

## Environmental Stewardship Resource Desk

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### New Research

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#### COVID-19

- 1. COVID-19 pandemic and healthcare solid waste management strategy - A mini-review.** Das AK, Islam MN, Billah MM, Sarker A. Sci Total Environ. 2021 Mar 5;778:146220. doi: 10.1016/j.scitotenv.2021.146220. Online ahead of print.  
<https://www.sciencedirect.com/science/article/pii/S0048969721012882>  
Healthcare waste comprises the waste generated by healthcare facilities, medical laboratories and biomedical research facilities. Improper treatment of this waste poses serious risks of disease transmission to waste pickers, waste workers, health workers, patients, and the community in general through exposure to infectious agents. Poor management of the waste emits harmful and deleterious contaminants into society. However, contamination of highly contagious agents such as the COVID-19 virus has created enormous instability in healthcare waste handling and subsequent recycling because of the volume of the waste generated and its contagious nature. Several countries have adopted safety measures to combat this contamination and manage healthcare waste; however, these measures are insufficient and vary depending on the context of the country. In addition, the WHO has set out guidelines for management of healthcare waste. These guidelines are helping to manage the highly contagious healthcare waste resulting from the current pandemic. Proper healthcare waste management may add value by reducing the spread of the COVID-19 virus and increasing the recyclability of materials instead of sending them to landfill. Disinfecting and sorting out healthcare waste facilitates sustainable management and allows their utilization for valuable purposes. This review discusses the different healthcare solid waste management strategies practiced in different countries, the challenges faced during this management, and the possible solutions for overcoming these challenges. It also provides useful insights into healthcare solid waste management scenarios during the COVID-19 pandemic and a possible way forward.
- 2. Climate change, environmental sustainability and health care quality.** Ossebaard HC, Lachman P. Int J Qual Health Care. 2021 Mar 5;33(1):mzaa036. doi: 10.1093/intqhc/mzaa036.  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7197527/>

The challenges for health care continue to grow and in the 21st century healthcare policymakers and providers will need to respond to the developing impact of global warming and the environmental impact of healthcare service delivery. This cannot be viewed apart from the current Coronavirus disease (COVID-19) pandemic, which is likely to be linked to the climate crisis.

3. **Assessing the impact of COVID-19 on global fossil fuel consumption and CO<sub>2</sub> emissions.**

Smith LV, Tarui N, Yamagata T. Energy Econ. 2021 May;97:105170. doi:

10.1016/j.eneco.2021.105170. Epub 2021 Feb 15.

<https://www.sciencedirect.com/science/article/pii/S014098832100075X>

We assess the effect of the COVID-19 pandemic on global fossil fuel consumption and CO<sub>2</sub> emissions over the two-year horizon 2020Q1-2021Q4. We apply a global vector autoregressive (GVAR) model, which captures complex spatial-temporal interdependencies across countries associated with the international propagation of economic impact due to the virus spread. The model makes use of a unique quarterly data set of coal, natural gas, and oil consumption, output, exchange rates and equity prices, including global fossil fuel prices for 32 major CO<sub>2</sub> emitting countries spanning the period 1984Q1-2019Q4. We produce forecasts of coal, natural gas and oil consumption, conditional on GDP growth scenarios based on alternative IMF World Economic Outlook forecasts that were made before and after the outbreak. We also simulate the effect of a relative price change in fossil fuels, due to global scale carbon pricing, on consumption and output. Our results predict fossil fuel consumption and CO<sub>2</sub> emissions to return to their pre-crisis levels, and even exceed them, within the two-year horizon despite the large reductions in the first quarter following the outbreak. Our forecasts anticipate more robust growth for emerging than for advanced economies. The model predicts recovery to the pre-crisis levels even if another wave of pandemic occurs within a year. Our counterfactual carbon pricing scenario indicates that an increase in coal prices is expected to have a smaller impact on GDP than on fossil fuel consumption. Thus, the COVID-19 pandemic would not provide countries with a strong reason to delay climate change mitigation efforts.

4. **Repercussions of COVID-19 pandemic on solid waste generation and management strategies.**

Liang Y, Song Q, Wu N, Li J, Zhong Y, Zeng W. Front Environ Sci Eng. 2021;15(6):115. doi:

10.1007/s11783-021-1407-5. Epub 2021 Mar 5.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7930516/>

It has been over ten months since the beginning of the 2019 coronavirus disease (COVID-2019), and its impact on solid waste management, especially medical waste, is becoming clearer. This study systematically reviews the potential influences of the COVID-19 pandemic on medical waste, personal protection equipment waste and municipal solid waste (MSW), and discusses the corresponding measures and policies of solid waste management in typical countries. The results show that the generation of medical waste from the pandemic increased significantly, with 18%-425% growth. It is estimated that the daily output of COVID-19 medical waste increased from 200 t/d on Feb. 22 to over 29000 t/d at the end of September 2020 throughout the world. The use of personal protective equipment will continue to grow in the long-term, while the blockade and isolation measures greatly reduced the volume of commercial waste, especially for tourist cities, and part of this waste was transferred to household waste.

Residents' attitudes and behavior toward food waste have changed due to the COVID-19 pandemic. In response to the pandemic, international organizations and several countries have issued new policies and guidelines and adjusted their management strategies for medical waste and MSW treatment. The pandemic has brought specific challenges to the disposal capacity of medical waste worldwide. It has also brought about the stagnation of policies related to the reduction of plastic products and waste recycling. This study will provide some useful information for managers and governmental officials on effective solid waste management during and after the COVID-19 pandemic.

### Health Impacts of Climate Change

5. **Projections of excess cardiovascular mortality related to temperature under different climate change scenarios and regionalized climate model simulations in Brazilian cities.** Henrique da Silveira I, Cortes TR, Alves de Oliveira BF, Junger WL. *Environ Res.* 2021 Mar 10:110995. doi: 10.1016/j.envres.2021.110995. Online ahead of print.

**BACKGROUND:** There is an urgent need for more information about the climate change impact on health in order to strengthen the commitment to tackle climate change. However, few studies have quantified the health impact of climate change in Brazil and in the Latin America region. In this paper, we projected the impacts of temperature on cardiovascular (CVD) mortality according to two climate change scenarios and two regionalized climate model simulations in Brazilian cities.

**METHODS:** We estimated the temperature-CVD mortality relationship in 21 Brazilian cities, using distributed lag non-linear models in a two-stage time-series analysis. We combined the observed exposure-response functions with the daily temperature projected under two representative concentration pathways (RCP), RCP8.5 and RCP4.5, and two regionalized climate model simulations, Eta-HadGEM2-ES and Eta-MIROC5.

**RESULTS:** We observed a trend of reduction in mortality related to low temperatures and a trend of increase in mortality related to high temperatures, according to all the investigated models and scenarios. In most places, the increase in mortality related to high temperatures outweighed the reduction in mortality related to low temperatures, causing a net increase in the excess temperature-related mortality. These trends were steeper according to the higher emission scenario, RCP8.5, and to the Eta-HadGEM2-ES model. According to RCP8.5, our projections suggested that the temperature-related mortality fractions in 2090-99 compared to 2010-2019 would increase by 8.6% and 1.7%, under Eta-HadGEM2-ES and Eta-MIROC5, respectively. According to RCP4.5, these values would be 0.7% and -0.6%.

**CONCLUSIONS:** For the same climate model, we observed a greater increase trend in temperature-CVD mortality according to RCP8.5, highlighting a greater health impact associated with the higher emission scenario. Our results may be useful to support public policies and strategies for mitigation of and adaptation to climate change, particularly in the health sector.

6. **Climate change and child health: a scoping review and an expanded conceptual framework.** Helldén D, Andersson C, Nilsson M, Ebi KL, Friberg P, Alfvén T. *Lancet Planet Health.* 2021 Mar;5(3):e164-e175. doi: 10.1016/S2542-5196(20)30274-6.

[https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(20\)30274-6/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30274-6/fulltext)

Climate change can have detrimental effects on child health and wellbeing. Despite the imperative for a fuller understanding of how climate change affects child health and wellbeing, a systematic approach and focus solely on children (aged <18 years) has been lacking. In this Scoping Review, we did a literature search on the impacts of climate change on child health from January, 2000, to June, 2019. The included studies explicitly linked an alteration of an exposure to a risk factor for child health to climate change or climate variability. In total, 2970 original articles, reviews, and other documents were identified, of which 371 were analysed. Employing an expanded framework, our analysis showed that the effects of climate change on child health act through direct and indirect pathways, with implications for determinants of child health as well as morbidity and mortality from a range of diseases. This understanding can be further enhanced by using a broader range of research methods, studying overlooked populations and geographical regions, investigating the costs and benefits of mitigation and adaptation for child health, and considering the position of climate change and child health within the UN Sustainable Development Goals. Present and future generations of children bear and will continue to bear an unacceptably high disease burden from climate change.

7. **Co-benefits of carbon and pollution control policies on air quality and health till 2030 in**

**China.** Yang J, Zhao Y, Cao J, Nielsen CP. *Environ Int.* 2021 Mar 9;152:106482. doi: 10.1016/j.envint.2021.106482. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0160412021001070>

Facing the dual challenges of climate change and air pollution, China has made great efforts to explore the co-control strategies for the both. We assessed the benefits of carbon and pollution control policies on air quality and human health, with an integrated framework combining an energy-economic model, an air quality model and a concentration-response model. With a base year 2015, seven combined scenarios were developed for 2030 based on three energy scenarios and three end-of-pipe control ones. Policy-specific benefits were then evaluated, indicated by the reduced emissions, surface concentrations of major pollutants, and premature deaths between scenarios. Compared to the 2030 baseline scenario, the nationwide PM<sub>2.5</sub>- and O<sub>3</sub>-related mortality was expected to decline 23% or 289 (95% confidence interval: 220-360) thousand in the most stringent scenario, and three quarters of the avoided deaths were attributed to the end-of-pipe control measures. Provinces in heavily polluted and densely populated regions would benefit more from carbon and pollution control strategies. The population fractions with PM<sub>2.5</sub> exposure under the national air quality standard (35 µg/m<sup>3</sup>) and WHO guideline (10 µg/m<sup>3</sup>) would be doubled from 2015 to 2030 (the most stringent scenario), while still very few people would live in areas with the WHO guideline achieved for O<sub>3</sub> (100 µg/m<sup>3</sup>). Increased health impact of O<sub>3</sub> suggested a great significance of joint control of PM<sub>2.5</sub> and O<sub>3</sub> in future policy-making.

8. **Estimating climate change-related impacts on outdoor air pollution infiltration.** Liang D, Lee

WC, Liao J, Lawrence J, Wolfson JM, Ebelt ST, Kang CM, Koutrakis P, Sarnat JA. *Environ Res.* 2021 Mar 8;196:110923. doi: 10.1016/j.envres.2021.110923. Online ahead of print.

BACKGROUND: Rising temperatures due to climate change are expected to impact human adaptive response, including changes to home cooling and ventilation patterns. These changes

may affect air pollution exposures via alteration in residential air exchange rates, affecting indoor infiltration of outdoor particles. We conducted a field study examining associations between particle infiltration and temperature to inform future studies of air pollution health effects.

**METHODS:** We measured indoor fine particulate matter (PM<sub>2.5</sub>) in Atlanta in 60 homes (810 sampling-days). Indoor-outdoor sulfur ratios were used to estimate particle infiltration, using central site outdoor sulfur concentrations. Linear and mixed-effects models were used to examine particle infiltration ratio-temperature relationships, based on which we incorporated projected meteorological values (Representative Concentration Pathways intermediate scenario RCP 4.5) to estimate particle infiltration ratios in 20-year future (2046-2065) and past (1981-2000) scenarios.

**RESULTS:** The mean particle infiltration ratio in Atlanta was  $0.70 \pm 0.30$ , with a 0.21 lower ratio in summer compared to transition seasons (spring, fall). Particle infiltration ratios were 0.19 lower in houses using heating, ventilation, and air conditioning (HVAC) systems compared to those not using HVAC. We observed significant associations between particle infiltration ratios and both linear and quadratic models of ambient temperature for homes using natural ventilation and those using HVAC. Future temperature was projected to increase by 2.1 °C in Atlanta, which corresponds to an increase of 0.023 (3.9%) in particle infiltration ratios during cooler months and a decrease of 0.037 (6.2%) during warmer months.

**DISCUSSION:** We estimated notable changes in particle infiltration ratio in Atlanta for different 20-year periods, with differential seasonal patterns. Moreover, when stratified by HVAC usage, increases in future ambient temperature due to climate change were projected to enhance seasonal differences in PM<sub>2.5</sub> infiltration in Atlanta. These analyses can help minimize exposure misclassification in epidemiologic studies of PM<sub>2.5</sub>, and provide a better understanding of the potential influence of climate change on PM<sub>2.5</sub> health effects.

9. **Physical activity promotion in the age of climate change.** Abu-Omar K, Gelius P, Messing S. F1000Res. 2020 May 11;9:349. doi: 10.12688/f1000research.23764.2. eCollection 2020. <https://f1000research.com/articles/9-349>

The importance of the global climate crisis requires linking physical activity promotion and climate action. This article provides a first overview of interconnections between physical activity promotion and climate action, potential synergies and discrepancies, aiming to stimulate further discussion about this topic. The analysis is based on the World Health Organization's Global Action Plan on Physical Activity 2018-2030 (GAPPA). The GAPPA covers five perspectives that are of particular relevance with respect to potential links with climate policy: (1) Infrastructures supporting active transport, (2) green spaces and recreational/exercise facilities, (3) exercise programs, (4) mass communication campaigns and mass participation events and (5) training of professionals. Our analysis demonstrates a considerable alignment between strategies for physical activity promotion and efforts for the reduction of greenhouse gas emissions. However, in some of the areas, this alignment could still be improved. Additionally, more climate-conscious policies, research and surveillance need to be developed in the field of physical activity promotion.

10. **Climate Change, Physical Activity and Sport: A Systematic Review.** Bernard P, Chevance G, Kingsbury C, Baillot A, Romain AJ, Molinier V, Gadais T, Dancause KN. *Sports Med.* 2021 Mar 10. doi: 10.1007/s40279-021-01439-4. Online ahead of print.

BACKGROUND: Climate change impacts are associated with dramatic consequences for human health and threaten physical activity (PA) behaviors.

OBJECTIVE: The aims of this systematic review were to present the potential bidirectional associations between climate change impacts and PA behaviors in humans and to propose a synthesis of the literature through a conceptual model of climate change and PA.

METHODS: Studies published before October 2020 were identified through database searches in PubMed, PsycARTICLES, CINAHL, SPORTDiscus, GreenFILE, GeoRef, Scopus, JSTOR and Transportation Research Information Services. Studies examining the associations between PA domains and climate change (e.g., natural disasters, air pollution, and carbon footprint) were included.

RESULTS: A narrative synthesis was performed and the 74 identified articles were classified into 6 topics: air pollution and PA, extreme weather conditions and PA, greenhouse gas emissions and PA, carbon footprint among sport participants, natural disasters and PA and the future of PA and sport practices in a changing world. Then, a conceptual model was proposed to identify the multidimensional associations between climate change and PA as well as sport practices. Results indicated a consistent negative effect of air pollution, extreme temperatures and natural disasters on PA levels. This PA reduction is more severe in adults with chronic diseases, higher body mass index and the elderly. Sport and PA communities can play an important mitigating role in post-natural disaster contexts. However, transport related to sport practices is also a source of greenhouse gas emissions.

CONCLUSION: Climate change impacts affect PA at a worldwide scale. PA is observed to play both a mitigation and an amplification role in climate changes.

TRIAL REGISTRATION NUMBER: PROSPERO CRD42019128314.

11. **Major climate change-induced risks to human health in South Africa.** Wright CY, Kapwata T, du Preez DJ, Wernecke B, Garland RM, Nkosi V, Landman WA, Dyson L, Norval M. *Environ Res.* 2021 Mar 6;196:110973. doi: 10.1016/j.envres.2021.110973. Online ahead of print.

There are many climatic changes facing South Africa which already have, or are projected to have, a detrimental impact on human health. Here the risks to health due to several alterations in the climate of South Africa are considered in turn. These include an increase in ambient temperature, causing, for example, a significant rise in morbidity and mortality; heavy rainfall leading to changes in the prevalence and occurrence of vector-borne diseases; drought-associated malnutrition; and exposure to dust storms and air pollution leading to the potential exacerbation of respiratory diseases. Existing initiatives and strategies to prevent or reduce these adverse health impacts are outlined, together with suggestions of what might be required in the future to safeguard the health of the nation. Potential roles for the health and non-health sectors as well as preparedness and capacity development with respect to climate change and health adaptation are considered.

12. **Climate change: A driver of future conflicts in the Persian Gulf Region?** Naderi Beni A, Marriner N, Sharifi A, Azizpour J, Kabiri K, Djamali M, Kirman A. *Heliyon*. 2021 Feb 24;7(2):e06288. doi: 10.1016/j.heliyon.2021.e06288. eCollection 2021 Feb. <https://www.sciencedirect.com/science/article/pii/S2405844021003935>

Ongoing global change and its direct environmental impacts, in addition to securing economic transition to the post-oil era, could trigger complex socio-economic and political crises in oil-dependent economies of the Persian Gulf Region (PGR). To evaluate the role of climate change and related policies in degrading the environment and its socio-economic impacts in the PGR, we have used a variety of available global datasets and published data. The results show that the countries of the PGR pursue some types of socio-economic reforms to alleviate the impacts of climate change. However, it seems that these attempts are not compatible with the environment's capacity. The main problem stems from the fact that political differences between the PGR nations prevent them from managing the Persian Gulf environment as an integrated natural system and consequently they have to limit their efforts within their borders, regardless of what happens in other parts of the system. The shift to alternative revenue sources by the countries needs socioeconomic preparedness while there are environmental obstacles, political tensions and geopolitical rivalries. Unless there is a cooperative approach to mitigate the effects of climate change, accompanied by a reorientation of PGR economies, the situation is likely to worsen rather than improve. To address the challenges of climate change, integrated regional collaborations are needed. Collective action, such as more investment in regional research and development and education, is required if the PGR is to successfully transition from a commodity-based to a knowledge-based economy.

13. **Occupations at risk of contracting zoonoses of public health significance in Québec.** Adam-Poupart A, Drapeau LM, Bekal S, Germain G, Irace-Cima A, Sassine MP, Simon A, Soto J, Thivierge K, Tissot F. *Can Commun Dis Rep*. 2021 Jan 29;47(1):47-58. doi: 10.14745/ccdr.v47i01a08. eCollection 2021 Jan 29. <https://www.canada.ca/content/dam/phac-aspc/documents/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2021-47/issue-1-january-2021/ccdrv47i01a08-eng.pdf>

**INTRODUCTION:** Climate change plays an important role in the geographic spread of zoonotic diseases. Knowing which populations are at risk of contracting these diseases is critical to informing public health policies and practices. In Québec, 14 zoonoses have been identified as important for public health to guide the climate change adaptation efforts of decision-makers and researchers. A great deal has been learned about these diseases in recent years, but information on at-risk workplaces remains incomplete. The objective of this study is to paint a portrait of the occupations and sectors of economic activity at risk for the acquisition of these zoonoses.

**METHODS:** A rapid review of the scientific literature was conducted. Databases on the Ovid and EBSCO research platforms were searched for articles published between 1995 and 2018, in English and French, on 14 zoonoses (campylobacteriosis, cryptosporidiosis, verocytotoxigenic *Escherichia coli*, giardiasis, listeriosis, salmonellosis, Eastern equine encephalitis, Lyme disease, West Nile virus, food botulism, Q fever, avian and swine influenza, rabies, hantavirus pulmonary syndrome) and occupational health. The literature search retrieved 12,558 articles

and, after elimination of duplicates, 6,838 articles were evaluated based on the title and the abstract. Eligible articles had to address both concepts of the research issue (prioritized zoonoses and worker health). Of the 621 articles deemed eligible, 110 were selected following their full reading.

**RESULTS:** Of the diseases under study, enteric zoonoses were the most frequently reported. Agriculture, including veterinary services, public administration services and medical and social services were the sectors most frequently identified in the literature.

**CONCLUSION:** The results of our study will support public health authorities and decision-makers in targeting those sectors and occupations that are particularly at risk for the acquisition of zoonoses. Doing so will ultimately optimize the public health practices of those responsible for the health of workers.

## **WE ACT**

- 14. Coming Together for Climate and Health: Proceedings of the Second Annual Clinical Climate Change Meeting, Jan. 24, 2020.** Senay E, Gore K, Sherman J, Patel S, Ziska L, Lucchini R, DeFelice N, Just A, Nabeel I, Thanik E, Sheffield P, Rizzo A, Wright R, Gore K, Sherman J, Patel S, Ziska L, Lucchini R, DeFelice N, Just A, Nabeel I, Thanik E, Sheffield P, Rizzo A, Wright R. *J Occup Environ Med.* 2021 Mar 8. doi: 10.1097/JOM.0000000000002186. Online ahead of print.  
[https://journals.lww.com/joem/Abstract/9000/Coming\\_Together\\_for\\_Climate\\_and\\_Health\\_.97942.aspx](https://journals.lww.com/joem/Abstract/9000/Coming_Together_for_Climate_and_Health_.97942.aspx)

Climate change is imposing increasingly severe impacts on public health. Addressing these impacts requires heightened awareness of climate-driven health conditions and appropriate clinical practices to manage these conditions. Within this context, the 2nd Annual Clinical Climate Change Conference, held January 24, 2020 at the New York Academy of Medicine, brought together more than 150 allied health practitioners from across the United States for a one-day conference showcasing the state of the science on the climate and health. Eight platform presentations-including a keynote address from Karena Gore of the Center for Earth Ethics at Union Theological Seminary-covered a range of environmentally induced, climate-related disease areas as well as topics related to environmental justice. Additionally, key workshops engaged participants in the clinical management of climate-related health conditions. Communicating the existing evidence base for climate change-driven impacts on human health is crucial for preparing practitioners to identify and address these impacts. Further partnership between researchers and practitioners to extend and disseminate this evidence base will yield important advancements toward protecting patients and improving health outcomes in an era of climate crisis.

- 15. Leveraging Big Data and Analytics to Improve Food, Energy, and Water System Sustainability.** Pitts J, Gopal S, Ma Y, Koch M, Boumans RM, Kaufman L. *Front Big Data.* 2020 Apr 28;3:13. doi: 10.3389/fdata.2020.00013. eCollection 2020.  
<https://www.frontiersin.org/articles/10.3389/fdata.2020.00013/full>

With the world population projected to grow significantly over the next few decades, and in the presence of additional stress caused by climate change and urbanization, securing the essential resources of food, energy, and water is one of the most pressing challenges that the world



faces today. There is an increasing priority placed by the United Nations (UN) and US federal agencies on efforts to ensure the security of these critical resources, understand their interactions, and address common underlying challenges. At the heart of the technological challenge is data science applied to environmental data. The aim of this special publication is the focus on big data science for food, energy, and water systems (FEWSs). We describe a research methodology to frame in the FEWS context, including decision tools to aid policy makers and non-governmental organizations (NGOs) to tackle specific UN Sustainable Development Goals (SDGs). Through this exercise, we aim to improve the "supply chain" of FEWS research, from gathering and analyzing data to decision tools supporting policy makers in addressing FEWS issues in specific contexts. We discuss prior research in each of the segments to highlight shortcomings as well as future research directions.

16. **From Climate Change Ignorant to Climate Change Educator.** Rudd JA. Chemistry. 2021 Mar 11. doi: 10.1002/chem.202004414. Online ahead of print.

<https://chemistry-europe.onlinelibrary.wiley.com/doi/10.1002/chem.202004414>

What happens when you teach someone about the effects of climate change? Dr Jennifer Rudd shares her reaction to hearing that the world could be on track for 4 °C of global heating in her lifetime and describes how she has made dramatic changes to her home life, her career and her lifestyle, and launched a new climate change education programme called You and CO<sub>2</sub> .

17. **Abatement of hazardous materials and biomass waste via pyrolysis and co-pyrolysis for environmental sustainability and circular economy.** Chew KW, Chia SR, Chia WY, Cheah WY, Munawaroh HSH, Ong WJ. Environ Pollut. 2021 Mar 1;278:116836. doi: 10.1016/j.envpol.2021.116836. Online ahead of print.

[https://www.sciencedirect.com/science/article/abs/pii/S0269749121004164?dgcid=rss\\_sd\\_all](https://www.sciencedirect.com/science/article/abs/pii/S0269749121004164?dgcid=rss_sd_all)

The remarkable journey of progression of mankind has created various impacts in the form of polluted environment, amassed heavy metals and depleting resources. This alarming situation demands sustainable energy resources and approaches to deal with these environmental hazards and power deficit. Pyrolysis and co-pyrolysis address both energy and environmental issues caused by civilization and industrialization. The processes use hazardous waste materials including waste tires, plastic and medical waste, and biomass waste such as livestock waste and agricultural waste as feedstock to produce gas, char and pyrolysis oil for energy production. Usage of hazardous materials as pyrolysis and co-pyrolysis feedstock reduces disposal of harmful substances into environment, reducing occurrence of soil and water pollution, and substituting the non-renewable feedstock, fossil fuels. As compared to combustion, pyrolysis and co-pyrolysis have less emission of air pollutants and act as alternative options to landfill disposal and incineration for hazardous materials and biomass waste. Hence, stabilizing heavy metals and solving the energy and waste management problems. This review discusses the pyrolysis and co-pyrolysis of biomass and harmful wastes to strive towards circular economy and eco-friendly, cleaner energy with minimum waste disposal, reducing negative impact on the planet and creating future possibilities.

18. **Congress and Health Advocates Can Build a Climate Change-Adapted Health Sector.** Moulton AD. Am J Public Health. 2021 Apr;111(4):568-570. doi: 10.2105/AJPH.2021.306172.

<https://search.ebscohost.com/login.aspx?direct=true&db=mdc&AN=33689425&authtype=sso&custid=ns247570&site=ehost-live&scope=site&authtype=shib&custid=ns247570>

Enactment of legislation to strengthen the capacity of the US health sector to address climate change health effects should be a high 2021 priority for Congress and for all who advocate improved health outcomes and health equity. This editorial is grounded in my experience in state government policy (Missouri, 1977–1993) and in senior policy positions at the Centers for Disease Control and Prevention (CDC; 1994–2015) as well as in preparing articles about health sector adaptation to climate change.<sup>1–4</sup>

19. **Health Care Waste and Climate Change.** Frumkin H. *Am J Public Health.* 2021 Apr;111(4):e15. doi: 10.2105/AJPH.2020.306142.

<https://search.ebscohost.com/login.aspx?direct=true&db=mdc&AN=33689410&authtype=sso&custid=ns247570&site=ehost-live&scope=site&authtype=shib&custid=ns247570>

Health care accounts for nearly 18% of the US economy and nearly 8% of the nation's greenhouse gas emissions.<sup>2</sup> Some of these emissions derive from energy use, some from transportation, some from practices such as using climate-active anesthetic gases, some from the embedded carbon in the extensive supply chain. Delivering health care is material and energy intensive. Of the identified sources of waste in health care,<sup>3</sup> roughly 60% relate directly to the delivery of health care services (as opposed to administrative waste, excessive pricing, and fraud). Just as pervasive waste in the food system accounts for a large portion of that sector's climate change contributions,<sup>4</sup> pervasive waste in health care delivery accounts for a substantial portion of the health care carbon footprint.

20. **Webinars reduce the environmental footprint of pediatric cardiology conferences.** Duane B, Lyne A, Faulkner T, Windram JD, Redington AN, Saget S, Tretter JT, McMahan CJ. *Cardiol Young.* 2021 Mar 9:1-8. doi: 10.1017/S1047951121000718. Online ahead of print.

**BACKGROUND:** Webinars have recently replaced in-person medical conferences, including paediatric cardiology conferences, given the COVID-19 pandemic.

**METHODS:** With increasing environmental concerns, we analysed the differences between the environmental footprint of a paediatric cardiology webinar with a hypothetical conference. Travel data was collected, with assumptions made on the amount of computer use, internet use and accordingly the overall use of electricity for both forms of conference. Life Cycle Assessment methodology was used (OpenLCA and Ecovinent v 3.7).

**RESULTS:** We showed that the theoretical environmental impact of a virtual conference is significantly less (4 tons CO<sub>2</sub> equivalent) than the traditional international face-to-face conference (192 tons CO<sub>2</sub> equivalent). The life cycle assessment methodology showed that resource use for a face-to-face conference lasting 2.5 days for 1374 attendees is equivalent to 400 times what an average person would use in one year, the climate change and photochemical ozone formation approximately 250 times and the eutrophication terrestrial equivalent to 225 times. However, using carbon equivalent emissions to measure environmental harm from flying is an under estimate of the potential damage, when one considers the additional production of airplane contrails. Notwithstanding this, there is a 98% reduction in climate change impact when meetings are held virtually.

CONCLUSIONS: While the virtual conference may never completely replace the traditional in-person paediatric cardiology conference, due to networking benefits, the significant theoretical benefits to the environment highlighted in this study, warrants consideration for the virtual conference taking a more common place in sustainable academia.

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[Lancet Planetary Health](#) – *open-access, interdisciplinary journal focused on sustainability*

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