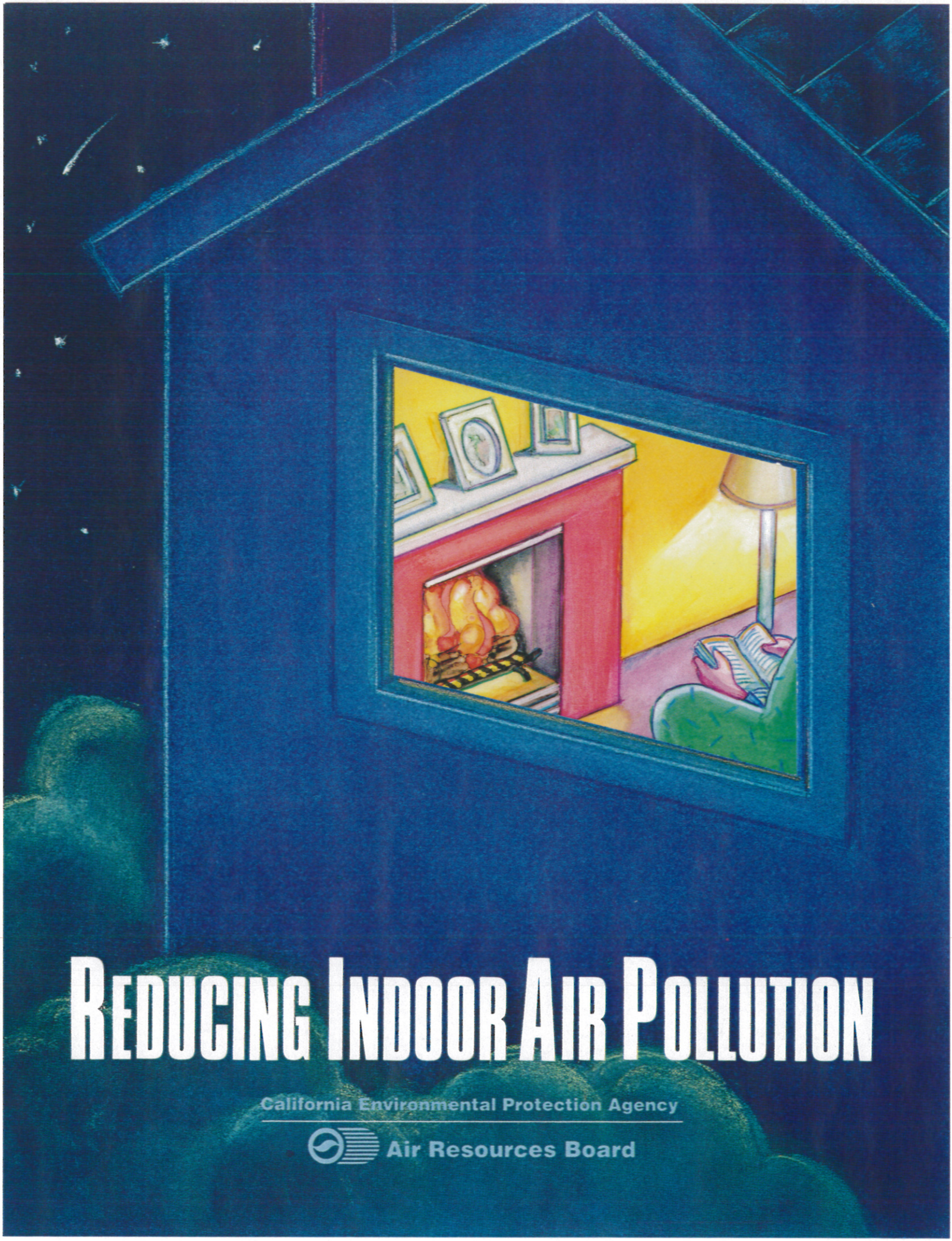


REDUCING INDOOR AIR POLLUTION

California Environmental Protection Agency

Air Resources Board

Indoor Air Pollution: A Serious Public Health Problem

We spend most of our time indoors surrounded by sources of air pollution: consumer products, gas appliances, building materials, cigarettes, and furniture can all contribute to the problem. Yet, the toxic emissions from many of these sources are not controlled or are only partially controlled by federal, state, or local laws.

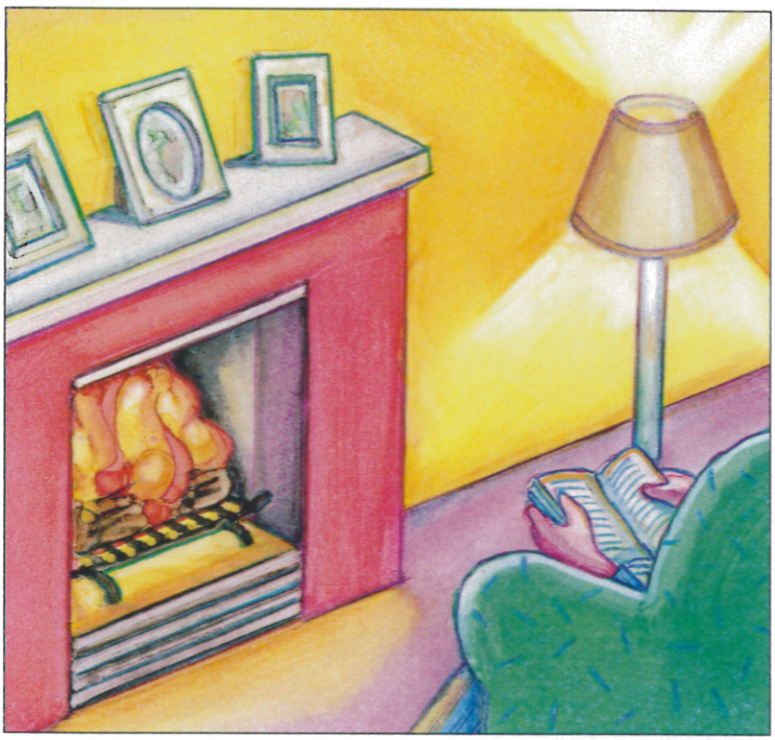
This brochure will tell you about indoor air pollution and what the California Air Resources Board (ARB) is doing about it.

Evaluating the Risk

In a 1987 study, the U.S. Environmental Protection Agency (EPA) ranked indoor air pollution fourth in cancer risk among the 13 top environmental problems analyzed. Indoor radon ranked first. What factors contribute to the high risk from indoor air pollution?

First, people spend most of their time indoors. A recent ARB-sponsored study found that Californians spend an average of 87% of their 24-hour day indoors. If pollutants are present indoors, people will almost certainly inhale them.

Second, indoor air pollutant levels are often higher than those outdoors. Research by the ARB, the EPA, and others has shown that indoor levels of some pollutants, such as formaldehyde, chloroform, and styrene, range from 2 to 50 times higher than outdoor levels. Exposure to pollutants such as environmental tobacco smoke and radon occurs almost entirely indoors. For most of us, the amount of air pollution that we breathe is primarily determined by what is in the indoor air.



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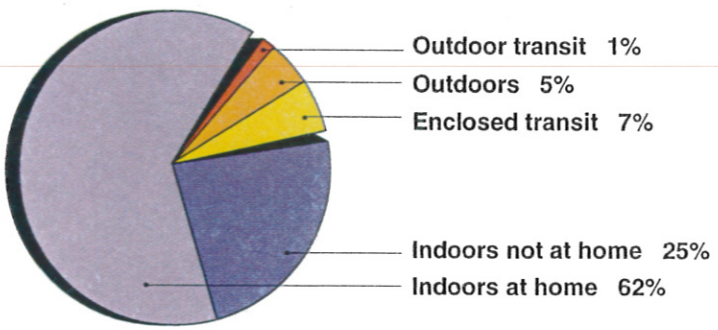


Californians spend an average of 87% of their day indoors.

What Is Indoor Air Pollution?

Indoor air pollution consists of toxic gases or particles that can harm your health. These pollutants can build up rapidly indoors to levels much higher than those usually found outdoors. This is especially true if large amounts of a pollutant are released indoors. Moreover, "tighter" construction in newer homes can prevent pollutants from escaping to the outdoors.

Sources and Potential Health Effects of Indoor Air Pollutants

Pollutant	Major Indoor Sources	Potential Health Effects*
Environmental tobacco smoke	Cigarettes, cigars, and pipes	Respiratory irritation, bronchitis and pneumonia in children, emphysema, lung cancer, and heart disease
Carbon monoxide	Unvented or malfunctioning gas appliances, wood stoves, and tobacco smoke	Headache; nausea; angina; impaired vision and mental functioning; fatal at high concentrations
Nitrogen oxides	Unvented or malfunctioning gas appliances	Eye, nose, and throat irritation; increased respiratory infections in children
Organic chemicals	Aerosol sprays, solvents, glues, cleaning agents, pesticides, paints, moth repellents, air fresheners, dry-cleaned clothing, and treated water	Eye, nose, and throat irritation; headaches; loss of coordination; damage to liver, kidney and brain; various types of cancer
Formaldehyde	Pressed wood products, such as plywood and particleboard; furnishings; wallpaper; durable press fabrics	Eye, nose, and throat irritation; headache; allergic reactions; cancer
Respirable particles	Cigarettes, wood stoves, fireplaces, aerosol sprays, and house dust	Eye, nose, and throat irritation; increased susceptibility to respiratory infections and bronchitis; lung cancer
Biological agents (bacteria, viruses, fungi, animal dander, mites)	House dust; pets; bedding; poorly maintained air conditioners, humidifiers, and dehumidifiers; wet or moist structures; furnishings	Allergic reactions; asthma; eye, nose, and throat irritation; humidifier fever, influenza, and other infectious diseases
Asbestos	Damaged or deteriorating insulation, fireproofing, and acoustical materials	Asbestosis, lung cancer, mesothelioma, and other cancers
Lead	Sanding or open-flame burning of lead paint; house dust	Nerve and brain damage, particularly in children; anemia; kidney damage; growth retardation
Radon	Soil under buildings, some earth-derived construction materials, and groundwater	Lung cancer

* Depends on factors such as the amount of pollutant inhaled, the duration of exposure, and susceptibility of the individual exposed.

Health Effects

The effects of indoor air pollutants range from short-term effects—eye and throat irritation—to long-term effects—respiratory disease and cancer. Exposure to high levels of some pollutants, such as carbon monoxide, can even result in immediate death. Also, some indoor pollutants can magnify the effects of other indoor pollutants. Based on cancer risk alone, federal scientists have ranked indoor air pollution as one of the most important environmental problems in the U.S.

"Sensitive" Groups

Many groups are especially susceptible to the health effects of indoor pollutants. These include infants and the elderly, those with heart and lung diseases, people with asthma, and individuals who have developed extreme sensitivity to chemicals. Unfortunately, these are the people who often spend the most time indoors.

Economic Impacts

The economic impacts of indoor pollution—including health care costs, lost productivity, legal costs, and human welfare impacts—have been estimated at billions of dollars each year.

Based on cancer risk alone, federal scientists have ranked indoor air pollution as one of the most important environmental problems in the U.S.

Children and the elderly are particularly sensitive to indoor pollutants.

ARB's Indoor Ai

Research

The ARB's Indoor Air Quality/Personal Exposure Assessment Research Program, started in 1986, has funded several pioneering studies that provide important, new information for assessing and reducing indoor exposures to pollutants.

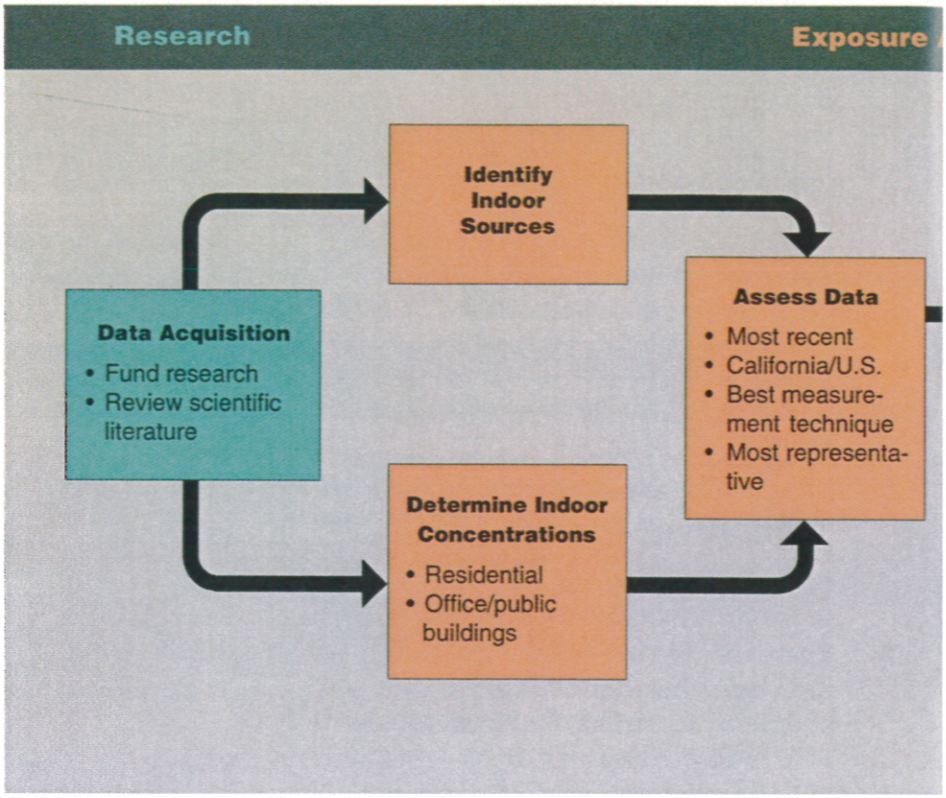
Exposures to Toxics. The ARB, in cooperation with the EPA, co-funded the first large-scale studies to measure Californians' actual indoor and outdoor exposures to airborne toxic gases and inhalable particles.

First Comprehensive Activity Study. This study examined Californians' daily activity patterns, especially those which can result in exposure to air pollutants. This study has significantly improved our knowledge of exposures and will help improve risk estimates.

First Statewide Radon Study. This residential survey was conducted in cooperation with the California Department of Health Services. It found that radon levels in California homes are much lower than in most other states and generally lower than recommended action levels.

New Test Equipment. ARB projects have promoted the development and testing of important new methods and equipment for measuring indoor concentrations of pollutants and people's actual exposures to them.

Personal monitor for gaseous pollutants



The ARB also has recently begun major research projects to develop a comprehensive computer-based model to predict indoor exposure to various air pollutants and to measure emissions of pollutants from known indoor pollutant sources.

Assessing Exposures

The ARB is required to assess Californians' indoor exposures to pollutants addressed under the ARB's Toxic Air Contaminants Program. These assessments require careful review of available data on indoor sources and concentrations of each pollutant, and on Californians' activity patterns. From the available data, ARB estimates average and peak indoor exposures to each pollutant.

Indoor exposure assessment reports have been completed for 11 different pollutants. These assessments have shown that indoor exposures to most of these toxic pollutants are greater than outdoor exposures, accounting for a large portion of the overall risk.

Reducing Exposure

Public information and guidance is an essential part of ARB's efforts to reduce the public's exposure to indoor air pollution. Choices you make often determine how much pollution you are exposed to. For example, using plenty of ventilation while applying solvents or glues can make your pollutant exposure very low rather than dangerously high.

Indoor Air Quality Guidelines

To help the public avoid unhealthful indoor air quality, the ARB pub-

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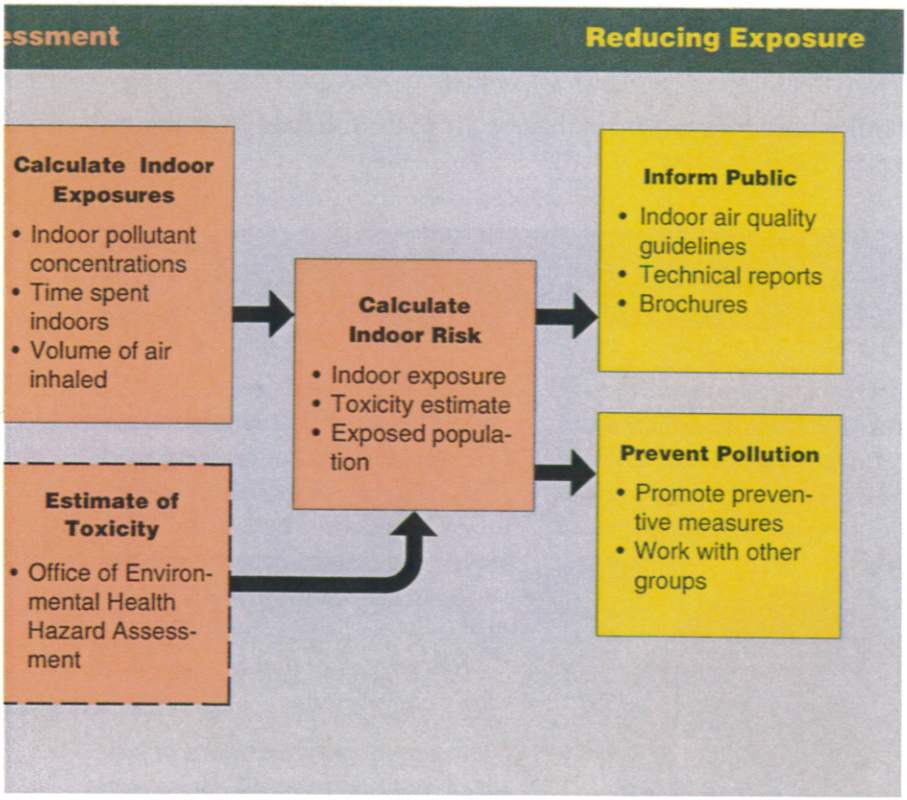

ishes indoor air quality health-)ased guidelines. Each guideline :overs a single pollutant or a group)f related indoor pollutants, and dis-:usses the indoor sources of the)ollutant(s) and specific steps you :an take to eliminate or reduce them n your home. The first guideline, *Formaldehyde in the Home*, discusses)ne of the most common indoor pol-utants. Detailed technical reports ıre also available for pollutants cov-:red in the guidelines.

Technical Reports

Other ARB technical reports exam-ne different aspects of indoor air quality.

Reducing Exposures to Indoor Air Pol-utants in California: Existing Authori-ies and Recommended Actions was the first comprehensive examination of existing laws and regulations that affect indoor air quality in California. It showed that, although the actions of many agencies can significantly affect indoor air quality, few laws are actually available to control indoor air pollution and its many sources. The report calls for a number of actions to be taken to protect indoor air quality.

Formaldahyde and radon indoor monitors

Indoor Air Quality and Personal Exposure Briefing Paper examines the scope of the indoor air quality problem, including known levels of indoor pollutants and their adverse health effects.

Indoor Air Quality/Personal Exposure Assessment Study Plan describes the ARB's current and planned research related to indoor air quality.

Research Notes summarize the results of ARB-funded research. These become available as projects are completed.

Promoting Preventive Controls

The ARB supports the prevention of pollution at its source. Pollution prevention is by far the most effective way to reduce exposure. ARB is working with other government agencies and interested groups to promote pollution prevention and reduce indoor exposures to air pollution to the fullest extent possible under existing authority.

Portable monitor for gaseous pollutants

What Can You Do About Indoor Air Pollution?

The most effective way to protect your family and yourself from indoor air pollution is to prevent or minimize the release of pollutants indoors in the first place.

Use Products Safely

Products such as cleaning agents, paints, and glues should be used outdoors whenever possible. Directions on the label should be followed carefully. If the product must be used indoors, lots of ventilation should be provided. Also, it may be possible to use safer consumer products, such as baking soda instead of harsher cleaners, or products in solid or liquid form rather than aerosol sprays.

Restrict Smoking

Restricting cigarette smoking to outdoor areas is especially important because cigarette smoke contains many toxic pollutants. It is harmful to both smokers and nonsmokers.

Use Appliances Properly

Use gas appliances, wood stoves, and fireplaces only as intended. Gas stoves should never be used to heat the house since high pollutant levels can result. Wood stoves and fireplaces should only be used to burn properly sized and aged wood, since other types of fuel may emit toxic compounds.

These combustion devices pollute less when properly maintained. Annual inspections and cleaning by your gas company's service personnel or by other qualified individuals will help reduce pollution and save energy.

Select Building Materials and Furniture Carefully

Many products, including some types of plywood and particleboard, emit significant amounts of formaldehyde or other gaseous pollutants. Try to avoid those products if possible.

You might request that new carpets or furniture be aired out by the manufacturer or distributor prior to delivery. Otherwise, you may want to air them in your garage or yard before bringing them inside.

Practice Good Housekeeping

Proper storage of solvents and frequent housecleaning to remove dust and molds are necessary steps in maintaining good indoor air quality.

Provide Adequate Ventilation

Adequate ventilation is another easy and effective way to maintain good indoor air quality, although it may not completely remove all pollutants. Increase ventilation by opening windows and doors when the weather permits. This is particularly important when using products or engaging in activities that may generate pollutants. Kitchen and bathroom exhaust fans that are properly vented to the outdoors are very effective at removing pollutants generated during cooking and showering. For effective ventilation while conserving energy during extreme weather, consider installing a heat recovery ventilator.

Opportunities for Further Action

The California Air Resources Board, working with representatives from other State and local agencies, is committed to reducing Californians' exposures to indoor air pollution by:

- Developing Indoor Air Quality Guidelines;
- Promoting preventive measures;
- Working with other government agencies and interested groups to reduce exposure to indoor air pollution;
- Increasing public education; and
- Increasing research into the health risks, economic impacts, and best mitigation measures for indoor air pollution.

How You Can Help

Follow the suggestions in this brochure. Educate yourself, your family, and your friends. Support the control of sources of indoor air pollution.

For further information and to obtain any of the reports mentioned in this brochure, please contact:

Indoor Exposure Assessment Program

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