

## Environmental Stewardship Resource Desk

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### New Research

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#### COVID-19

1. **Observations on the Occurrence, Transmission and Management of the COVID-19 Pandemic Derived from Physics.** Ingersoll JG. Diseases. 2021 Jan 16;9(1):E9. doi: 10.3390/diseases9010009.

<https://www.mdpi.com/2079-9721/9/1/9/htm>

Three important observations derived from the ongoing COVID-19 pandemic could result in the development of novel approaches to deal with it and avoid or at least minimize the occurrence and impact of future outbreaks. First, the dramatic increase in pandemics in the past decade alone suggests that the current relationship of humans with the environment is quickly becoming unstable, with potentially catastrophic consequences. In order to reduce the toll in life and property, we would need to shift our emphasis from control of nature to a symbiosis with nature. This, then, can become the new framework for dealing effectively with environmental issues such as climate change, whereby properly applied medical science would provide the necessary impetus for action. Second, the existence of superspreaders of infection among populations in this pandemic requires that we develop objective tests, most likely of a genetic nature, to identify them rather than apply indiscriminate and draconian controls across the board. Not identifying superspreaders in a timely fashion could allow this pandemic to turn into a black swan event, with a catastrophic impact on society. Third, we need to refocus our efforts in dealing with this pandemic from the virus itself to the human hosts. An objective morbidity risk index can be developed such that most of us can go about our daily business without the fear of becoming seriously ill, while measures can be implemented to protect those who are most vulnerable to this virus. These observations point clearly to a need for a paradigm shift.

2. **Nature and COVID-19: The pandemic, the environment, and the way ahead.** McNeely JA. Ambio. 2021 Jan 16:1-15. doi: 10.1007/s13280-020-01447-0. Online ahead of print.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7811389/>

The COVID-19 pandemic has brought profound social, political, economic, and environmental challenges to the world. The virus may have emerged from wildlife reservoirs linked to environmental disruption, was transmitted to humans via the wildlife trade, and its spread was facilitated by economic globalization. The pandemic arrived at a time when wildfires, high temperatures, floods, and storms amplified human suffering. These challenges call for a powerful response to COVID-19 that addresses social and economic development, climate change, and biodiversity together, offering an opportunity to bring transformational change to the structure and functioning of the global economy. This biodefense can include a "One Health" approach in all relevant sectors; a greener approach to agriculture that minimizes greenhouse gas emissions and leads to healthier diets; sustainable forms of energy; more effective international environmental agreements; post-COVID development that is equitable and sustainable; and nature-compatible international trade. Restoring and enhancing protected areas as part of devoting 50% of the planet's land to environmentally sound management that conserves biodiversity would also support adaptation to climate change and limit human contact with zoonotic pathogens. The essential links between human health and well-being, biodiversity, and climate change could inspire a new generation of innovators to provide green solutions to enable humans to live in a healthy balance with nature leading to a long-term resilient future.

3. **Environmental management strategy in response to COVID-19 in China: Based on text mining of government open information.** Kang A, Ren L, Hua C, Song H, Dong M, Fang Z, Zhu M. *Sci Total Environ.* 2021 Jan 15;769:145158. doi: 10.1016/j.scitotenv.2021.145158. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S0048969721002242>

Coronavirus disease 2019 (COVID-19) is a global pandemic and a major health emergency. In the process of fighting against COVID-19, the China Ministry of Ecology and Environment (MEE) responded quickly and set up a working group as soon as possible. This article uses text mining to retrospectively analyze the government's public information on the website of MEE during the epidemic, sort out the timeline of MEE's response to COVID-19. We find that MEE's work during the COVID-19 pandemic is focused on medical waste and wastewater treatment, environment emergency monitoring, pollution prevention, and other environmental management for supporting economic recovery. It drafted three main medical waste management plans, an emergency environmental monitoring plan, and formulated "two lists" - a Positive checklist for Environmental impact assessment (EIA) approval and a positive checklist for supervision and enforcement, to promote the resumption of work and production. 2020 is the final year of China's "three years of fighting pollution prevention and control". In the case of the sudden COVID-19 epidemic, the Chinese environment department has ensured that the quality of the ecological environment has not been affected by the epidemic prevention and control while ensuring the smooth progress of the fight against pollution. China's medical waste disposal capacity has also been greatly improved during this epidemic. The review of China's environmental management strategy in response to COVID-19 can provide a reference for countries in the world that are still in the critical period of epidemic control; it can provide action guidelines for the ecological environment system to respond to sudden pandemic events in the future.

4. **More Is Not Enough: A Deeper Understanding of the COVID-19 Impacts on Healthcare, Energy and Environment Is Crucial.** Jiang P, Klemeš JJ, Fan YV, Fu X, Bee YM. *Int J Environ Res Public Health*. 2021 Jan 14;18(2):684. doi: 10.3390/ijerph18020684.

<https://www.mdpi.com/1660-4601/18/2/684/htm>

The coronavirus disease 2019 (COVID-19) pandemic has magnified the insufficient readiness of humans in dealing with such an unexpected occurrence. During the pandemic, sustainable development goals have been hindered severely. Various observations and lessons have been highlighted to emphasise local impacts on a single region or single sector, whilst the holistic and coupling impacts are rarely investigated. This study overviews the structural changes and spatial heterogeneities of changes in healthcare, energy and environment, and offers perspectives for the in-depth understanding of the COVID-19 impacts on the three sectors, in particular the cross-sections of them. Practical observations are summarised through the broad overview. A novel concept of the healthcare-energy-environment nexus under climate change constraints is proposed and discussed, to illustrate the relationships amongst the three sectors and further analyse the dynamics of the attention to healthcare, energy and environment in view of decision-makers. The society is still on the way to understanding the impacts of the whole episode of COVID-19 on healthcare, energy, environment and beyond. The raised nexus thinking could contribute to understanding the complicated COVID-19 impacts and guiding sustainable future planning.

5. **How science can put the Sustainable Development Goals back on track.** *Nature*. 2021 Jan;589(7842):329-330. doi: 10.1038/d41586-021-00104-0.

<https://www.nature.com/articles/d41586-021-00104-0>

In October, United Nations secretary-general António Guterres made a series of key appointments. He tasked 15 scientists from around the world with providing policymakers with evidence, as well as their thoughts, on the Sustainable Development Goals (SDGs). This time last year, the UN's flagship plan to end poverty and guide the world to environmental sustainability by 2030 was already off track. Since then, the pandemic has reversed most of the achievements made in the five years since countries adopted the goals.

6. **Extended use or reuse of single-use surgical masks and filtering face-piece respirators during the coronavirus disease 2019 (COVID-19) pandemic: A rapid systematic review.** Toomey EC, Conway Y, Burton C, Smith S, Smalle M, Chan XS, Adishes A, Tanveer S, Ross L, Thomson I, Devane D, Greenhalgh T. *Infect Control Hosp Epidemiol*. 2021 Jan;42(1):75-83. doi: 10.1017/ice.2020.1243. Epub 2020 Oct 8.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7588721/>

**BACKGROUND:** Shortages of personal protective equipment during the coronavirus disease 2019 (COVID-19) pandemic have led to the extended use or reuse of single-use respirators and surgical masks by frontline healthcare workers. The evidence base underpinning such practices warrants examination.

**OBJECTIVES:** To synthesize current guidance and systematic review evidence on extended use, reuse, or reprocessing of single-use surgical masks or filtering face-piece respirators.

**DATA SOURCES:** We used the World Health Organization, the European Centre for Disease Prevention and Control, the US Centers for Disease Control and Prevention, and Public Health England websites to identify guidance. We used Medline, PubMed, Epistemonikos, Cochrane Database, and preprint servers for systematic reviews.

**METHODS:** Two reviewers conducted screening and data extraction. The quality of included systematic reviews was appraised using AMSTAR-2. Findings were narratively synthesized.

**RESULTS:** In total, 6 guidance documents were identified. Levels of detail and consistency across documents varied. They included 4 high-quality systematic reviews: 3 focused on reprocessing (decontamination) of N95 respirators and 1 focused on reprocessing of surgical masks. Vaporized hydrogen peroxide and ultraviolet germicidal irradiation were highlighted as the most promising reprocessing methods, but evidence on the relative efficacy and safety of different methods was limited. We found no well-established methods for reprocessing respirators at scale.

**CONCLUSIONS:** Evidence on the impact of extended use and reuse of surgical masks and respirators is limited, and gaps and inconsistencies exist in current guidance. Where extended use or reuse is being practiced, healthcare organizations should ensure that policies and systems are in place to ensure these practices are carried out safely and in line with available guidance.

## Health Impacts of Climate Change

### 7. **The Environment and Suicide - Why Suicidologists Should Support Climate Change Policies.**

Lester D. Crisis. 2021 Jan 21:1-3. doi: 10.1027/0227-5910/a000752. Online ahead of print.

<https://econtent.hogrefe.com/doi/10.1027/0227-5910/a000752>

When suicidologists consider how the environment may impact suicide, they typically focus on the social and economic environment and the interpersonal environment. For the former, Lester and Yang (1997) documented how factors such as the business cycle might impact suicide rates while, many years ago, Platt (1984) showed that unemployment increased suicide rates. As for the interpersonal environment, in articulating his interpersonal theory of suicide, Joiner (2005) argued that perceived burdensomeness and thwarted belonging were present in those who died by suicide, and Van Orden et al. (2010) reviewed research supporting the theory. But does the physical environment have an impact on suicide?

### 8. **Impact of Environmental Injustice on Children's Health-Interaction between Air Pollution and Socioeconomic Status.**

Mathiarasan S, Hüls A. Int J Environ Res Public Health. 2021 Jan 19;18(2):795. doi: 10.3390/ijerph18020795.

<https://www.mdpi.com/1660-4601/18/2/795/htm>

Air pollution disproportionately affects marginalized populations of lower socioeconomic status. There is little literature on how socioeconomic status affects the risk of exposure to air pollution and associated health outcomes, particularly for children's health. The objective of this article was to review the existing literature on air pollution and children's health and discern how socioeconomic status affects this association. The concept of environmental injustice recognizes how underserved communities often suffer from higher air pollution concentrations in addition to other underlying risk factors for impaired health. This exposure

then exerts larger effects on their health than it does in the average population, affecting the whole body, including the lungs and the brain. Children, whose organs and mind are still developing and who do not have the means of protecting themselves or creating change, are the most vulnerable to the detrimental effects of air pollution and environmental injustice. The adverse health effects of air pollution and environmental injustice can harm children well into adulthood and may even have transgenerational effects. There is an urgent need for action in order to ensure the health and safety of future generations, as social disparities are continuously increasing, due to social discrimination and climate change.

9. **Analysis of Correlation between Climate Change and Human Health Based on a Machine Learning Approach.** Pizzulli VA, Telesca V, Covatariu G. Healthcare (Basel). 2021 Jan 17;9(1):86. doi: 10.3390/healthcare9010086.

<https://www.mdpi.com/2227-9032/9/1/86/htm>

Climate change increasingly affects every aspect of human life. Recent studies report a close correlation with human health and it is estimated that global death rates will increase by 73 per 100,000 by 2100 due to changes in temperature. In this context, the present work aims to study the correlation between climate change and human health, on a global scale, using artificial intelligence techniques. Starting from previous studies on a smaller scale, that represent climate change and which at the same time can be linked to human health, four factors were chosen. Four causes of mortality, strongly correlated with the environment and climatic variability, were subsequently selected. Various analyses were carried out, using neural networks and machine learning to find a correlation between mortality due to certain diseases and the leading causes of climate change. Our findings suggest that anthropogenic climate change is strongly correlated with human health; some diseases are mainly related to risk factors while others require a more significant number of variables to derive a correlation. In addition, a forecast of victims related to climate change was formulated. The predicted scenario confirms that a prevalently increasing trend in climate change factors corresponds to an increase in victims.

10. **Ecological Grief as a Response to Environmental Change: A Mental Health Risk or Functional Response?** Comtesse H, Ertl V, Hengst SMC, Rosner R, Smid GE. Int J Environ Res Public Health. 2021 Jan 16;18(2):734. doi: 10.3390/ijerph18020734.

<https://www.mdpi.com/1660-4601/18/2/734>

The perception of the impact of climate change on the environment is becoming a lived experience for more and more people. Several new terms for climate change-induced distress have been introduced to describe the long-term emotional consequences of anticipated or actual environmental changes, with ecological grief as a prime example. The mourning of the loss of ecosystems, landscapes, species and ways of life is likely to become a more frequent experience around the world. However, there is a lack of conceptual clarity and systematic research efforts with regard to such ecological grief. This perspective article introduces the concept of ecological grief and contextualizes it within the field of bereavement. We provide a case description of a mountaineer in Central Europe dealing with ecological grief. We introduce ways by which ecological grief may pose a mental health risk and/or motivate environmental behavior and delineate aspects by which it can be differentiated from related concepts of

solastalgia and eco-anxiety. In conclusion, we offer a systematic agenda for future research that is embedded in the context of disaster mental health and bereavement research.

11. **Potential Impacts of Extreme Heat and Bushfires on Dementia.** Farugia TL, Cuni-Lopez C, White AR. *J Alzheimers Dis.* 2021 Jan 11. doi: 10.3233/JAD-201388. Online ahead of print. <https://content.iospress.com/articles/journal-of-alzheimers-disease/jad201388>  
Australia often experiences natural disasters and extreme weather conditions such as: flooding, sandstorms, heatwaves, and bushfires (also known as wildfires or forest fires). The proportion of the Australian population aged 65 years and over is increasing, alongside the severity and frequency of extreme weather conditions and natural disasters. Extreme heat can affect the entire population but particularly at the extremes of life, and patients with morbidities. Frequently identified as a vulnerable demographic in natural disasters, there is limited research on older adults and their capacity to deal with extreme heat and bushfires. There is a considerable amount of literature that suggests a significant association between mental disorders such as dementia, and increased vulnerability to extreme heat. The prevalence rate for dementia is estimated at 30% by age 85 years, but there has been limited research on the effects extreme heat and bushfires have on individuals living with dementia. This review explores the differential diagnosis of dementia, the Australian climate, and the potential impact Australia's extreme heat and bushfires have on individuals from vulnerable communities including low socioeconomic status Indigenous and Non-Indigenous populations living with dementia, in both metropolitan and rural communities. Furthermore, we investigate possible prevention strategies and provide suggestions for future research on the topic of Australian bushfires and heatwaves and their impact on people living with dementia. This paper includes recommendations to ensure rural communities have access to appropriate support services, medical treatment, awareness, and information surrounding dementia.

*WE ACT: Waste Energy/water Agriculture/food Chemicals Transportation*

12. **Environmentally sustainable emergency medicine.** Spruell T, Webb H, Steley Z, Chan J, Robertson A. *Emerg Med J.* 2021 Jan 22:emermed-2020-210421. doi: 10.1136/emermed-2020-210421. Online ahead of print.  
Emergency clinicians worldwide are demonstrating increasing concern about the effect of climate change on the health of the populations they serve. The movement for sustainable healthcare is being driven by the need to address the climate emergency. Globally, healthcare contributes significantly to carbon emissions, and the healthcare sector has an important role to play in contributing to decarbonisation of the global economy. In this article, we consider the implications for emergency medicine of climate change, and suggest ways to improve environmental sustainability within emergency departments. We identify examples of sustainable clinical practice, as well as outlining research proposals to address the knowledge gap that currently exists in the area of provision of environmentally sustainable emergency care.
13. **Mobilizing the past to shape a better Anthropocene.** Boivin N, Crowther A. *Nat Ecol Evol.* 2021 Jan 18. doi: 10.1038/s41559-020-01361-4. Online ahead of print.

As our planet emerges into a new epoch in which humans dominate the Earth system, it is imperative that societies initiate a new phase of responsible environmental stewardship. Here we argue that information from the past has a valuable role to play in enhancing the sustainability and resilience of our societies. We highlight the ways that past data can be mobilized for a variety of efforts, from supporting conservation to increasing agricultural sustainability and food security. At a practical level, solutions from the past often do not require fossil fuels, can be locally run and managed, and have been tested over the long term. Past failures reveal non-viable solutions and expose vulnerabilities. To more effectively leverage increasing knowledge about the past, we advocate greater cross-disciplinary collaboration, systematic engagement with stakeholders and policymakers, and approaches that bring together the best of the past with the cutting-edge technologies and solutions of tomorrow.

**14. Fresh gas flow during total intravenous anaesthesia and marginal gains in sustainable**

**healthcare.** Comment on Br J Anaesth 2020; 125: 773-8. Back M, Al-Attar A, Sutton R, Shelton C. Br J Anaesth. 2021 Jan 15;S0007-0912(20)30988-0. doi: 10.1016/j.bja.2020.12.006. Online ahead of print.

The British cycling team won eight gold medals at the 2012 London Olympics. This success, it has been suggested, was attributable, in part, to the philosophy of ‘the aggregation of marginal gains’: small improvements every day, everywhere and anywhere, that have a compound effect. This concept has gained traction in clinical anaesthesia and perioperative medicine; we believe that it should likewise be applied in sustainable healthcare.

**15. Inculcation of Green Behavior in Employees: A Multilevel Moderated Mediation Approach.**

Saleem M, Qadeer F, Mahmood F, Han H, Giorgi G, Ariza-Montes A. Int J Environ Res Public Health. 2021 Jan 5;18(1):331. doi: 10.3390/ijerph18010331.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7794897/>

In this era of globalization, preventing organizations from undermining and degrading the environment has become a great challenge, especially when considering that organizations are among the major contributors to environmental deterioration. As a result, scholars have recently begun to focus on understanding the key determinants of employee green behavior (EGB), a nascent field within the area of sustainable development and organizational behavior. This study extends the emerging discussion over EGB by investigating how green behavior can be inculcated into employees' mindsets and under what conditions this can best be accomplished. The present research examines the relationship between ethical leadership and EGB by the mediating mechanisms of green psychological climate, employees' harmonious environmental passion, and employees' environmental commitment, through the underpinnings of social learning theory. Further, the study examines the contingency effects of leaders' pro-environmental attitudes to determine how leaders with ethical attributes and pro-environmental attitudes can create a green psychological climate that ultimately leads to EGB through employees' harmonious environmental passion and employees' environmental commitment. The approach to implementing theory development is deductive as the research employed a quantitative research design and survey administration with a time-lagged approach. Multi-level data were collected from 400 respondents working in public and private sector hospitals and universities in Pakistan. The analysis was conducted in MPlus. The results

show positive and statistically significant effects of ethical leadership on EGB through the serial mediations of a green psychological climate and employees' harmonious environmental passion, and a green psychological climate and employees' environmental commitment. Moreover, the leaders' pro-environmental attitude contingency strengthens the indirect impact of ethical leadership on EGB. This research provides several managerial implications through which organizations can strategically concentrate on EGB, including saving energy by turning off unused lights, reducing waste, and recycling.

**16. Environmental Sustainability in Canadian Critical Care: A Nationwide Survey Study on Medical Waste Management.** Yu A, Baharmand I. *Healthc Q.* 2021 Jan;23(4):39-45. doi:

10.12927/hcq.2020.26394.

**BACKGROUND:** To date, the literature surrounding healthcare sustainability has focused largely on operating rooms, energy efficiency and biohazardous waste management. Few studies have looked at the sustainability within intensive care units (ICUs).

**OBJECTIVE:** Our study sought to capture the array of sustainability initiatives undertaken by Canadian ICUs and gain a better understanding of current practices with regard to the management of single-use equipment waste.

**METHODS:** We conducted a nationwide e-mail survey through the Canadian Critical Care Network.

**RESULTS:** We received responses from a total of 81 hospital sites representing all 10 Canadian provinces and approximately 28.3% of all Canadian ICUs. The vast majority of responses came from ICU managers or nursing leadership. Our study identified variable waste management practices across the country and showcased successful initiatives undertaken by Canadian ICUs toward increased environmental sustainability.

**17. Switching off for future-Cost estimate and a simple approach to improving the ecological footprint of radiological departments.** Büttner L, Posch H, Auer T, Jonczyk M, Fehrenbach U, Hamm B, Bauknecht HC, Böning G. *Eur J Radiol Open.* 2020 Dec 31;8:100320. doi:

10.1016/j.ejro.2020.100320. eCollection 2021.

<https://www.sciencedirect.com/science/article/pii/S235204772030109X>

**PURPOSE:** Besides diagnostic imaging devices, in particular computed tomography (CT) and magnetic resonance imaging (MRI), numerous reading workstations contribute to the high energy consumption of radiological departments. It was investigated whether switching off workstations after core working hours can relevantly lower energy consumption considering both ecological and economical aspects.

**METHODS:** Besides calculating different theoretical energy consumption scenarios, we measured power consumption of 3 workstations in our department over a 6-month period under routine working conditions and another 6-month period during which users were asked to switch off workstations after work. Staff costs arising from restarting workstations manually were calculated.

**RESULTS:** Our approach to switching off workstations after core working hours reduced energy consumption by about 5.6 %, corresponding to an extrapolated saving of 3.2 tons in carbon dioxide (CO<sub>2</sub>) emissions and 2100.70 USD/year in electricity costs for 227 workstations.

Theoretical calculations indicate that consistent automatic shutdown after core working hours

could result in a potential total reduction of energy consumption of 38.6 %, equaling 22.2 tons of CO2 and 14,388.28 USD/year. However, staff costs resulting from waiting times after manually restarting workstations would amount to 36,280.02 USD/year.

CONCLUSIONS: Switching off workstations after core working hours can considerably reduce energy consumption and costs, but varies with user adherence. Staff costs caused by waiting time after manually starting up workstations outweigh energy savings by far. Therefore, an energy-saving plan with automated shutdown/restart besides enabling an energy-saving mode would be the most effective way of saving both energy and costs.

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