Healthy Air Quality Solutions for Schools

Adapted from “Outdoor Air” by Andrea Hricko

Chapter 12 in Safe and Healthy School Environments
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Outline

How outdoor air affects schools

- Health effects
- School absences
- Transportation
- Exercise and sports practice
- School siting

Solutions

- Investigate and address sources
- Modify transportation and school buses
- What to do on bad air days
- Buffer zones
How Outdoor Air Affects Schools

- Exposure to diesel exhaust from school buses
- Outdoor exercise or sports practice
- Exposure to emissions from nearby traffic and industrial facilities
- Outdoor air becomes indoor air
Health effects of air pollution

- Asthma attacks
- New asthma cases
- Bronchitis
- Emergency room visits
- Decreased lung function
- Reduced activity

Source: Children’s Health Study, University of Southern California
Air Pollution and School Concerns
School absences

- High levels of air pollution lead to increased school absences
- In a 2001 study, twice as many children are absent from school when ozone levels exceeded the state standard
- School absences cost schools money, harm academic performance, and cause parents to miss work
Transportation

- Children transported to school in school buses, cars, walking, or biking

- Concern about high vehicle exhaust levels:
  - on freeways and roads used to get to school
  - inside school buses
  - at loading and unloading areas at the school
Exercise and Sports Practice

- When air quality is poor, exercising outdoors can be harmful to health
- Includes recess, physical education, and sports practices
Air Pollution and School Siting

- Homes and schools located near freeways have higher risk of health impacts from air pollution
- Consider air pollution when building new schools
Investigate the air pollution at the school

- What are the levels of air pollution?
- What time of day are the levels highest?
- What are nearby sources of pollution?
Investigate Student Transportation Patterns

- How do students get to school?
  - School Bus
  - Walk or bicycle
  - Drive
  - Public transportation

- Solutions
  - Relocate drop-off and pickup areas
  - Provide safe ways to walk to school
School Buses

- Conduct an inventory of the school bus fleet
- Replacement of oldest buses
- Alternative fuels
- Filters and retrofits
- Shorten bus routes
- Reduce caravanning
- Limit idling
- Keep windows open, except when following other buses or trucks
Investigate Nearby Sources

- Investigate around schools for high traffic roads or industrial facilities
- Count traffic on large roads
- Search Toxic Release Inventory database [www.epa.gov/TRI](http://www.epa.gov/TRI)
- Contact your local air district with any concerns
Information Sources

- Air Quality Management District
  www.AQMD.gov
- Air Resources Board
  www.ARB.CA.gov
- Daily air pollution information:
  www.AirNow.gov
What to do on bad air days

- Consider a system to alert students, staff, and teachers about bad air days
- Reschedule outdoor practices for team sports, cheerleading, marching band, or other groups
- Close windows and turn on air conditioning
School Siting

- California state law and air quality agencies prohibit building a new school within 500 feet of a freeway.
- Plan the school layout to locate play areas as far away from sources as possible.
How Can You Get Involved?

- **School administrators**
  Work to implement solutions such as retrofitting school buses, creating buffer zones, and rescheduling sports practices

- **Teachers, staff, and parents**
  Offer to serve on an air quality committee to assess your school’s air pollution and work on solutions

- **Councilmembers and other representatives**
  Make sure your city has incorporated buffer zones into its laws or General Plan
For more information, contact Andrea Hricko at (323) 442-3077 or ahricko@usc.edu
Information on specific air pollutants

- Show these slides if someone wants more information, or if a school has a very high level of a certain pollutant.
Key Air Pollutants

- Particulate Matter
- Nitrogen Dioxide
- Ozone
- Carbon Monoxide
- Sulfur Dioxide
- Lead
Particulate Matter

- Air pollutant that affects people’s health
- Sources: burning fuel in cars, trucks, power plants
- Divided into size categories:
  - $\text{PM}_{10}$
  - $\text{PM}_{2.5}$
  - Ultrafine
Comparison of PM$_{10}$, PM$_{2.5}$, and Ultrafine PM Coarse (2.5-10), Fine (0.1-2.5), UF (<0.1)

Human Hair (60 μm diameter)

Relative size of particles
Particles in the Body

- Particles travel with the air people breathe into the respiratory system.
- Smaller particles can go farther and lodge deeper into the lungs.
- They get into the bloodstream and brain.
Nitrogen Dioxide (NO$_2$)

- Sources: vehicle exhaust, burning fuel
- Contributes to smog
Ozone

- Formed when Nitrogen oxides react with sunlight
- Often called “smog”
- Linked with reduced lung function, asthma, and other respiratory problems
- Levels vary by season and time of day
Carbon Monoxide

- Sources: vehicle exhaust, burning fuel
- Impairs ability of body to absorb oxygen
- Linked to birth defects and low birth weight babies with high exposures
Sulfur Dioxide

- Sources: industrial facilities
- Contributes to acid rain
Lead

- Metal that has been used in water pipes, paint and gasoline (before 1970), batteries, and plastics
- Linked to neurological effects
Air Toxics

- Diesel Exhaust
- Dioxins
- Polycyclic Organic Compounds
- Acrolein
- Cigarette Smoke
Diesel Exhaust

- Sources: exhaust from diesel engines, such as trucks, trains, ships, and heavy duty equipment
- Linked to respiratory problems and increased cancer risk
Dioxins

- Sources: incinerators, hazardous waste sites, burning chlorine
- Linked to cancer and reproductive effects
Polycyclic Organic Compounds

- Sources: burning fuel, forest fires, tobacco smoke, vehicle exhaust
Acrolein

- Sources: vehicle exhaust, tobacco smoke, forest fires
- Linked with asthma exacerbation
Cigarette Smoke

- Sources: smoking, second hand smoke in outdoor areas
- Educational programs to target child and parent smoking