $10^{-6}$  and  $10^{-4}$  are subject to TAP-BACT
- 7) Sources with Risk above  $10^{-4}$  must reduce emissions below  $10^{-4}$  and are subject to TAP-BACT

# Overview of Today's Presentation

---

- ✚ National Control Strategy
- ✚ Kentucky's Current Air Toxics Program
- ✚ Proposed Air Toxics Regulatory Framework
  - Applicability
  - **Toxic Air Pollutants of Concern (TAPs)**
  - Development of Benchmark Concentrations
  - Screening/Modeling/Risk Assessment Process
  - Air Toxics Risk Assessment Reference Library
  - Safety Net Program
  - Science & Technology Advisory Panel
  - Voluntary Program

# TOXIC AIR POLLUTANTS OF CONCERN (TAPs)

---

The proposed program begins  
with a focus on  
33 toxic air pollutants  
of concern (TAPs)

# Q. What types of TAPs are included ?

---

## **Carcinogens**

- ✚ Toxicological endpoint is some type of cancer
- ✚ Weight-of Evidence Rankings:
  - known
  - probable
  - possible

## **Non-carcinogens**

Toxicological endpoints other than cancer

# Q: How were the 33 TAPs chosen ?

---

- ✦ The 33-TAPs mirror the 33-HAPs identified in EPA's Integrated Urban Air Toxics Strategy (IUATS).
- ✦ IUATS looks at 33 HAPs EPA identified in 1999 as potentially posing the greatest threat to public health in the largest number of urban areas.
- ✦ The 33-TAPs is a subset of the CAA §112(b) list of 188-HAPS.



# Q: What compounds are included in the 33 TAPs ?

acetaldehyde  
acrolein  
acrylonitrile  
arsenic compounds  
benzene  
beryllium compounds  
1,3-butadiene  
cadmium compounds  
carbon tetrachloride\*  
chloroform  
chromium compounds  
coke oven emissions\*  
1,2-dibromoethane\*  
1,2-dichloropropane(propylene dichloride)  
1,3-dichloropropene  
ethylene dichloride  
(1,2-dichloroethane)

ethylene oxide  
formaldehyde  
hexachlorobenzene  
hydrazine  
lead compounds  
manganese compounds  
mercury compounds  
methylene chloride (dichloromethane)  
nickel compounds  
polychlorinated biphenyls (PCBs)  
polycyclic organic matter (POM)  
quinoline  
2,3,7,8-tetrachlorodibenzo-p-dioxin  
1,1,2,2-tetrachloroethane  
tetrachloroethylene (perchloroethylene)  
trichloroethylene  
vinyl chloride

*Note: Diesel PM is not included*

# Identifying TAPs in Regulation

## ✚ Criteria used by EPA to identify NATA Pollutants

- 1) Effects
- 2) Exposure and number of people at risk
- 3) Impact on sensitive human populations
- 4) Number and degree of benchmark concentration exceedances (NATA benchmarks as point of reference)
- 5) Potential to cause harm through persistence or bioaccumulation

## ✚ Criteria for addition/revision to the 33-TAP List

# Remaining §112(b) HAPs

While the 33-HAPs and diesel PM identified in IUATS are expected to dominate the inhalation risks from outdoor sources of air toxics, the remaining hazardous air pollutants can also contribute to risks, especially in localized areas around individual sources.

Therefore, the proposal includes provisions to enhance the reporting and recordkeeping for all 188 CAA §112(b)HAPS.

# Overview of Today's Presentation

---

- ✚ National Control Strategy
- ✚ Kentucky's Current Air Toxics Program
- ✚ Proposed Air Toxics Regulatory Framework
  - Applicability
  - Toxic Air Pollutants of Concern (TAPs)
  - **Development of Benchmark Concentrations**
  - Screening/Modeling/Risk Assessment Process
  - Air Toxics Risk Assessment Reference Library
  - Safety Net Program
  - Science & Technology Advisory Panel
  - Voluntary Program

# Benchmark Concentrations

- ✚ Are pollutant specific and will be enacted in a separate regulation
- ✚ Utilize the Hierarchy established in EPA's Prioritized Chronic Dose-Response Values (PDRVs) Tables
- ✚ Selected to represent the concentration of an air toxic in outdoor air that would result in:
  - **A cancer risk =  $1 \times 10^{-6}$**
  - **A non-cancer threshold (HQ) = 1.0**
- ✚ Will be used for:
  - ✚ A Simple comparison of a source-specific modeled concentration of an HAP to its acceptable concentration; and
  - ✚ Risk assessments with location-specific modeled or ambient monitored estimates of concentration

# TAP Benchmark Set

| Chemical Name                                | CAS NO.    | HAP NO. | Noncancer benchmark<br>(mg/m <sup>3</sup> ) | Cancer Benchmark<br>(µg/m <sup>3</sup> ) |
|--|------------|---------|---|--|
| acetaldehyde                                 | 75-07-0    | 1       | 0.009                                       | 4.5E-01                                  |
| acrolein                                     | 107-02-8   | 6       | 0.00002                                     |  |
| acrylonitrile                                | 107-13-1   | 9       | 0.002                                       | 1.5E-02                                  |
| arsenic compounds                            | 7440-38-2  | 174     | 0.00003                                     | 2.3E-04                                  |
| arsine                                       | 7784-42-1  | 174     |   |  |
| benzene                                      | 71-43-2    | 15      | 0.03  | 1.3E-01                                  |
| beryllium compounds                          | 7440-41-7  | 175     | 0.00002                                     | 4.2E-04                                  |
| 1,3-butadiene                                | 106-99-0   | 23      | 0.002                                       | 3.3E-02                                  |
| cadmium compounds                            | 7440-43-9  | 176     | 0.00002                                     | 5.6E-04                                  |
| carbon tetrachloride                         | 56-23-5    | 29      | 0.19  | 6.7E-02                                  |
| chloroform                                   | 67-66-3    | 39      | 0.098                                       |  |
| chrome (III)                                 | 16065-83-1 | 177     |   |  |
| chromium (VI) compounds                      | 18540-29-9 | 177     | 0.0001                                      | 8.3E-05                                  |
| chromium (VI) trioxide,<br>chromic acid mist | 11115-74-5 | 177     | 0.000008                                    |  |

Example of a table that may be adopted in a regulation in the proposed program.

# PDRVs

---

- ✚ The proposal uses EPA's Prioritized Chronic Dose-Response Values (PDRVs) to calculate benchmark concentrations for air toxics.
- ✚ "Prioritized" means:

# Hierarchy of Dose Response Values used in EPA's Prioritized Chronic Dose Response Values (PDRV) Tables



## IRIS Values

<http://www.epa.gov/iris/subst/index.html>



## Health Effects Assessment Summary Tables (HEAST)

Included in IRIS



## ATSDR Chronic MRLs & Draft MRLs

Agency for Toxic Substances and Disease Registry  
ONLY available for noncancer effects

<http://www.atsdr.cdc.gov/mrls.html>



## CalEPA Chronic RELs and UREs

California Environmental Protection Agency

[http://www.oehha.ca.gov/air/hot\\_spots/index.html](http://www.oehha.ca.gov/air/hot_spots/index.html)



## International Agency for Research on Cancer (IARC)

Sponsored by the World Health Organization

<http://monographs.iarc.fr/>

## Q: How will Dose-Response Values be used?

---

To calculate benchmark concentrations for air toxics the proposal uses EPA's Prioritized Chronic Dose-Response Values (PDRVs).

- ✚ Benchmark concentrations for carcinogenic TAPs use: unit risk estimates (UREs)
- ✚ Benchmark concentrations for non-carcinogenic TAPs use: reference concentrations (RfCs)

# Benchmark Concentrations for Carcinogens

... the concentration of an air toxic in outdoor air that would result in an excess lifetime cancer risk level of one in a million ( $1 \times 10^{-6}$ ).

$$\mathbf{Risk = C_{air} \cdot URE = 1 \times 10^{-6}}$$

Unit risk estimate (URE) 1/ ( $\mu\text{g}/\text{m}^3$ )

- # Upper-bound excess lifetime cancer risk estimated to result from continuous exposure of an agent at  $1 \mu\text{g}/\text{m}^3$  in air, meaning they represent a plausible upper limit to the true value. (Note that this is usually not a true statistical confidence limit.) The true risk is likely to be less, but could be greater.
- # The interpretation of the Unit Risk Estimate would be as follows: if the Unit Risk Estimate =  $1.5 \times 10^{-6}$  per  $\mu\text{g}/\text{m}^3$ , 1.5 excess tumors are expected to develop per 1,000,000 people if exposed daily for a lifetime to  $1 \mu\text{g}$  of the chemical in 1 cubic meter of air.

# Benchmark Concentrations for Non-carcinogens

... the concentration of an air toxic in outdoor air that would result in a non-cancer hazard Quotient of one.

$$HQ = \frac{C_{air}}{RfC} = 1$$

## Reference concentration (RfC)

- ✦ No appreciable risk of harmful effects during a lifetime of continuous inhalation exposure
- ✦ Estimate of a continuous inhalation exposure to the human population (including sensitive subgroups such as children, asthmatics and the elderly) that is likely to be without an appreciable risk of deleterious effects during a lifetime.
- ✦ Can be derived from various types of human or animal data, with uncertainty factors generally applied to reflect limitations of the data used.

# Overview of Today's Presentation

---

- ✚ National Control Strategy
- ✚ Kentucky's Current Air Toxics Program
- ✚ Proposed Air Toxics Regulatory Framework
  - Applicability
  - Toxic Air Pollutants of Concern (TAPs)
  - Development of Benchmark concentrations
  - **Screening/Modeling/Risk Assessment Process**
  - Air Toxics Risk Assessment Reference Library
  - Safety Net Program
  - Science & Technology Advisory Panel
  - Voluntary Program

# Modeling & Risk Assessment

Performed by the source



The diagram shows a vertical spring-mass system. A coiled spring is attached to a fixed horizontal support at the top. A rectangular mass is suspended from the bottom of the spring. The entire system is enclosed in a rectangular box. Below the box is the label (b).

$E = \left( \sum_{i=1}^n \frac{1}{E_i} \right)^{-1}$

Reviewed by the Division

$\eta = \left( \sum_{i=1}^n \frac{1}{\eta_i} \right)^{-1}$

(b)

# Modeled Concentrations - MEI

---

## Point of maximum modeled concentration (maximum exposed individual – MEI)

---

### for Screening Analysis

- ✚ High-end modeling node where the maximum concentration occurs, regardless of whether there is a person there or not.
- ✚ An estimate of the highest offsite annual average concentration – for chronic effects from exposure to a substance that occurs over a long period of time (more than 1 year)

*(Air Toxics Risk Assessment Reference Library, Volume 1, Technical Resource Manual: Part II human Health Risk Assessment: Inhalation, Chapter 11.2.2)*

# Modeled Concentrations - MIR

---

**Point of maximum modeled concentration  
at an actual receptor location**  

---

**(maximum individual risk – MIR)**

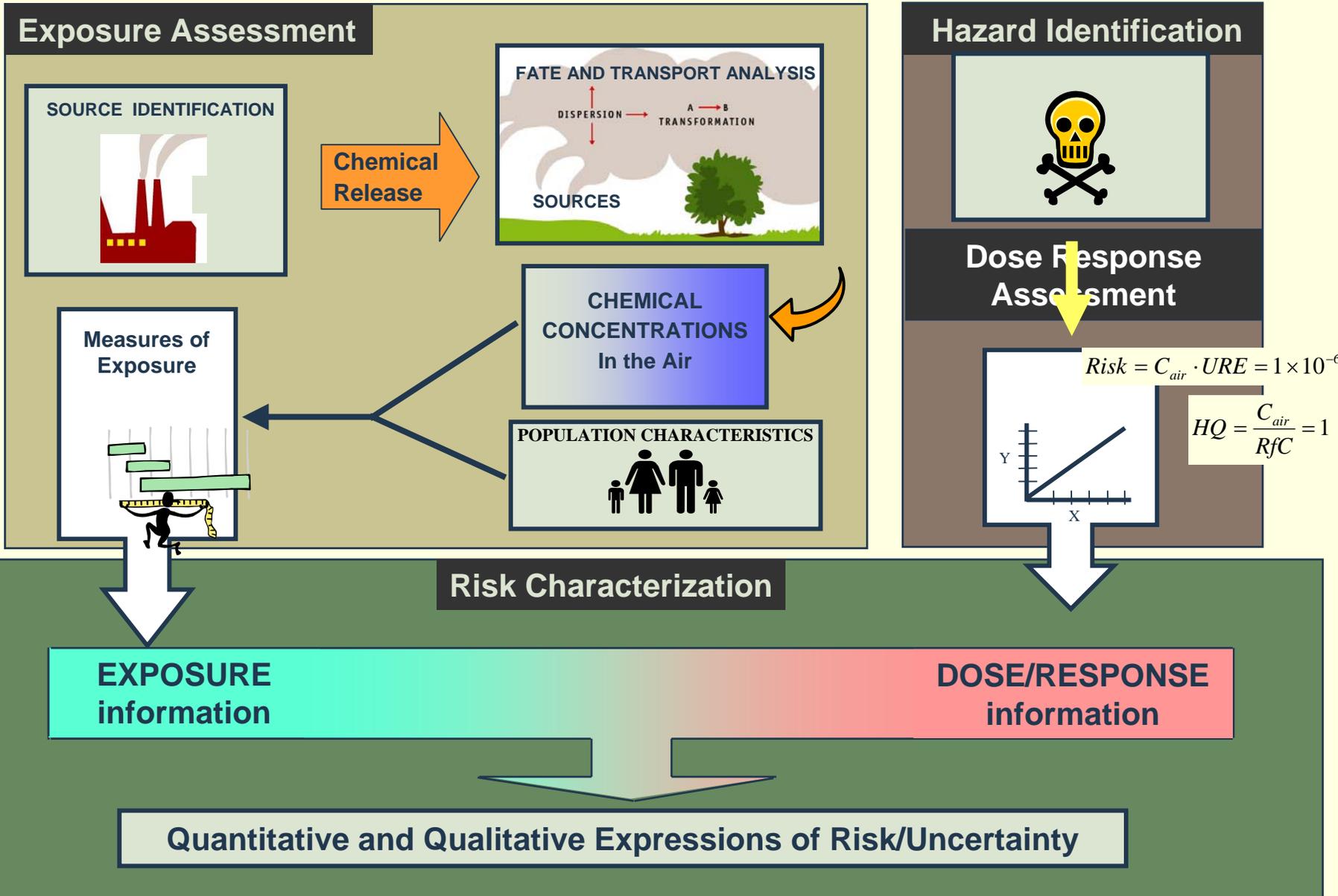
for  
Risk Assessment Purposes

- ✚ High-end modeling node where the maximum concentration occurs to an actual person in the area of impact, usually an actual residence.
- ✚ To identify this point precisely, it is necessary to know detailed information about the location of actual people in the study area.
- ✚ Highest offsite annual average concentration – for chronic effects from exposure to a substance that occurs over a long period of time (more than 1 year)

*(Air Toxics Risk Assessment Reference Library, Volume 1, Technical Resource Manual: Part II human Health Risk Assessment: Inhalation, Chapter 11.2.2)*

# Detailed Air Toxics Risk Assessment Process

## Planning/Scoping/Problem Formulation





# Overview of Today's Presentation

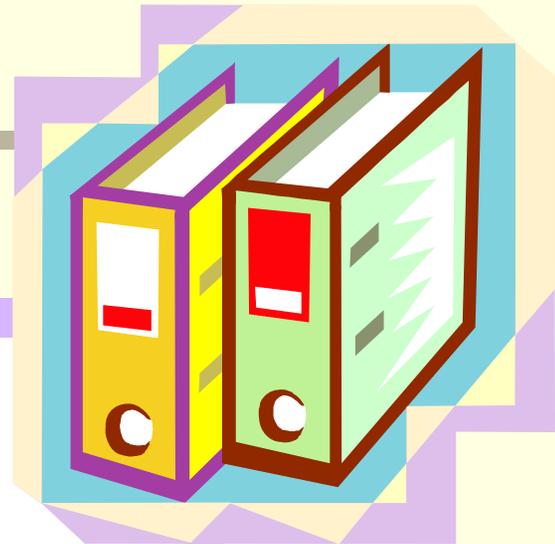
---

- ✚ National Control Strategy
- ✚ Kentucky's Current Air Toxics Program
- ✚ Proposed Air Toxics Regulatory Framework
  - Applicability
  - Toxic Air Pollutants of Concern (TAPs)
  - Development of Benchmark concentrations
  - Screening/Modeling/Risk Assessment Process
  - **Air Toxics Risk Assessment Reference Library**
  - Safety Net Program
  - Science & Technology Advisory Panel
  - Voluntary Program

# Air Toxics Risk Assessment (ATRA) Reference Library

OAR is developing methods for conducting facility-specific and community scale assessments

- Volume 1:** Technical Resource Manual
- Volume 2:** Facility-specific Assessment
- Volume 3:** Community-Level Assessment



[http://www.epa.gov/ttn/fera/risk\\_atra\\_main.html](http://www.epa.gov/ttn/fera/risk_atra_main.html)

# Q: Who will use the Library ?

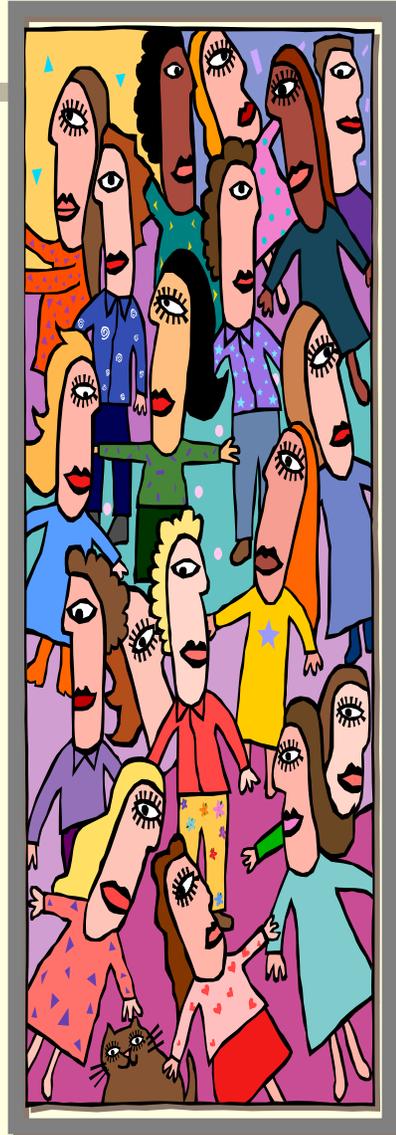
## ✚ Residual Risk (RR) Assessments

- OAQPS staff performing analyses to develop RR rules
- State/local/tribal (SLT) staff reviewing facility-specific RR assessments
- Regional risk assessors reviewing (or assisting SLT review of) facility-specific RR assessments

## ✚ OAQPS staff performing source category delisting analyses

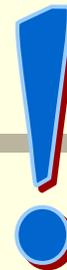
## ✚ Community-Level Multisource Assessments

## ✚ Others



# What the Library is NOT . . .

## A Regulation



- ✦ It does not constitute an EPA rulemaking and cannot be relied upon to create a substantive or procedural rights enforceable by any party in litigation with the United States.
- ✦ EPA may take action that differs with the recommendations and procedures in the manual and may change them at any time without public notice.

*EPA recognizes that other methods may be valid, but generally considers assessments that conform to the Library's recommendations to constitute "best science."*

*It's up to the reviewing authority to determine if alternate procedures are SCIENTIFICALLY ACCEPTABLE AND ADEQUATELY PROTECTIVE.*

# Overview of Today's Presentation

---

- ✚ National Control Strategy
- ✚ Kentucky's Current Air Toxics Program
- ✚ Proposed Air Toxics Regulatory Framework
  - Applicability
  - Toxic Air Pollutants of Concern (TAPs)
  - Development of Benchmark concentrations
  - Screening/Modeling/Risk Assessment Process
  - Air Toxics Risk Assessment Reference Library
  - **Safety Net Program**
  - Science & Technology Advisory Panel
  - Voluntary Program

# Safety Net Program

---

The Safety Net Program is for Cases of High Risk Emissions where:

- ✦ A source's air toxics emissions are not controlled by a regulation
- or**
- ✦ Unacceptable risk remains after application of other regulations
- or**
- ✦ Ambient monitoring or modeling data show concentrations above benchmarks in the vicinity of the source, and human exposure at these levels can occur
- or**
- ✦ The source's emissions alone or in combination with other sources can be shown to be causing or contributing to the exceedance of a benchmark concentration or PDRV.

## Q: How is a Source or Region identified to be evaluated under the Safety Net Program ?

---

- ✦ The Division selects and proposes Safety Net Sources.
- ✦ Selection is based on a single pollutant exceeding the benchmark concentration or PDRV.
- ✦ The source may be subject to a federal rule, which does not address (or completely address) control for the air toxic that poses potential for harm.
- ✦ Local/regional initiatives may be addressed under the safety net program.

## Q: What Level of Control is required by the Safety Net ?

---

If a source is identified for evaluation under the air toxics program, the source's emissions and risk will be evaluated under the program and the appropriate level of control will be applied if necessary.



# Overview of Today's Presentation

---

- ✚ National Control Strategy
- ✚ Kentucky's Current Air Toxics Program
- ✚ Proposed Air Toxics Regulatory Framework
  - Applicability
  - Toxic Air Pollutants of Concern (TAPs)
  - Development of Benchmark concentrations
  - Screening/Modeling/Risk Assessment Process
  - Air Toxics Risk Assessment Reference Library
  - Safety Net Program
  - **Science & Technology Advisory Panel**
  - Voluntary Program

# Kentucky Air Toxics Science & Technology Advisory Panel (KSTAP)

---

7 - 9 members panel representing 6 specific technical disciplines related to air toxics:

- ✦ Toxicology
- ✦ Environmental science or engineering
- ✦ Risk assessment
- ✦ Epidemiology & biostatistics
- ✦ Public health medicine
- ✦ Air pollution modeling, monitoring, meteorology or engineering



# Kentucky Air Toxics Science & Technology Advisory Panel (KSTAP)

---

- ✦ Will provide DAQ with sound scientific and technical advice
  - ✦ No delegation of Cabinet authorities
  - ✦ No management or policy recommendations
  - ✦ Not a stakeholder forum
- ✦ Formed via a 3-step selection process
  - ✦ Nominated by DAQ Director
  - ✦ Approved by DEP Commissioner
  - ✦ Appointed by EPPC Secretary
- ✦ In preparing advice and comments, the Panel may avail itself of the technical and scientific capabilities of:
  - ✦ Any State/Federal agency, and
  - ✦ Any industry or environmental group.

# Q: What are Sample Duties of KSTAP?

---

- ✦ Review benchmark concentrations
- ✦ Provide advice on development of a risk assessment methodology for the Safety Net Program
- ✦ Evaluate overall progress in reducing emissions of, and exposure to, air toxics by considering trends in emissions and ambient concentrations of air toxics
- ✦ Periodically advise DAQ on air toxics program effectiveness
- ✦ Make technical recommendations for program development with respect to: (a) adverse environmental effects of air toxics, and (b) risk from exposure to multiple air toxics
- ✦ Provide, as requested by DAQ, advisory opinions on questions requiring scientific expertise

# Overview of Today's Presentation

---

- ✚ National Control Strategy
- ✚ Kentucky's Current Air Toxics Program
- ✚ Proposed Air Toxics Regulatory Framework
  - Applicability
  - Toxic Air Pollutants of Concern (TAPs)
  - Development of Benchmark concentrations
  - Screening/Modeling/Risk Assessment Process
  - Air Toxics Risk Assessment Reference Library
  - Safety Net Program
  - Science & Technology Advisory Panel
  - **Voluntary Program**

# Voluntary Programs

## Purpose



- ✚ Develop innovative approaches to address air toxic emissions
- ✚ Identify approaches that may be less resource intensive than rulemaking

# Voluntary Programs



## Approach

- ✦ Utilize the Environmental Leadership Program (KYEXCEL) being developed by DEP.
- ✦ Model/utilize EPA's "Performance Track" program
- ✦ Refer sources to University of Louisville's P2 Program & to the Kentucky Small Business Assistance Program for assistance
- ✦ Identify business/trade associations that are receptive to voluntary approaches and work in partnership with them