

Environmental Stewardship Resource Desk

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COVID-19

1. **Our future in the Anthropocene biosphere.** Folke C, Polasky S, Rockström J, Galaz V, Westley F, Lamont M, Scheffer M, Österblom H, Carpenter SR, Chapin FS 3rd, Seto KC, Weber EU, Crona BI, Daily GC, Dasgupta P, Gaffney O, Gordon LJ, Hoff H, Levin SA, Lubchenco J, Steffen W, Walker BH. *Ambio*. 2021 Apr;50(4):834-869. doi: 10.1007/s13280-021-01544-8. Epub 2021 Mar 14.

<https://link.springer.com/article/10.1007/s13280-021-01544-8>

The COVID-19 pandemic has exposed an interconnected and tightly coupled globalized world in rapid change. This article sets the scientific stage for understanding and responding to such change for global sustainability and resilient societies. We provide a systemic overview of the current situation where people and nature are dynamically intertwined and embedded in the biosphere, placing shocks and extreme events as part of this dynamic; humanity has become the major force in shaping the future of the Earth system as a whole; and the scale and pace of the human dimension have caused climate change, rapid loss of biodiversity, growing inequalities, and loss of resilience to deal with uncertainty and surprise. Taken together, human actions are challenging the biosphere foundation for a prosperous development of civilizations. The Anthropocene reality-of rising system-wide turbulence-calls for transformative change towards sustainable futures. Emerging technologies, social innovations, broader shifts in cultural repertoires, as well as a diverse portfolio of active stewardship of human actions in support of a resilient biosphere are highlighted as essential parts of such transformations.

2. **Survey of One Health programs in U.S. medical schools and development of a novel one health elective for medical students.** Docherty L, Foley PL. *One Health*. 2021 Mar 1;12:100231. doi: 10.1016/j.onehlt.2021.100231. eCollection 2021 Jun.

<https://www.sciencedirect.com/science/article/pii/S2352771421000215>

Lessons learned from recent pandemics, such as SARS-CoV-2 have illustrated that education and training in a One Health approach, which recognizes the interdependency of the health of people, animals and the environment, are essential in improving preparations for and responses to disease outbreaks. For this reason and others, there is a critical need to provide

One Health (OH) training to medical professionals early in their careers. 133 U.S. medical schools were surveyed for the incorporation of OH learning activities. Results showed that 56% of surveyed programs included OH-related subject matter, primarily in the context of preclinical classroom learning. This supports previous findings that OH education efforts in medical schools lag behind veterinary schools, with many veterinary schools already including OH as a central part of their curricula. A two week OH elective course for third year medical students was developed and implemented at Georgetown University School of Medicine. Topics such as emerging infectious diseases, zoonoses, vector-borne diseases, epidemiology, emergency preparedness, the human-animal bond, and effects of climate change on public health were discussed. The 21 participants were surveyed before and after the course regarding their knowledge and understanding of OH. Participation in the course enhanced the students' knowledge of OH and furthermore, the students' perception of the importance of incorporating OH within the curriculum and in their future careers changed significantly. This study provides clear evidence that successful integration of OH material is achievable at low cost through interdepartmental and interdisciplinary collaboration. A more holistic approach to health care that takes into consideration environmental, wildlife, and domestic animal factors, and introduction of concepts such as OH into the medical school curriculum, can help close the educational gaps identified in the surveys.

Health Impacts of Climate Change

- 3. Incidence, Drivers and Global Health Implications of the 2019/2020 Yellow Fever Sporadic Outbreaks in Sub-Saharan Africa.** Emeribe AU, Abdullahi IN, Ajagbe OOR, Ugwu CE, Onoja SO, Abubakar SD, Umeozuru CM, Animasaun OS, Omosigho PO, Danmusa UM, Mallam MAB, Aminu MS, Yahaya H, Oyewusi S. *Pathog Dis.* 2021 Mar 19;ftab017. doi: 10.1093/femspd/ftab017. Online ahead of print.

The 2019 and 2020 sporadic outbreaks of Yellow fever (YF) in Sub-Saharan Africa (SSA) countries had raised a lot of global health concerns. This article aims to narratively review the vector biology, YF vaccination program, environmental factors and climatic changes, and to understand how they could facilitate the re-emergence of YF. This study comprehensively reviewed articles that focused on the interplay and complexity of YF Virus (YFV) vector diversity/competence, YF vaccine immunodynamics, and climatic changes impacts on YFV transmission as they influence the 2019/2020 sporadic outbreaks in Sub-Saharan Africa (SSA). Based on available reports, vectorial migration, climatic changes, and YF immunization level could be reasons for the re-emergence of YF at the community and national levels. Essentially, the drivers of YFV infection due to spillover are moderately constant. However, changes in land use and landscape have been shown to influence sylvan-to-urban spillover. Furthermore, increased precipitation and warmer temperatures due to climate change, are likely to broaden the range of mosquitoes' habitat. The 2019/2020 YF outbreaks in SSA is basically a result of inadequate vaccination campaigns, YF surveillance and vector control. Consequently, and most importantly, adequate immunization coverage must be implemented and properly achieved under the responsibility of the public health stakeholders.

4. **A bibliometric review on the drivers of environmental migration.** Priovashini C, Mallick B. *Ambio*. 2021 Mar 18. doi: 10.1007/s13280-021-01543-9. Online ahead of print.

A large body of literature exists arguing that numerous, complex factors result in environmental migration. Thus, in order to understand environmental migration, we must investigate how its drivers are defined, explained and interrelated. This study aims to produce a comprehensive analysis of the literature on the drivers of environmental migration and assess future opportunities for studying 'environmental migration'. We conduct a systematic literature search using the keywords 'environmental migration' and 'drivers' in Scopus and Web of Knowledge, analysing 146 publications. The findings are organised as a bibliometric analysis, including network analysis and evaluation of publication metrics. Results show that the literature on environmental migration drivers constitutes a relatively new, growing field largely developed in the USA. It is rooted in the wider environmental migration literature and strongly associated with the discourse of climate change impacts as driving factors. Typologies of 'migrants' are more prevalent than 'refugees' when referring to actors.
5. **Understanding the effect of climate change in the distribution and intensity of malaria transmission over India using a dynamical malaria model.** Chaturvedi S, Dwivedi S. *Int J Biometeorol*. 2021 Mar 18. doi: 10.1007/s00484-021-02097-x. Online ahead of print.

Efforts have been made to quantify the spatio-temporal malaria transmission intensity over India using the dynamical malaria model, namely, Vector-borne Disease Community Model of International Centre for Theoretical Physics Trieste (VECTRI). The likely effect of climate change in the variability of malaria transmission intensity over different parts of India is also investigated. The Historical data and future projection scenarios of the rainfall and temperature derived from the Coupled Model Intercomparison Project Phase 5 (CMIP5) model output are used for this purpose. The Entomological Inoculation Rate (EIR) and Vector are taken as quantifiers of malaria transmission intensity. It is shown that the maximum number of malaria cases over India occur during the Sept-Oct months, whereas the minimum during the Feb-Apr months. The malaria transmission intensity as well as length of transmission season over India is likely to increase in the future climate as a result of global warming.
6. **Wind disasters adaptation in cities in a changing climate: A systematic review.** He Y, Wu B, He P, Gu W, Liu B. *PLoS One*. 2021 Mar 17;16(3):e0248503. doi: 10.1371/journal.pone.0248503. eCollection 2021.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0248503>

Wind-related disasters will bring more devastating consequences to cities in the future with a changing climate, but relevant studies have so far provided insufficient information to guide adaptation actions. This study aims to provide an in-depth elaboration of the contents discussed in open access literature regarding wind disaster adaptation in cities. We used the Latent Dirichlet Allocation (LDA) to refine topics and main contents based on 232 publications (1900 to 2019) extracted from Web of Science and Scopus. We conducted a full-text analysis to filter out focal cities along with their adaptation measures. The results show that wind disaster adaptation research in cities has formed a systematic framework in four aspects: 1) vulnerability and resilience of cities, 2) damage evaluation, 3) response and recovery, and 4) health impacts of wind disaster. Climate change is the background for many articles discussing

vulnerability and adaptation in coastal areas. It is also embedded in damage evaluation since it has the potential to exacerbate disaster consequences. The literature is strongly inclined towards more developed cities such as New York City and New Orleans, among which New York City associated with Hurricane Sandy ranks first (38/232). Studies on New York City cover all the aspects, including the health impacts of wind disasters which are significantly less studied now. Distinct differences do exist in the number of measures regarding the adaptation categories and their subcategories. We also find that hard adaptation measures (i.e., structural and physical measures) are far more popular than soft adaptation measures (i.e., social and institutional measures). Our findings suggest that policymakers should pay more attention to cities that have experienced major wind disasters other than New York. They should embrace the up-to-date climate change study to defend short-term disasters and take precautions against long-term changes. They should also develop hard-soft hybrid adaptation measures, with special attention on the soft side, and enhance the health impact study of wind-related disasters.

7. **A scoping review on climate change and tuberculosis.** Maharjan B, Gopali RS, Zhang Y. *Int J Biometeorol.* 2021 Mar 16. doi: 10.1007/s00484-021-02117-w. Online ahead of print. Climate change is a global public health challenge. The changes in climatic factors affect the pattern and burden of tuberculosis, which is a worldwide public health problem affecting low and middle-income countries. However, the evidence related to the impact of climate change on tuberculosis is few and far between. This study is a scoping review following a five-stage version of Arksey and O'Malley's method. We searched the literature using the keywords and their combination in Google scholar, and PubMed. Climate change affects tuberculosis through diverse pathways: changes in climatic factors like temperature, humidity, and precipitation influence host response through alterations in vitamin D distribution, ultraviolet radiation, malnutrition, and other risk factors. The rise in extreme climatic events induces population displacement resulting in a greater number of vulnerable and risk populations of tuberculosis. It creates a conducive environment of tuberculosis transmission and development of active tuberculosis and disrupts tuberculosis diagnosis and treatment services. Therefore, it stands to reasons that climate change affects tuberculosis, particularly in highly vulnerable countries and areas. However, further studies and novel methodologies are required to address such a complex relationship and better understand the occurrence of tuberculosis attributable to climate change.
8. **Environmental *Candida auris* and the Global Warming Emergence Hypothesis.** Casadevall A, Kontoyiannis DP, Robert V. *mBio.* 2021 Mar 16;12(2):e00360-21. doi: 10.1128/mBio.00360-21. Comment on
mBio. 2021 Mar 16;12(2):
<https://mbio.asm.org/content/12/2/e00360-21>
Global warming was proposed to be a contributing cause for the nearly simultaneous emergence of different clades of *Candida auris* as a nosocomial pathogen in different continents. The global warming emergence hypothesis posits that *C. auris* existed in the environment prior to its clinical recognition and became pathogenic for humans because of thermal adaptation in response to climate change. The isolation of *C. auris* from two sites in the

remote Andaman Islands establishes it as an environmental organism, a necessary condition for the hypothesis. The observation that one environmental isolate grew slower at mammalian temperatures than clinical strains is consistent with the notion that their ancestor recently adapted to higher temperatures. The knowledge that *C. auris* can be recovered from the environment should prompt additional searches to define its ecological niches, and the analysis of future environmental isolates will provide evidence for validating or refuting the global warming emergence hypothesis.

9. **Associations between weather-related data and influenza reports: A pilot study and related policy implications.** Carter-Templeton H, Templeton GF, Nicoll LH, Maxie L, Kittle TS, Jasko SA, Carpenter EE, Monsen KA. *Appl Nurs Res.* 2021 Feb 24;151413. doi: 10.1016/j.apnr.2021.151413. Online ahead of print.
AIM: The purpose of this retrospective, correlational pilot study was to explore the relationship between historical weekly weather data including temperature, dew point, humidity, barometric pressure, visibility, and cloud cover compared to weekly influenza-like illness reports over a four year period.
BACKGROUND: Climate and weather-related conditions may affect the viral activity and transmission of influenza, although this relationship has not been widely studied in nursing. Some research suggests that there are causal links between old temperatures, low indoor humidity, minimal sun exposure, and influenza outbreaks. Additionally, rapid weather variability in a warming climate can increase influenza epidemic risk.
METHODS: Data from a local public health district were extracted and used to correlate with weekly weather averages for the area.
RESULTS: Findings showed that current influenza reports are significantly associated with temperature and visibility, both lagged two weeks.
CONCLUSIONS: Though more research is needed, nurses must understand, recognize, and act upon weather and climate factors that affect the health of populations. With a greater understanding of the relationship between weather and influenza-like illness, nurses and other healthcare providers can potentially work to respond to and mitigate the consequences of weather-related illness as well as anticipate and prepare for increased flu burden. Furthermore, nurses can remain engaged in climate protective initiatives and policy development at their local community and/or organizational levels to underscore and advocate for the needs of populations and groups they serve.
10. **Increased risk of multiple pregnancy complications following large-scale power outages during Hurricane Sandy in New York State.** Xiao J, Zhang W, Huang M, Lu Y, Lawrence WR, Lin Z, Primeau M, Dong G, Liu T, Tan W, Ma W, Meng X, Lin S. *Sci Total Environ.* 2021 May 20;770:145359. doi: 10.1016/j.scitotenv.2021.145359. Epub 2021 Jan 24.
BACKGROUND: Large-scale power outages (PO) are increasing in the context of climate change. Although some research has been conducted into the adverse health impacts of POs, significant gaps remain regarding whether POs would affect the health of pregnant women. We investigated the association between ED visits due to pregnancy complications and the occurrence, intensity, and duration of large-scale POs in eight Sandy-affected counties in New York State (NYS).

METHODS: In this cross-sectional study, daily ED visits for pregnancy complications and large-scale PO data in eight counties in NYS from October to December in 2005-2014 were collected. Using time-series analysis, we estimated the relative increase in ED visits for pregnancy complications during POs compared with non-PO periods at lag 0-7 days. Short-term health impacts of PO intensity and PO duration were investigated. Estimations were also stratified by sociodemographic characteristics and disease subtypes including threatened or spontaneous abortion, threatened or early labor, hypertension complications, infections of genitourinary tract, renal diseases, gestational diabetes mellitus, mental illnesses, and cardiovascular diseases during pregnancy.

RESULTS: From October to December in 2005-2014, there were 307,739 ED visits for pregnancy complications in the eight counties. We found significant increases in ED visits for overall pregnancy complications (16.6%, 95% confidence interval [CI]: 10.3%, 23.2%) during the Hurricane-PO period at lag 0-7 days. The ED visits increased by 8.8% per level increase in PO intensity and 1.4% per day increase in PO duration. Specifically, threatened/early delivery and gestational diabetes mellitus during the PO period increased by 26.7% (95% CI: 8.2%, 48.4%) and 111.8% (95% CI: 16.7%, 284.4%), respectively. Young adult, Black, Hispanic, and uninsured individuals were at higher risk of complications.

CONCLUSIONS: POs may adversely impact pregnancy, especially for certain pregnancy complications and among low sociodemographic women.

11. **The Association Between Ambient Air Pollution and Atrial Fibrillation.** Chen M, Zhao J, Zhuo C, Zheng L. *Int Heart J.* 2021 Mar 6. doi: 10.1536/ihj.20-523. Online ahead of print.

[https://www.jstage.jst.go.jp/article/ihj/advpub/0/advpub_20-523/ article](https://www.jstage.jst.go.jp/article/ihj/advpub/0/advpub_20-523/article)

Atrial fibrillation (AF) is the most common cardiac arrhythmia; it has been known to increase the risk of stroke and heart failure. The association between air pollutants and AF has remained to be controversial. Thus, in this study, we sought to undertake a systematic review and meta-analysis in order to assess the short- and long-term effects of ambient air pollution on AF. We searched PubMed, Web of Science, Embase, and Ovid for all related studies up to October 2019. We used the random-effects model to estimate the excess risk percentage (ER%) and confidence intervals (CI) for particulate matter with diameter ≤ 2.5 (PM_{2.5}) and ≤ 10 μm (PM₁₀), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), ozone (O₃), and carbon monoxide (CO). Results were further analyzed by subgroups according to location, age, outcome, and gender. In total, 18 studies were included in our meta-analysis: 5 evaluated for long-term effects, 12 for short-term effects, and 1 for both long- and short-term effects. For the short term, ER per 10 $\mu\text{g}/\text{m}^3$ increase of pollutants was 1.8% (0%-3.7%) for PM_{2.5} and 1.1% (-0.2%-2.4%) for PM₁₀; per 10 parts per billion (ppb) increment of gaseous pollutants was 3.2% (0.6%-5.8%) for NO₂, 2.9% (0.3%-5.7%) for SO₂, 0.5% (-3.4%-4.7%) for O₃, and 2.0% (-1.3%-5.4%) for CO per 1000 ppb change. The subgroup analysis showed the short-term effect was significantly different by region, gender, outcome, and age. Meanwhile, in the long term, except for O₃, a statistically significant association was noted between AF incidence and all pollutants. Our meta-analysis suggests that short-term exposure to part of pollutants (PM_{2.5}, SO₂, and NO₂) increases AF attack. Further, long-term exposure to air pollution can significantly contribute to the incidence of AF in a healthy population.

WE ACT

- 12. Waste generation and carbon emissions of a hospital kitchen in the US: Potential for waste diversion and carbon reductions.** Thiel CL, Park S, Musicus AA, Agins J, Gan J, Held J, Horrocks A, Bragg MA. PLoS One. 2021 Mar 17;16(3):e0247616. doi: 10.1371/journal.pone.0247616. eCollection 2021.

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0247616>

This study measured the total quantity and composition of waste generated in a large, New York City (NYC) hospital kitchen over a one-day period to assess the impact of potential waste diversion strategies in potential weight of waste diverted from landfill and reduction in greenhouse gas (GHG) emissions. During the one-day audit, the hospital kitchen generated 1515.15 kg (1.7 US tons) of solid waste daily or 0.23 kg of total waste per meal served. Extrapolating to all meals served in 2019, the hospital kitchen generates over 442,067 kg (487 US tons) of waste and emits approximately 294,466 kg of CO₂e annually from waste disposal. Most of this waste (85%, 376,247 kg or 415 US tons annually) is currently sent to landfill. With feasible changes, including increased recycling and moderate composting, this hospital could reduce landfilled waste by 205,245 kg (226 US tons, or 55% reduction) and reduce GHG emissions by 189,025 kg CO₂e (64% reduction). Given NYC's ambitious waste and GHG emission reduction targets outlined in its OneNYC strategic plan, studies analyzing composition, emissions, and waste diversion potential of large institutions can be valuable in achieving city sustainability goals.

- 13. Technologies to deliver food and climate security through agriculture.** Horton P, Long SP, Smith P, Banwart SA, Beerling DJ. Nat Plants. 2021 Mar;7(3):250-255. doi: 10.1038/s41477-021-00877-2. Epub 2021 Mar 15.

Agriculture is a major contributor to environmental degradation and climate change. At the same time, a growing human population with changing dietary preferences is driving ever increasing demand for food. The need for urgent reform of agriculture is widely recognized and has resulted in a number of ambitious plans. However, there is credible evidence to suggest that these are unlikely to meet the twin objectives of keeping the increase in global temperature within the target of 2.0 °C above preindustrial levels set out in the Paris Agreement and delivering global food security. Here, we discuss a series of technological options to bring about change in agriculture for delivering food security and providing multiple routes to the removal of CO₂ from the atmosphere. These technologies include the use of silicate amendment of soils to sequester atmospheric CO₂, agronomy technologies to increase soil organic carbon, and high-yielding resource-efficient crops to deliver increased agricultural yield, thus freeing land that is less suited for intensive cropping for land use practices that will further increase carbon storage. Such alternatives include less intensive regenerative agriculture, afforestation and bioenergy crops coupled with carbon capture and storage technologies.

- 14. Net-zero emissions targets are vague: three ways to fix.** Rogelj J, Geden O, Cowie A, Reisinger A. Nature. 2021 Mar;591(7850):365-368. doi: 10.1038/d41586-021-00662-3.

<https://www.nature.com/articles/d41586-021-00662-3>

Five years ago, the United Nations Paris climate agreement set a ceiling for global warming at well below 2 °C, ideally 1.5 °C relative to pre-industrial levels. World leaders also agreed to balance greenhouse-gas emissions in the second half of the century, so that the sum of all greenhouse gases emitted from human activities is zero. In response, ever more countries, institutions and companies are announcing net-zero targets^{1,2}. Recent examples include the United States, China, the European Union, the technology firm Microsoft and an alliance of European airports. These welcome signs of intent come with difficulties.

Plans are hard to compare, and definitions loose. The details behind 'net-zero' labels differ enormously. Some targets focus solely on carbon dioxide. Others cover all greenhouse gases. Companies might consider only emissions under their direct control, or include those from their supply chains and from the use or disposal of their products. Sometimes the targets do not aim to reduce emissions, but compensate for them with offsets.

15. **Minority influence in climate change mitigation.** Bolderdijk JW, Jans L. *Curr Opin Psychol.* 2021 Feb 17;42:25-30. doi: 10.1016/j.copsyc.2021.02.005. Online ahead of print.

<https://www.sciencedirect.com/science/article/pii/S2352250X21000154>

While the majority of people care about environmental quality, they keep engaging in carbon-intensive practices that exacerbate climate change. Can we expect humans to collectively change by themselves, from the bottom up? Social change is often initiated by minorities - individuals who challenge the status quo. The dominant literature paints a rather pessimistic picture about the ability of minorities to instigate change in the environmental domain: environmental activists, vegans, and other minority members often elicit social sanctions, thereby ironically reinforcing the majority's commitment to current, environmentally harmful norms. Recent findings, however, point towards more optimism: pro-environmental minorities can pave the way towards 'tipping points' and spontaneous social change. Policymakers can speed up this process by offering top-down support for minorities - by giving them 'voice'.

16. **'A change of heart': Indigenous perspectives from the Onjisy Aki Summit on climate change.** Cameron L, Courchene D, Ijaz S, Mauro I. *Clim Change.* 2021;164(3):43. doi: 10.1007/s10584-021-03000-8. Epub 2021 Feb 15.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7884590/>

In June 2017, the Turtle Lodge Indigenous knowledge centre convened the Onjisy Aki International Climate Summit, an unparalleled opportunity for cross-cultural dialogue on climate change with environmental leaders and Indigenous Knowledge Keepers from 14 Nations around the world. In collaboration with Turtle Lodge, the Prairie Climate Centre was invited to support the documentation and communication of knowledge shared at the Summit. This process of Indigenous-led community-based research took an inter-epistemological approach, using roundtable discussions within a ceremonial context and collaborative written and video methods. The Summit brought forward an understanding of climate change as a symptom of a much larger problem with how colonialism has altered the human condition. The Knowledge Keepers suggested that, in order to effectively address climate change, humanity needs a shift in values and behaviours that ground our collective existence in a balanced relationship with the natural world and its laws. They emphasized that their diverse knowledges and traditions can provide inspiration and guidance for this cultural shift. This underscores the

need for a new approach to engaging with Indigenous knowledge in climate research, which acknowledges it not only as a source of environmental observations, but a wealth of values, philosophies, and worldviews which can inform and guide action and research more broadly. In this light, Onjisay Aki makes significant contributions to the literature on Indigenous knowledge on climate change in Canada and internationally, as well as the ways in which this knowledge is gathered, documented, and shared through the leadership of the Knowledge Keepers.

SUPPLEMENTARY INFORMATION: The online version contains supplementary material available at 10.1007/s10584-021-03000-8.

17. Initiatives to broaden safety concerns in anaesthetic practice: The green operating room.

Beloeil H, Albaladejo P. *Best Pract Res Clin Anaesthesiol.* 2021 May;35(1):83-91. doi: 10.1016/j.bpa.2020.07.010. Epub 2020 Jul 24.

<https://www.clinicalkey.com/#!/content/journal/1-s2.0-S1521689620300677>

The health sector is a major contributor to climate change through its large carbon footprint. Hospitals are highly energy and resource intensive. Operating rooms (ORs) contribute to a major part of these emissions because of anaesthetic gases, energy-intensive equipment and waste. Besides initiatives aimed to mitigate hospitals' climate footprints, health care professionals need to be involved in this process by changing their professional and personal behaviours without compromising the quality of care. Education on metrics (greenhouse gases), concepts (life cycle) and strategies to reduce the health care footprint would help professionals to commit themselves to the issue. The 5R's rule (reduce, reuse, recycle, rethink and research) used to promote an environmentally friendly way of life can be applied to the medical field and especially to the operating room and anaesthesia. When applied in the ORs, these strategies help question the use of disposable devices, attires and packaging, as well as our professional and personal behaviour. Greening the ORs requires the engagement of all professionals as well as other departments (pharmacy, hygiene) and management. Economic and social co-benefits are expected from this process.

18. The Ethics of the Reuse of Disposable Medical Supplies. Das AK, Okita T, Enzo A, Asai A. *Asian Bioeth Rev.* 2020 Apr 12;12(2):103-116. doi: 10.1007/s41649-020-00114-6. eCollection 2020 Jun.

The use of single-use items (SUDs) is now ubiquitous in medical practice. Because of the high costs of these items, the practice of reusing them after sterilisation is also widespread especially in resource-poor economies. However, the ethics of reusing disposable items remain unclear. There are several analogous conditions, which could shed light on the ethics of reuse of disposables. These include the use of restored kidney transplantation and the use of generic drugs etc. The ethical issues include the question of patient safety and the possibility of infection. It is also important to understand the role (or otherwise) of informed consent before reuse of disposables. The widespread practice of reuse may bring down high healthcare costs and also reduce the huge amount of hospital waste that is generated. The reuse of disposables can be justified on various grounds including the safety and the cost effectiveness of this practice.

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