

## Environmental Stewardship Resource Desk

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### New Research

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#### COVID-19

1. **Environmental and health impacts of spraying COVID-19 disinfectants with associated challenges.** Bhat SA, Sher F, Kumar R, Karahmet E, Haq SAU, Zafar A, Lima EC. Environ Sci Pollut Res Int. 2021 Oct 1. doi: 10.1007/s11356-021-16575-7. Online ahead of print.

<https://link.springer.com/article/10.1007/s11356-021-16575-7>

To stop COVID-19 from spreading, the governing agencies used various chemicals to disinfect different commercial spaces, streets and highways. However, people used it aggressively because of panic conditions, anxiety and unconsciousness, which can have a detrimental impact on human health and the environment. Our water bodies, soil and air have been polluted by disinfectants, forming secondary products that can be poisonous and mutagenic. In the prevention and spread of COVID-19, disinfection is crucial, but disinfection should be carried out with sufficient precautions to minimize exposure to harmful by-products. In addition, to prevent inhalation, adequate personal protective equipment should be worn and chemical usage, concentrations, ventilation in the room and application techniques should be carefully considered. In the USA, 60% of respondents said they cleaned or disinfected their homes more often than they had in the previous months. In addition to the robust use of disinfection approaches to combat COVID-19, we will explore safe preventative solutions here.

2. **Environmental impact assessment of plastic waste during the outbreak of COVID-19 and integrated strategies for its control and mitigation.** Al Qahtani S, Al Wuhayb F, Manaa H, Younis A, Sehar S. Rev Environ Health. 2021 Sep 29. doi: 10.1515/reveh-2021-0098. Online ahead of print.

Herein, we presented an overview on the rise of plastic pollution during the COVID-19 pandemic. The potential sources of plastic waste during COVID-19 with its negative effects on the environment such as marine ecosystems and the global economics are highlighted. We also suggested some strategies and recommendations to tackle plastic leakages by applying feedstock recycling, sterilization, and with the use of biodegradable plastics that have become a

sustainable alternative to fossil fuel plastics. Also, the importance of elevating public awareness and some recommendations to mitigate plastic generated during the pandemic has been addressed as well.

- 3. Impact of COVID-19 containment and closure policies on tropospheric nitrogen dioxide: A global perspective.** Li Y, Li M, Rice M, Yang C. *Environ Int.* 2021 Sep 21;158:106887. doi: 10.1016/j.envint.2021.106887. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0160412021005122>

We utilized a data-driven approach to analyze the relationship between tropospheric NO<sub>2</sub> and COVID-19 mitigation measures by clustering regions based on pollution levels rather than constraining the study units by predetermined administrative boundaries as pollution knows no borders. Specifically, three clusters were discovered signifying mild, moderate, and poor pollution levels. The most severely polluted cluster saw significant reductions in tropospheric NO<sub>2</sub>, coinciding with lockdown periods. Based on the clustering results, qualitative and quantitative analyses were conducted at global and regional levels to investigate the spatiotemporal changes. In addition, panel regression analysis was utilized to quantify the impact of policy measures on the NO<sub>2</sub> reduction. This study found that a 23.58 score increase in the stringency index (ranging from 0 to 100) can significantly reduce the NO<sub>2</sub> TVCD by 3.2% ( $p < 0.05$ ) in the poor cluster in 2020, which corresponds to a 13.1% maximum reduction with the most stringent containment and closure policies implemented. In addition, the policy measures of workplace closures and close public transport can significantly decrease the tropospheric NO<sub>2</sub> in the poor cluster by 6.7% ( $p < 0.1$ ) and 4.5% ( $p < 0.1$ ), respectively. An additional heterogeneity analysis found that areas with higher incomes, CO<sub>2</sub> emissions, and fossil fuel consumption have larger NO<sub>2</sub> TVCD reductions regarding workplace closures and public transport closures.

### Health Impacts of Climate Change

- 4. Air pollution exposure and depression: A comprehensive updated systematic review and meta-analysis.** Borroni E, Pesatori AC, Bollati V, Buoli M, Carugno M. *Environ Pollut.* 2021 Sep 29;118245. doi: 10.1016/j.envpol.2021.118245. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0269749121018273>

We observed an increased risk of depression associated with long-term exposure to PM<sub>2.5</sub> (relative risk: 1.074, 95% confidence interval: 1.021-1.129) and NO<sub>2</sub> (1.037, 1.011-1.064), and with short-term exposure to PM<sub>10</sub> (1.009, 1.006-1.012), PM<sub>2.5</sub> (1.009, 1.007-1.011), NO<sub>2</sub> (1.022, 1.012-1.033), SO<sub>2</sub> (1.024, 1.010-1.037), O<sub>3</sub> (1.011, 0.997-1.026), and CO (1.062, 1.020-1.105). The publication bias affecting half of the investigated associations and the high heterogeneity characterizing most of the meta-analytic estimates partly prevent to draw very firm conclusions. On the other hand, the coherence of all the estimates after excluding single studies in the sensitivity analysis supports the soundness of our results. This especially applies to the association between PM<sub>2.5</sub> and depression, strengthened by the absence of heterogeneity and of relevant publication bias in both long- and short-term exposure studies. Should further investigations be designed, they should involve large sample sizes, well-defined diagnostic criteria for depression, and thorough control of potential confounding factors.

Finally, studies dedicated to the comprehension of the mechanisms underlying the association between air pollution and depression remain necessary.

5. **Acute effect of particulate matter pollution on hospital admissions for cause-specific respiratory diseases among patients with and without type 2 diabetes in Beijing, China, from 2014 to 2020.** Liu M, Li Z, Lu F, Guo M, Tao L, Liu M, Liu Y, Deginet A, Hu Y, Li Y, Wu M, Luo Y, Wang X, Yang X, Gao B, Guo X, Liu X. *Ecotoxicol Environ Saf.* 2021 Sep 27;226:112794. doi: 10.1016/j.ecoenv.2021.112794. Online ahead of print.  
<https://www.sciencedirect.com/science/article/pii/S0147651321009064>  
CONCLUSIONS: Short-term PM exposure was associated with increased RD admission with and without T2D, and the effect size of PM<sub>2.5</sub> was higher in patients with T2D than those without T2D.
  
6. **Associations between ambient air pollutants and hospital admissions: more needs to be done.** Belch JJ, Fitton C, Cox B, Chalmers JD. *Environ Sci Pollut Res Int.* 2021 Sep 30. doi: 10.1007/s11356-021-16544-0. Online ahead of print.  
Deaths from air pollution in the UK are higher by a factor of 10 than from car crashes, 7 for drug-related deaths and 52 for murders, and yet awareness seems to be lacking in local government. We conducted an 18-year retrospective cohort study using routinely collected health care records from Ninewells Hospital, Dundee, and Perth Royal Infirmary, in Tayside, Scotland, UK, from 2000 to 2017. Hospitalisation events and deaths were linked to daily nitric oxides (NO<sub>x</sub>, NO, NO<sub>2</sub>), and particulate matter 10 (PM<sub>10</sub>) levels extracted from publicly available data over this same time period. Distributed lag models were used to estimate risk ratios for hospitalisation and mortality, adjusting for temperature, humidity, day of the week, month and public holiday. Nitric oxides and PM<sub>10</sub> were associated with an increased risk of all hospital admissions and cardiovascular (CV) admissions on day of exposure to pollutant. This study shows a significant increase in all cause and CV hospital admissions, on high pollution days in Tayside, Scotland.
  
7. **The association between air pollution and childhood asthma: United States, 2010-2015.** Connor EM, Zablotsky B. *J Asthma.* 2021 Sep 29:1-16. doi: 10.1080/02770903.2021.1988105. Online ahead of print.  
Results: From 2010-2015, there were significant declines in PM<sub>2.5</sub> concentrations and asthma outcomes. In unadjusted models, children living in areas with higher PM<sub>2.5</sub> concentrations were more likely to have current asthma, ≥1 asthma episode in the past year, and ≥1 ER visit due to asthma compared with children living in areas with the lowest quartile (< 8.11 µg/m<sup>3</sup>). After adjusting for characteristics at the county, geographic, and child and family-level, significant associations remained for asthma episode, and ER visit among children living in areas with PM<sub>2.5</sub> annual concentrations between 9.51-10.59 µg/m<sup>3</sup> (3rd quartile) compared with children living in areas with the lowest quartile. Conclusions: This study adds to the limited literature by incorporating nationally representative county-, child-, and family-level data to provide a multi-level analysis of the associations between air pollution and childhood asthma in the U.S.

8. **Increased Impact of Air Pollution on Lung Function in Preterm vs. Term Infants: The BILD Study.** Decrue F et al. *Am J Respir Crit Care Med.* 2021 Sep 29. doi: 10.1164/rccm.202102-0272OC. Online ahead of print.

Conclusion Preterm infants showed significant higher susceptibility even to low-to-moderate prenatal air pollution exposure than term infants, leading to increased impairment of postnatal lung function. FeNO results further elucidate differences in inflammatory/oxidative stress response comparing preterms to terms.

9. **Current and future threats to human health in the Anthropocene.** Tong S, Bambrick H, Beggs PJ, Chen L, Hu Y, Ma W, Steffen W, Tan J. *Environ Int.* 2021 Sep 25;158:106892. doi: 10.1016/j.envint.2021.106892. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0160412021005171>

It has been widely recognised that the threats to human health from global environmental changes (GECs) are increasing in the Anthropocene epoch, and urgent actions are required to tackle these pressing challenges. A scoping review was conducted to provide an overview of the nine planetary boundaries and the threats to population health posed by human activities that are exceeding these boundaries in the Anthropocene. The research progress and key knowledge gaps were identified in this emerging field. Over the past three decades, there has been a great deal of research progress on health risks from climate change, land-use change and urbanisation, biodiversity loss and other GECs. However, several significant challenges remain, including the misperception of the relationship between human and nature; assessment of the compounding risks of GECs; strategies to reduce and prevent the potential health impacts of GECs; and uncertainties in fulfilling the commitments to the Paris Agreement. Confronting these challenges will require rigorous scientific research that is well-coordinated across different disciplines and various sectors. It is imperative for the international community to work together to develop informed policies to avert crises and ensure a safe and sustainable planet for the present and future generations.

10. **Ambient and household PM<sub>2.5</sub> pollution and adverse perinatal outcomes: A meta-regression and analysis of attributable global burden for 204 countries and territories.** Ghosh R, Causey K, Burkart K, Wozniak S, Cohen A, Brauer M. *PLoS Med.* 2021 Sep 28;18(9):e1003718. doi: 10.1371/journal.pmed.1003718. eCollection 2021 Sep.

<https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1003718>

CONCLUSIONS: Ambient and household PM<sub>2.5</sub> were associated with reduced birth weight and GA, which are, in turn, associated with neonatal and infant mortality, particularly in low- and middle-income countries.

11. **The Complex Epidemiological Relationship between Flooding Events and Human Outbreaks of Mosquito-Borne Diseases: A Scoping Review.** Coalson JE, Anderson EJ, Santos EM, Madera Garcia V, Romine JK, Dominguez B, Richard DM, Little AC, Hayden MH, Ernst KC. *Environ Health Perspect.* 2021 Sep;129(9):96002. doi: 10.1289/EHP8887. Epub 2021 Sep 28.

<https://ehp.niehs.nih.gov/doi/full/10.1289/EHP8887>

DISCUSSION: Flooding is generally associated with increased incidence of MBD, potentially following a brief decrease in incidence for some diseases. Methodological inconsistencies

significantly limit direct comparison and generalizability of study results. Regions with established MBD and weather surveillance should be leveraged to conduct multisite research to a) standardize the quantification of relevant flooding, b) study nonlinear relationships between rainfall and disease, c) report outcomes at multiple lag periods, and d) investigate interacting factors that modify the likelihood and severity of outbreaks across different settings. <https://doi.org/10.1289/EHP8887>.

12. **Effects of Air Pollutants on Airway Diseases.** Lee YG, Lee PH, Choi SM, An MH, Jang AS. *Int J Environ Res Public Health*. 2021 Sep 20;18(18):9905. doi: 10.3390/ijerph18189905. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8465980/>

In general, air pollution decreases quality of life and life expectancy. It exacerbates acute and chronic respiratory symptoms in patients with chronic airway diseases, and increases the morbidity and risk of hospitalization associated with respiratory diseases. However, the mechanisms underlying these effects remain unclear. Therefore, we reviewed the impact of air pollutants on airway diseases such as asthma and COPD, focusing on their underlying mechanisms.

13. **The cardiovascular effects of air pollution: Prevention and reversal by pharmacological agents.** Miller MR. *Pharmacol Ther*. 2021 Sep 24:107996. doi: 10.1016/j.pharmthera.2021.107996. Online ahead of print.

Several studies have used pharmacological agents to prevent or reverse the cardiovascular effects of PM; an approach that not only has the advantages of elucidating mechanisms, but also potentially revealing therapeutic agents that could benefit individuals that are especially susceptible to the effects of air pollution. This review gathers investigations with pharmacological agents, offering insight into the biology of how PM, and other air pollutants, may cause cardiovascular morbidity.

14. **Associations of Air Pollution and Pediatric Asthma in Cleveland, Ohio.** Khatri SB et al. *ScientificWorldJournal*. 2021 Sep 15;2021:8881390. doi: 10.1155/2021/8881390. eCollection 2021. <https://www.hindawi.com/journals/tswj/2021/8881390/>

This article presents an evaluation of short-term (daily) and long-term associations between motor vehicle and industrial air pollution components and pediatric asthma emergency department (ED) visits by evaluating two sets of air quality data with healthcare utilization for pediatric asthma. Exposure estimates were developed using land use regression models for long-term exposures for nitrogen dioxide (NO<sub>2</sub>) and coarse (i.e., with aerodynamic diameters between 2.5 and 10 µm) particulate matter (PM) and the US EPA Positive Matrix Factorization receptor model for short-term exposures to fine (<2.5 µm) and coarse PM components. Exposure metrics from these two approaches were used in asthma ED visit prevalence and time series analyses to investigate seasonal-averaged short- and long-term impacts of both motor vehicles and industry emissions. Increased pediatric asthma ED visits were found for LUR coarse PM and NO<sub>2</sub> estimates, which were primarily contributed by motor vehicles. Consistent, statistically significant associations with pediatric asthma visits were observed, with short-term exposures to components of fine and coarse iron PM associated with steel production. Our

study is the first to combine spatial and time series analysis of ED visits for asthma using the same periods and shows that PM related to motor vehicle emissions and iron/steel production are associated with increased pediatric asthma visits.

## WE ACT

15. **Climate and health concerns of Montana's public and environmental health professionals: a cross-sectional study.** Byron L, Akerlof KL. BMC Public Health. 2021 Sep 30;21(1):1778. doi: 10.1186/s12889-021-11737-1.  
<https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-11737-1>  
RESULTS: Health professionals in Montana, a politically conservative state, demonstrated high levels of awareness that global warming is happening, human-caused, and a threat to human health, well above reported rates of public concern. Eighty-eight percent said that global warming is occurring and 69% that it is mostly anthropogenic. Sixty-nine percent said that their own health was already affected by climate, and 86% said they were already seeing at least one climate change-related event in their communities. Seventy-two percent said that their departments should be preparing to deal with climate change's health effects, but just 30% said that it is currently happening. We found no statistically significant differences between Montana environmental health and public health professionals in regression models predicting climate beliefs, risk perception, and prioritization. As in studies of the public, political ideology and the observation of local climate-related changes were the strongest factors.  
CONCLUSIONS: Montana environmental and public health officials said that departmental action was needed on climate change, indicating the readiness of rural health professionals to take action. Further studies of health professionals in rural regions are warranted.
16. **The Impact of Consequences Awareness of Public Environment on Medicine Return Behavior: A Moderated Chain Mediation Model.** Lv J, Liu X, Lay S. Int J Environ Res Public Health. 2021 Sep 16;18(18):9756. doi: 10.3390/ijerph18189756.  
<https://www.mdpi.com/1660-4601/18/18/9756>  
The model explores the moderating effect of personal health awareness with through observation of to the mediating effect of personal norms and return intention. Using a sample size of 366 residents from China, the proposed hypotheses are empirically tested. The results show: firstly, the direct effect of residents' consequences awareness of public environmental awareness on the proper medicine return behavior is not significant; secondly, return intention plays a mediating role in the positive effect of consequences awareness of the public environment on proper return behavior; thirdly, personal norms and return intention play a chain mediating role in the positive impact of consequences awareness of the public environment on proper return behavior; and lastly, personal health awareness moderates the chain mediation path by strengthening the positive effect of return intention on proper return behavior.
17. **A Scoping Review of Interventions for the Treatment of Eco-Anxiety.** Baudon P, Jachens L. Int J Environ Res Public Health. 2021 Sep 13;18(18):9636. doi: 10.3390/ijerph18189636.  
<https://www.mdpi.com/1660-4601/18/18/9636/htm>

A scoping review was conducted to examine the current understanding of eco-anxiety and related intervention options and recommendations. The review included 34 records, 13 of which reflected specific psychological approaches. A thematic analysis of the content of the selected records yielded five major themes across interventions for individual and group treatment of eco-anxiety: practitioners' inner work and education, fostering clients' inner resilience, encouraging clients to take action, helping clients find social connection and emotional support by joining groups, and connecting clients with nature. Recommendations for treatment plans are to focus on holistic, multi-pronged, and grief-informed approaches that include eco-anxiety focused group work.

18. **Situational assessment of hospital facilities for modernization purposes and resilience improvement.** Grimaz S, Ruzzene E, Zorzini F. *Int J Disaster Risk Reduct.* 2021 Dec;66:102594. doi: 10.1016/j.ijdrr.2021.102594. Epub 2021 Sep 20.

<https://www.sciencedirect.com/science/article/pii/S2212420921005550>

Modernization of hospital facilities is one of the objectives of administrators and decision-makers of healthcare systems. Hospital facilities are both complex and critical infrastructures, because they are characterized by high level of interconnections, dynamism, technological innovation, and because they offer health and social essential services. Decision-makers have to implement modernization strategies of hospital facilities in order to guarantee a high standard of care and a resilient response during disasters and emergencies. The critical role played by hospital facilities is acknowledged by the international action programs, including the 2030 Agenda of United Nations for Sustainable Development, and it has been emphasized by the COVID-19 pandemic. The paper illustrates the RADAR-Hospital Facilities methodology (RADAR-HF) developed for the situational assessment of the physical environment of hospital facilities. RADAR-HF provides the decision-makers with an overview of the main aspects for modernization (safety, functionality, sustainability, adaptability, comfort) and substantial information for planning interventions, considering hospital facilities as interconnected systems. The outcomes are represented by ad-hoc designed graphical indicators and overview-tools, that summarize the status-conditions of one or a set of existing hospital facilities, the upgrading needs, and the best occupancy of facilities. Decision-makers could use RADAR-HF to define integrated modernization strategies with resilience improvement, monitor the situation of the facilities, and understand the effectiveness of interventions. The paper ends showing the results obtained in a research project, in which RADAR-HF has been applied to assess the existing hospital facilities of the Friuli Venezia Giulia region (North-East of Italy).

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## News

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[Delayed global warming could reduce human exposure to cyclones.](#) Klopfer A. *Nature.* 2021 Sep 30. doi: 10.1038/d41586-021-02659-4. Online ahead of print.

[Human population growth is the root cause of climate change.](#) Austen J. BMJ. 2021 Sep 30;374:n2386. doi: 10.1136/bmj.n2386.

[Climate Change Action and Individual Responsibility.](#) Lawson E. Br J Gen Pract. 2021 Sep 30;71(711):435. doi: 10.3399/bjgp21X717377. Print 2021 Oct.

[No child's play: what climate change will inflict on today's newborns.](#) Nature. 2021 Sep 29. doi: 10.1038/d41586-021-02586-4. Online ahead of print.

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[Waste management needs a data revolution - Is plastic pollution an opportunity?](#) Velis CA, Cook E, Cottom J. Waste Manag Res. 2021 Sep;39(9):1113-1115. doi: 10.1177/0734242X211051199.

[WHO introduces ambitious new air quality guidelines.](#) Burki T. Lancet. 2021 Sep 25;398(10306):1117. doi: 10.1016/S0140-6736(21)02126-7.

[Plastic waters, plastic land. Pandemic pollution.](#) Kosmas E. Can Med Educ J. 2021 Sep 14;12(4):155. doi: 10.36834/cmej.72051. eCollection 2021 Sep.

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