

**General**

- Reduced Outdoor Contaminants in Inside Spaces is a powerful clearinghouse: great links, videos, etc. [ROCIS.org](https://www.rocis.org)
  - ROCIS participant interview on VT Pub Radio 30 min. [www.outsideinradio.org/shows/inpittsburgh](https://www.outsideinradio.org/shows/inpittsburgh)
- EPA is a rich resource! <https://www.epa.gov/pm-pollution>
  - Interactive PM & ozone map <https://gispub.epa.gov/airnow/>
  - Steps to Reduce PM Exposure <https://www.airnow.gov/aqi/aqi-basics/extremely-high-levels-of-pm25/>
  - Wildfire Smoke Tracking <https://fire.airnow.gov/>
- Other rich PM resources: [cleanaircrew.org](https://www.cleanaircrew.org)
- Air quality resources and activism [www.breatheproject.org](https://www.breatheproject.org)
- [AirNow.gov](https://www.airnow.gov) provides maps, and also a basic overview of air pollution, including a description of standards. The role of better standards to reduce pollution sources should not be underestimated as critical to public health.
- “How Much Wildfire Smoke is Infiltrating our Homes, Kara Manke, Aug. 31, 2021 <https://news.berkeley.edu/2021/08/31/how-much-wildfire-smoke-is-infiltrating-our-homes/>
- This is a helpful guide for explaining the connections between wildfires and climate change <https://www.visualcapitalist.com/how-climate-change-is-influencing-wildfires/>
- “A decade of the U.S. energy mix transitioning away from coal: historical reconstruction of the reductions in the public health burden of energy”, Non-combustion pM2.5 Pollution Sources, JJ Buonocore, P. Salimifard, DR Michanowicz, & JG Allen. “Environmental Research Letters” Vol 16, No. 5, 5 May 2021 <https://iopscience.iop.org/article/10.1088/1748-9326/abe74c>
- “Preliminary Report: The Climate and Energy Impacts of the Inflation Reduction Act” by the Rapid Energy Policy Evaluation and Analysis Toolkit indicates that avoided mortalities from reduced air pollution basically pay for the entire Inflation Reduction Act, p18 , 2022 [www.rapidproject.org](https://www.rapidproject.org)
- [Healthy Housing Principles Reference Guide](https://www.bpi.org), and “Certificate of Knowledge.” Reference Guide and opportunity to earn certification in the eight fundamental principles of healthy housing. Building Performance Institute, 2020 [www.bpi.org](https://www.bpi.org) Also see free HUD Guide on which BPI’s is built [www.hud.gov/healthyhomes](https://www.hud.gov/healthyhomes)
- [A House Needs to Breathe...Or Does It?](https://www.energyvanguard.com) by Allison Bailes. A new read from a consummate building scientist-- 350 pages--about how houses work and don’t work-- and myth busting, 2022 [www.energyvanguard.com](https://www.energyvanguard.com)
- [A Field Guide to the INVISIBLE](https://www.invisible.org) by Wayne Biddle is a terrific read that visits a host of “life’s ingredients that are out of sight and often out of mind” It includes a useful index, & surprising illustrations and facts. 1998
- HVAC 2.0, developed by Nate Adams and Ted Kidd, offers a consultative sales process contractors can use to help customers solve their real comfort and air quality problems. [www.hvac20.com](https://www.hvac20.com) Also from Nate: <https://bit.ly/HVAC6Functions> , <https://bit.ly/DuctPressure>

**Health Impacts**

- [“Why you should protect your eyes when air pollution levels are high,”](https://www.washingtonpost.com/health/why-you-should-protect-your-eyes-when-air-pollution-levels-are-high/2023/03/24/) Marta Zaraska, The Washington Post, 02-03-24
- [“Health Risks of Indoor Exposure to Fine Particulate Matter and Practical Mitigation Solutions,”](https://doi.org/10.17226/27341) National Academies of Sciences, Engineering, and Medicine, 2024. Washington, DC: The National Academies Press. <https://doi.org/10.17226/27341>
- [“Harm from Indoor Air Contaminants,”](https://pubs.acs.org/doi/10.1021/acs.est.3c07374) Gioberti Morantes, Constanza Molina, and Max Sherman, Environ. Sci. & Tech. Dec. 27, 2023 <https://pubs.acs.org/doi/10.1021/acs.est.3c07374>
- [“Review of Ultra Fine Particle metrics, health risks, etc.”](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5129264/) Baldauf et al 2016 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5129264/>
- Health effects from gas stove pollution <https://rmi.org/insight/gasstoves-pollution-health>
- Even “renewable” resources that are touted for carbon neutrality have significant health impacts <https://yaleclimateconnections.org/2021/08/energy-production-contributes-to-tens-of-thousands-of-premature-u-s-deaths/>

- “Smog (aerosol) emissions from small off-road engines (SOREs) are significant, even as the high (100) decibel output of leaf blowers is (literally) deafening,” [https://www.sierraclub.org/sierra/2022-3-fall/notes-here-there/got-leafblower-blues-youre-not-only-one?utm\\_source=greenlife&utm\\_medium=email&utm\\_campaign=newsletter](https://www.sierraclub.org/sierra/2022-3-fall/notes-here-there/got-leafblower-blues-youre-not-only-one?utm_source=greenlife&utm_medium=email&utm_campaign=newsletter)
- “Airborne Transmission of Respiratory Viruses” C.C. Wang, et. al., Science 373, eabd9149 (2021). DOI: 10.1126/science.abd9149, August 27, 2021 <http://science.sciencemag.org/>
- “The Teeny Tiny Scientific Screw-up that Helped COVID Kill” reveals how the CDC denial of accepted science re: how airborne particles could be inhaled led to denial and confusion re: viral transmission. May, 2021 <https://www.wired.com/story/the-teeny-tiny-scientific-screwup-that-helped-covid-kill/>
- “Rebreathed Fraction of Air” from room CO2 <https://twitter.com/DavidElstrom/status/1485829682012504064>
- “Small Particle Pollution & Cognitive Function,” <https://freakonomics.com/podcast/season-10-episode-52/>
- It is not news that fetuses are at risk from many types of pollution. This study highlights black carbon/soot. <https://www.theguardian.com/environment/2022/oct/05/toxic-air-pollution-particles-found-in-lungs-and-brains-of-unborn-babies?fbclid=IwAR1WmSkXKePB8ulFNyxZk9zjzUwHfOHEsmVZ8h74yifrRdYzWoyinqRKBuU>
- The link between chemical exposure, air quality, and human health is explored in this [Summary Report](#). It considers the state-of-the science regarding how [indoor chemistry](#) findings fit into context of what is already known. 2022 [https://nap.nationalacademies.org/resource/26228/Indoor\\_Chemistry\\_Report\\_Highlights.pdf](https://nap.nationalacademies.org/resource/26228/Indoor_Chemistry_Report_Highlights.pdf)
- “The Deadly Donora Smog of 1948 Spurred Environmental Protection—But Have We Forgotten the Lesson?” October, 2018 <https://www.smithsonianmag.com/history/deadly-donora-smog-1948-spurred-environmental-protection-have-we-forgotten-lesson-180970533/>
- “Association between PM2.5 Exposure Level and Primary Open-Angle Glaucoma in Taiwanese Adults: A Nested Case-Control Study,” Han-Yin Sun, et. al. International Journal of Environmental Research and Public Health, Jan. 11, 2021 <https://www.mdpi.com/1660-4601/15/10/2269>
- “We’ve engineered our way into a new Stone Age,” **Building Green Report, Elizabeth Waters, Vol. 33, Issue 3**, [https://www.buildinggreen.com/news-analysis/amid-silicosis-surge-we-need-rethink-countertops?mc\\_cid=8ee8f9a9a0&mc\\_eid=fbf79078d5](https://www.buildinggreen.com/news-analysis/amid-silicosis-surge-we-need-rethink-countertops?mc_cid=8ee8f9a9a0&mc_eid=fbf79078d5)
- Wildfire Smoke: State Policies for Reducing Indoor Exposure, Tobie Bernstein, Environmental Law Institute, January 2024 [https://www.eli.org/research-report/wildfire-smoke-state-policies-reducing-indoor-exposure?utm\\_content=&utm\\_medium=email&utm\\_name=&utm\\_source=govdelivery&utm\\_term=](https://www.eli.org/research-report/wildfire-smoke-state-policies-reducing-indoor-exposure?utm_content=&utm_medium=email&utm_name=&utm_source=govdelivery&utm_term=)

**Reduce Air Exchange with Outside & Limit Indoor Sources**

- The “See Stack” app is a unique tool to understand/address impact of airsealing & stack effect. It is free from the Energy Conservatory. Download tab is toward the bottom of the TEC download page. <https://energyconservatory.com/downloads/?categories=6>
- Control cooking emissions: <http://rocis.org/kitchen-range-hoods>
- Online Kitchen Ventilation group <https://www.buildingperformancecommunity.org/groups/kitchen-ventilation>
- HEPA filter vacuums are an important tool. This is a good description/discussion. It does not imply product endorsement. <https://molekule.com/blog/hepa-vacuum-what-it-can-and-cannot-do/>

**Filter the Air**

- Safety and Effectiveness of Air Cleaners Parts 1-4 [itsairborne.com](https://www.itsairborne.com)
- Impact of portable air cleaner <http://rocis.org/rocis-data-explorer> use code (j1t8)
- DIY box fan filters – Corsi-Rosenthal Box <https://cleanaircrew.org/box-fan-filters/>
- DIY Corsi-Rosenthal Air Cleaners are effective regardless of particle sources <https://www.epa.gov/air-research/research-diy-air-cleaners-reduce-wildfire-smoke-indoors>
- Minneapolis supplier of affordable 2” & 4” MERV 13 filters <https://twincityfilterservice.com/>
- “Filter Fist-a Cuffs & Who is This MERV Character?” from Robert Bean <http://www.healthyheating.com/IAQ/Indoor-Air-Quality-Air-Filters1.htm#.Y1rXxuTMKMo>
- “DIY Tented Design by Tom Builds Stuff and Marshall Hansen Design” and other cool stuff is available by searching here <https://bluehouseenergy.com/blogs/bhe-blog/blog-top-8-resources-ventilation-and-air-filtration>

- “Adventures with Monitors, Humidifiers and Filters,” Shawna Henderson, March 3, 2022 <https://bluehouseenergy.com/blogs/bhe-blog/adventures-with-monitors-humidifiers-and-filters>
- Portable air cleaners with add-ons to be **avoided**:
  - “Caution to the Wind,” Madison Pauly, May, 2021 <https://www.motherjones.com/politics/2021/05/air-purifier-covid-asthma-unproven-science-coronavirus-ionization/>
  - “Is an \$800 purifier best to clean your home's air? Marketplace tested 5 top brands and their claims,” CBC News, Feb 2021 <https://www.cbc.ca/news/business/portable-air-purifier-tests-marketplace-1.5900782>
  - “Avoid air cleaners with photocatalytic oxidation (PCO). PCO air cleaners have been shown to generate formaldehyde, acetaldehyde, nitrogen dioxide, and carbon monoxide” <https://www.iaqradio.com/jeffrey-siegel-ph-d-covid-19-risk-mitigation-a-researchers-perspective/>
- Whole house 24/7 HVAC filtration [ROCIS.org/what-rocis-0](https://www.rocis.org/what-rocis-0) under “What is ROCIS” click on “Air Handler Inquiry”
- Montana Wildfire Smoke <https://www.montanawildfiresmoke.org/hepa-filters.html> This website grew out of efforts by [Climate Smart Missoula](https://www.climate-smart-missoula.org/) to help our community during times of wildfire smoke. ~ \$40 build to clean the air in a small to medium sized closed room. [Download our handy 2 page guide HERE.](#)
- AirNow Wildfire Guide Factsheets Publications [Wildfire Guide Factsheets Publications | AirNow.gov](https://www.airnow.gov/wildfire-guide-factsheets-publications)  
**12 resource guides:** Prepare for Fire Season, Reduce Your Smoke Exposure, At-Risk Groups of People, Children’s Health and Wildfires: A Resource for Families, Protect Your Lungs from Wildfire Smoke and Ash, How to Create a Clean Room at Home, Indoor Air Filtration, Coping with the Stress of Wildfire Smoke, Using Air Quality /sensors for Smoke, Protect Your Pets from Wildfire Smoke, Protect Your Large Animals and Livestock from Wildfire Smoke, Protect Yourself from Ash

**Monitoring/Diagnostic Equipment** There is a lot of development in PM2.5 diagnostic equipment.

- Dylos DC1700 Air Quality Monitor. This ROCIS workhorse measures numbers of both small  $\leq .5$  micron and large  $\geq 2.5$  micron particles; it provides one week storage and time stamped data downloadable to Excel. [www.dylosproducts.com/dc1700](https://www.dylosproducts.com/dc1700)
- AWAIR measures PM2.5 and Total VOCs, CO2, humidity, & temperature [www.getawair.com](https://www.getawair.com)
- Online Building Performance Community Group [www.buildingperformancecommunity.org/groups/inexpensive-residential-particle-monitoring](https://www.buildingperformancecommunity.org/groups/inexpensive-residential-particle-monitoring)
- EPA Air Sensor Tool Box – Air Sensor Loan Programs <https://www.epa.gov/air-sensor-toolbox/air-sensor-loan-programs> EPA has established air sensor loan programs independently and through collaborations with libraries, tribes, museums, and others to enable the public to learn about air quality in their communities. These programs bring air sensor technology to the public for supplemental monitoring and educational purposes.
- Digital TrueFlow® Air Handler Flow Meter Accurate measurement of residential air handler flow and system static pressures from The Energy Conservatory (TEC) <https://energyconservatory.com/>