

Statement on Environmental Impacts of the COVID-19 Pandemic

World Emergency COVID19 Pandemic Ethics (WeCope) Committee (13 September 2020)

As an independent, multidisciplinary and cross-cultural committee, comprised of experts from cultures and nations across the world, we offer the following recommendations on the environmental impacts of the COVID-19 pandemic.¹

- 1) Everyone and all organizations and countries should adopt the Earth Charter
- 2) All countries should implement the Environmental Treaties they have already signed and ratified.
- 3) Everyone and all organizations and countries should consider the level of consumption that is necessary that is compatible with sustainable living.
- 4) The destruction of rain forests and other critical biodiversity hotspots should be stopped immediately. In return for stopping the destruction of these spaces, the indigenous people who are home to these places should be given all kinds of incentives to continue to be the guardians. Where possible this assistance can be provided through countries which should enact laws to protect both the guardians and biodiversity hotspots.
- 5) Representatives of surviving indigenous communities should be formally represented on all national and international forums so that together all Peoples with humility can learn the art of protecting Mother Earth.
- 6) Effective public health policy must recognize the importance of interactions between humans and animals to reduce zoonotic diseases. Policy makers should consider the agency of animals in both rural and urban areas. All countries may adopt the "One-Health" model of healthcare, that recognizes the connections among humans, animals, and the environment as a whole.
- 7) Urban transformation policies must be implemented. There is a need for access to healthy behaviors including green spaces, sanitation, clean water, and so on. We must reduce displacement of residents of lower economic levels from natural habitats for setting up of commercial industries and factories and directing foreign aid towards achieving that purpose.
- 8) Reduction of poverty must be achieved, because not only does it harm people but it also harms the environment. Creating alternative arrangements within the villages including good education facilities, alternative cash and food crops, good infrastructure, and so on to reduce rural to urban migration and over population in cities, by altering the pull and push effects of poverty.
- 9) As we emerge from the pandemic, it is timely to reflect on how non-essential motorized travel can be reduced from the previous norms in order to reduce environmental

¹ This Statement draws on ideas and literature from many sources, and developed from a background paper, that follows this Statement (Darryl Macer, Abhik Gupta, Deborah Kala Perkins, Lakshmi Vyas; Nilza Maria Diniz, Suma Parahakaran, M. Selvanayagam, Ayoub Abu Dayyeh, Layne Hartsell, Thalia Arawi, Mihaela Serbulea, Nader Ghotbi (2020) Environmental Impacts and Implications of the COVID-19 Pandemic, *EJAIB* 30 (8) (October), 403-413) and benefited through comments from other persons as well. https://www.eubios.info/world_emergency_covid19_pandemic_ethics_committee

pollution, and to continue our reflections on the definition of non-essential. The balance between human need and desire is a critical ethical issue, and the WeCope Committee Statement on Autonomy and Responsibility is useful in reflection.

9) As we are trying to emerge from the pandemic, it is timely to reflect on how non-essential motorized travel can be reduced from the previous norms, and car pooling encouraged in order to reduce environmental pollution, and to continue our reflections on the definition of non-essential. Also all should encourage public transportation which is lower on CO₂ emission per capita per mileage covered, and focus on developing no-carbon emission public transportation, electric vehicles charged with clean PV power and so on. The balance between human need and desire is a critical ethical issue, and the WeCope Committee Statement on Autonomy and Responsibility is useful in reflection.

10) New buildings should architecturally passively designed, wherever possible have energy efficiency audited, cost effective methods of renewable energy supply installed, as well as introducing thermally insulated walls, roofs and external openings, recycle water, increase the green areas, where as governments should provide financial incentives for this transition. However, existing buildings should also be shaded and ventilation enhanced in hot climates. In cold climates existing buildings should have their thermal insulation upgraded supported with subsidies.

11) Local production should be encouraged. Innovations should be adopted, such as environmentally appropriate vegetable gardens, fruit trees and aqua-culture at homes and public places for better hygiene, nutrition and health, as we face a pandemic.

12) There should be enhanced and transparent communication and use of all appropriate technologies for surveillance of pandemics, monitoring environmental data including internal and external air quality.

13) Educational policies related to integrating traditional, indigenous wisdom and their spiritual practices should be integrated into the curriculum. Interdisciplinary knowledge, theory and practice for sustainability issues existing locally and globally provide concrete examples of knowledge for the preservation and conservation of wild life and protection of species that are useful in education.

14) Educational policies to include the human/animal/plant nexus as well as zoonotic and plant diseases should be integrated into the environmental and sustainability education curriculum.

15) Reflections and alternative world-views that provide the perspectives of all living beings can be identified in every culture, and frameworks for discussion of the bioethical dilemmas in the curriculum in every country benefit from intercultural dialogue from the perspective that we, human beings, have as a member of our world, with all beings. The promotion of intercultural and interfaith dialogue which enables the younger generation to view common lessons will promote global well-being and stewardship for the environment and a responsibility to bequeath it healthy for future generations.

The evidence from the past decades of bioethics and environmental education leave no ambiguity - these discussions are welcome by students, and lead to better educational outcomes in students minds and hearts as part of every nations responsibility to prepare

a mature community that is better prepared to discuss and make some tough decisions, such as those listed above.

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Environmental Impacts and Implications of the COVID-19 Pandemic

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Preamble

This background paper provides the context to the recommendations of this paper, that were adopted by the full World Emergency COVID19 Pandemic Ethics (WeCope) Committee as the **Statement on Environmental Impacts of the COVID-19 Pandemic** (9 September 2020). This paper is published in *Eubios Journal of Asian and International Bioethics* 30 (8) (October 2020), 403-414.

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1. Environmental impacts of COVID 19 Shutdown

In a short span of time, SARS-CoV-2 corona virus and COVID-19 has disrupted the world order and normal life. What we call the “shutdown” is a closure of many schools, offices, shops, and businesses in the majority of countries around the world. Since a high proportion of the human population was “locked” at home, with few people on the streets, trains, cars, trucks, flights and a number of other activities have come to a standstill. What happened? In accordance with the ethical principle of non-maleficence, and the dread of death or in order to save the lives of citizens, a temporary “lockdown” was enforced in most countries as a public health measure. The governance, community and public health aspects of these policies are considered in other papers of the World Emergency COVID19 Pandemic Ethics Committee (WeCope).² In this paper we explore some of the environmental impacts and related issues of the first six months of the COVID-19 pandemic.

In many cities the animal kingdom had a good respite, particularly birds, insects and bees could move freely. Depending where we live, it may have been flamingos visibly present, wild boars, of elephants, nilgai, bear, wild goats, dolphins, antelopes, deer, hippopotamus and number of other animals being spotted in areas where human activity had otherwise dispelled them.³ In cases where these animals were fed through tourism,

² https://www.eubios.info/world_emergency_covid19_pandemic_ethics_committee

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<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewidteqe9OTpAhV>

there have been cases of hunger as well, both in wild-life parks and in zoos. We are also tragically witnessing extensive human hunger⁴ and displacement; the toll of suffering of humanity due to hunger resulting from the poverty and toppled economies induced and by the COVID shutdown may more than triple the number of deaths from the virus. In this report we address some of these issues.

Regarding the environment, ecological responses to the shutdown were an outstanding expression of nature's resilience. With up to 26% mitigation in polluting agents⁵ the response included clear skies, clean rivers and oceans, animal freedom, and increased visibility. There is predicted to be substantial reduction in carbon dioxide emissions in 2020 (Le Quéré, et al., 2020).⁶ Mountains which were usually hidden by smoke became visible, from Nepal to Nigeria. This is due to combinations of a reduction in traffic, both on land and air, reduced emissions from industry and factories and reduction of particulate matter in the atmosphere. There is also a significant reduction in seismic noise, with reduced land and air travel, less fracking for oil and other industrial disturbance. The relative silence from human activity has allowed a reemergence of natural harmonics.

Even as we emerge from the COVID-19 pandemic, the threats of similar zoonotic viruses affecting us and exposing us to the twin danger of widespread morbidity and loss of life, as well as loss of livelihood and economic depression will remain. We have also seen the vulnerability of the present model of a range of areas including public health, economic sustainability, social welfare and others. In the post-COVID-19 phase, we have the opportunity to evolve a new model which lays more emphasis on ecosystem-based development and lifestyle. We need to ensure augmentation of local food and renewable energy production along with conservation of biodiversity. In this report we explore selected areas that need our attention. We refer readers to a forthcoming WeCope report that will explore the linkages between COVID-19 and the possible new world order, a new way of looking at the goals of development and the pursuit of happiness, noting that there is linkage to the environmental issues which is the focus of this report.

2. Environmental ethics

Environmental ethics explores the relationship between human beings and the environment. Humans are a part of a society co-existing with other living creatures, which includes plants and animals. This ecocentric ideology is a very important part of our world and is considered to be a functional part of what it means to be human. Ecocentric approaches demand that in moral decisions we consider our fellow creatures (Macer, 1998). It's not only for their preservation, but also beneficial for our quality of life (Bosworth, et al., 2012). *"Environmental ethics is a branch of applied philosophy that studies the conceptual foundations of environmental values as well as more concrete issues surrounding societal attitudes, actions, and policies to protect and sustain biodiversity and ecological systems."*⁷

Most flora and fauna as well as non-living parts of nature itself have seen positive impacts from this pandemic. It seems as if the plants and animals are reclaiming the land that we forgot to share with them or instead snatched away from them. Also, it is quite

[xNX0KHSUPC9IQFjAEegQIARAB&url=https%3A%2F%2Fwww.theguardian.com%2Fworld%2F2020%2Fmar%2F22%2Fanimals-cities-coronavirus-lockdowns-deer-raccoons&usg=AOvVaw0b4UUX1n9JLSNQCQRqMY15;](https://www.theguardian.com/world/2020/22/mar/22/animals-cities-coronavirus-lockdowns-deer-raccoons&usg=AOvVaw0b4UUX1n9JLSNQCQRqMY15)
<https://www.cosmopolitanme.com/life/coronavirus-is-having-a-really-positive-impact-on-the-environment>

⁴ <https://www.newyorker.com/news/q-and-a/the-coronavirus-crisis-will-lead-to-catastrophic-hunger>

⁵ <https://www.visualcapitalist.com/coronavirus-lockdowns-emissions/>

⁶ <https://www.bbc.com/news/science-environment-52485712>

⁷ Nature.com

vivid that environment seems to have activated the hidden reset button that it had, to replenish itself and recover from the aftereffects of our rapid industrialization. All of these can be categorized as the positive side effects of COVID-19. For example, it was reported in India that as a consequence of lockdown, along the coast of the eastern state of Odisha, over 475,000 endangered Olive Ridley sea turtles have come ashore to dig their nests and laid eggs (maybe sixty million), according to the “Mind Unleashed”.⁸

Environmental pollution is one the greatest challenges that the world is facing today, and as Leopold (1949) and Carson (1962) have written, pollution occurs when our ethics is not good. An important point is whether non-human beings only have an instrumental value or whether they also have an intrinsic value. Aristotle said that “*nature has made all things specifically for the sake of man*”, which means non-human beings only have an instrumental value; they are meant to serve as ‘instruments’ for human beings. From an anthropocentric point of view (which lays emphasis on human beings), the use of other living elements in nature by humans is only right. Causing them harm or destroying them is wrong only because it eventually affects human life. With this view, cruelty to animals is wrong because it develops insensitivity, and not because animals *should not* be harmed (Regan, 2009). Or the felling of trees (Stone, 1972) is wrong because it eventually causes loss of food sources for humans, and not because it is simply *unethical*. According to Holmes Rolston III (1997) the protection of species is our moral responsibility as they have an intrinsic value. In his view, the loss of a species spells disrespect to nature’s process of speciation. According to him, biological processes deserve respect. Thus, any action that translates into disregard for the environment is unethical. We refer readers to many books that explain more about environmental ethics.

We have certain duties towards the environment. Our approach towards other living entities should be based on strong ethical values. Even if the human race is considered as the main constituent of the environment, animals and plants are also important. They have a right to get a fair share of resources and lead a safe life (Bosworth et al., 2012). By our environmental degradation and over exploitation of our natural resources, we are risking the lives of future generation. We have to strike a balance between our needs and the availability of resources, so that the forthcoming generations are able to benefit for their use. Even if we are not able to leave a better environment for our future generation at least we should not deteriorate the quality of our environment and the bioresources. Therefore, it is very important to be remembered that environmental ethics is our moral responsibility to preserve and conserve nature for future generations of life and posterity.

3. Consumption

The main drivers of environmental harm from the socio economic perspectives include emissions of substances because of free movement of goods, services, capitals and workers, industry, trade, tourism, forest fires, deforestation, wild life trade, and conversion of forests to agricultural land. Increased consumption is associated with high use of electricity and transport emissions. The quality and quantity of freshwater and groundwater is affected. Acidification, contamination and salinity of soil, and soil erosion, as also generally increased with more consumption. The divide between rural and urban areas is changing and agricultural practices affect the environment.

We can also consider the imbalance between rich and poor countries in energy consumption, fossil fuel consumption, and use of raw materials. The broad imbalance has been called by some a global apartheid (Haviland, 1997). One North American consumes several hundred times the resources of most Africans. So many indicators of quality of life vary between rich and poor countries, such as life expectancy, pollution-related

⁸ <https://themindunleashed.com/2020/03/with-india-on-lockdown-endangered-sea-turtles-on-course-to-lay-sixty-million-eggs-this-year.html?fbclid=IwAR31pUL97QcvJSF5ZAFkiJgVFPpkwuqJwXujG4GI6SrhYjasGijqjqPKatE>

diseases and leisure time. The right to personal enjoyment of a love of life is denied to many of the world's population by economic and social structures because of a lack of love shown to neighbor (Macer, 1998). Whether the time of reflection during the COVID-19 has reduced materialism is unclear at present, because one of the reasons behind reduced financial spending is also increased unemployment.⁹

The wild life trade has contributed to loss of animals and species as biodiversity is depleted (Bosworth, et al., 2012; Parahakaran, 2020). There are existing methods to allow us all, and countries to analyse the economic, environmental and social impacts of actions, and to offer guidance on sustainability impact assessment (OECD, 2010). Examples of areas for reducing socio economic drivers which harm the environment are provided in the Appendix in Teaching Resources.

Sustainable living involves not just efficient agriculture, but also minimizing our energy use and pollution. The spirit of love is to minimize consumption and disturbance of others. It involves changing public policy and the very way people think. We must realize how important the use of new technology is when it aids this process, and work towards this goal. The type of research that is required for a transition to a lasting earth is of three broad types (Macer, 1994). One is the use of science to discover the workings of nature, such as elemental cycles, and developing technology for energy and resource conservation. Another is economic systems that are consistent with sustainable living. Recent reports suggest that technical change alone will not allow a switch to sustainable living because the global economic system may not be able to be made compatible with sustainability (Krupp, 1993). Even with an optimistic view, the time delay in global implementation of new technology would mean that the world may be very different from that of today.

We need a fresh approach to add to the battle of protecting the environment. In the long term the most important approach is a lasting change of human attitudes to those that are compatible with sustainable life. We need lifestyle change (Macer, 1994; 1998). We cannot isolate any environmental problem from the whole crisis of modern life. The environment is influenced mainly by human behaviour, national and international development, economics and politics.

The recognition that we live on "Spaceship Earth" has led to the growing acceptance of international accords, such as the United Nations Bills on Human Rights, the Law of the Sea, the Montreal Protocol to eliminate the production of ozone-depleting chlorofluorocarbons, and the Antarctic Treaty ban on mining. As Peoples of the world attempt to unite more, especially in the increasingly positive international spirit of the last few years, further agreements on global responsibility will be made. However, lasting attitude change to proper stewardship is required to save the planet. There is a danger that like the many short-lived public concerns of the last few decades, the focus on ecological survival will pass. In order to assure the permanent attitude change that is necessary for a lasting earth, we must consider how people view life (Macer, 1998).

4. Fall in global emissions of anthropogenic chemicals into the atmosphere

During the early April 2020, global carbon dioxide emissions decreased by 17% when compared to the 2019 levels. After the COVID-19 shutdowns, researchers suggested that government actions and economic support will influence global carbon dioxide emissions (Le Quéré et al., 2020). There are many sources of greenhouse gases (GHGs) across many sectors of economic activity.

These include many sources such as coal-fired power plants, transportation, intensive animal production, data centers and communication networks. Even things

⁹ These issues are being discussed in the WeCope Committee report on COVID-19 and the New World Order.

such as smart phones¹⁰ are associated with GHG emissions in their production energy where the material extraction related to the mining activities and the energy used in manufacturing (Belkhir & Elmeligi, 2018). Some of the data is hidden. Human impact on the environment needs to be measured (COMEST, 2010) and assessed. A summary of the 2020 emissions by country is in Figure 1.

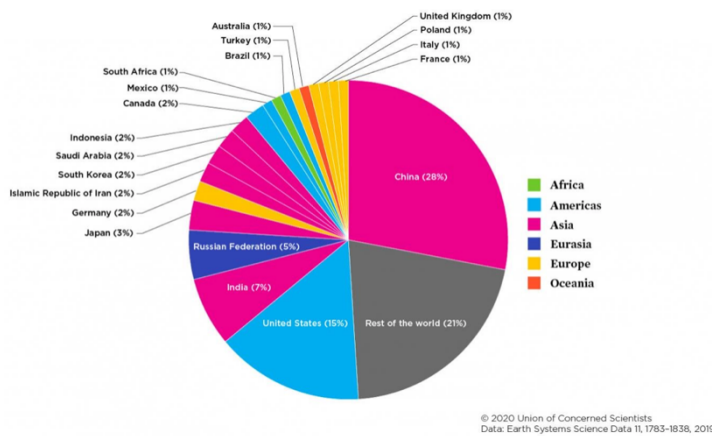


Figure 1: Carbon dioxide emissions
(Source: Union of Concerned Scientists)

Marshall Burke, a researcher at Stanford University, calculated the improvements in air quality recorded in China may have saved the lives of 4,000 children under 5 years old and 73,000 adults over 70 years of

Union of Concerned Scientists

Each Country's Share of CO2 Emissions

age.¹¹ Variations of pollutant levels over the world are recorded on the website www.CovidExplore.com. Reductions in nitrogen dioxide levels are clear, but PM2.5 levels were not found to be correlated closely.

According to China's Ministry of Ecology and Environment, the average number of "good quality air days" increased 21.5% in February 2020, compared to the same period last year in Hubei province, the epicenter of the coronavirus pandemic. According to China's Ministry of Ecology and Environment, data recorded between January and March 2020 reflects an 84.5 per cent increase in days with good air quality in 337 cities, and satellite data from the United States National Aeronautics and Space Administration shows a drastic decline in nitrogen dioxide over China. "In (January and February) of 2020, NO2 values in eastern and central China were significantly lower (from 10 to 30 percent lower) than what is normally observed for this time period," according to NASA.¹²

Although there is reduced consumption from reduced economic activity, there is increase in some forms of waste. Hospitals in Wuhan produced an average of over 200 tons of disposable Personal Protection Equipment including gloves and face masks as waste per day during the outbreak, up from the previous average of less than 50 tons.¹³ As the entire world population shifts to using masks, this is a new item of trash. Certain members of the population are at higher risk of adverse impacts from exposure to medical waste including cleaners, janitors, garbage collectors, not only health care workers.

China has asked sewage treatment plants to strengthen their disinfection routines to prevent coronavirus from spreading through sewage, mostly through increased use of chlorine. There are also reports of the virus being detected in sewage water even in December 2019 in Northern Italy, suggesting that the virus was circulating earlier than initially recognized. In the Netherlands, traces of the COVID-19 coronavirus were detected in untreated wastewater six

¹⁰ <https://apple.news/AWnBYF78SQHSKr0h1Z4Cklw>

¹¹ <https://www.cnn.com/2020/03/17/health/china-air-pollution-coronavirus-deaths-intl/index.html>

¹² <https://www.earthobservatory.nasa.gov/images/146362/airborne-nitrogen-dioxide-plummets-over-china>

¹³ <https://hb.qq.com/a/20200310/028362.htm>

days before the first case was reported. Traces were detected in untreated wastewater in the Swiss city of Lugano when only one case had been confirmed, and in Zurich after only six infections. Wastewater surveillance showed that community transmission in Valencia, Spain began earlier than previously believed.¹⁴

5. Environmental consequences of reduced travel

Our lifestyle choices affect our environmental footprint (Hansla et al., 2008). Air pollution has decreased as COVID-19 has slowed all travel. COVID-19– pandemic is shutting down countries across the world, causing a significant decline in air pollution in major cities as countries implement stricter quarantines and travel restrictions. However, the pandemic’s unintended climate impact offers a glimpse into how countries and corporations are equipped to handle the slower-moving but destructive climate crisis. So far, researchers warn that the world is ill-prepared (REF).

Travelling by automated transport has negative effects on the local environment, including air, noise, and water pollution and on land use. These effects have implications on human health and well-being. The emissions of greenhouse gases by some transport modes also contributes to climate change, with possible impacts on the long-term sustainability of the planet. There is a need for governments to adopt policies to reduce car and air travel and promote modes of transportation with lower environmental impact.

The negative consequences of heavy automotive use include the use of non-renewable fuels, a dramatic increase in the rate of accidental death, the disconnection of local community, the decrease of local economy, the rise in obesity and cardiovascular diseases, the emission of air and noise pollution, the emission of GHGs, generation of urban sprawl and traffic, segregation of pedestrians and other active mobility means of transport, decrease in the railway network, urban decay and the high cost per unit-distance on which the car paradigm is based and contributes to climate change.

The sharp decline in commercial air travel is also reducing pollution. We are all aware of tourism, though we can see over-tourism in places like Venice, Barcelona, Paris, Florida, and so on. Another unexpected effect on the environment from the coronavirus has been seen in Venice, Italy. With tourists’ numbers culled because of the virus, the waters in Venice’s canals are cleaner than they have been, so much so, in fact, that fish can be seen once again in the canal’s transparent waters.¹⁵ The problem includes the results of cruise ships disgorging thousands of people for half-day visits that overwhelm the destination but leave little economic benefit. There is also the rush to beaches in Thailand and Southeast Asia, since the Caribbean was already significantly destroyed. Sustainability concerns in the travel and tourism sectors extend far beyond carbon emissions.

Aviation emissions include GHGs and nitrogen oxides (NO_x), water vapor, particulates, contrails and cirrus changes have additional warming effects. Cheap airline fares encourage weekend breaks that have inundated old cities such as Prague and Dubrovnik. The need for growth becomes self-perpetuating as tourism dependency locks communities into the system. Tourism is embedded in the cultural ideology as an essential pillar to achieve endless economic growth. For instance, the Australian government prioritises tourism as a “super growth industry”, accounting for almost 10% of “exports” in 2017-18.¹⁶

¹⁴ (PDF) *A COVID-19 Bridge Over Troubled Water*. Available from: https://www.researchgate.net/publication/343193691_A_COVID-19_Bridge_Over_Troubled_Water [accessed Jul 29 2020].

¹⁵ <https://www.france24.com/en/20200320-clearer-water-cleaner-air-the-environmental-effects-of-coronavirus>

¹⁶ <https://www.tourism.australia.com/en/markets-and-stats/tourism-statistics/the-economic-importance-of-tourism.html>

The speed of vehicles on roads, the make of vehicles, congestion, stop-start driving conditions, size of the vehicle such as buses, coaches, trucks, and other logistics are all factors that decide the total emissions. Noise is an important product out of transportation industry depending on the nature of road surfaces, mix of vehicles on the road, the use of horns, the age of the vehicles. When a large vehicle passes near a house, the windows vibrate, and the continuous passage of vehicles has negative impact on the adjacent houses, especially along highways.

In terms of transport modes, 72% of global transport emissions come from road vehicles, which accounted for 85% of the rise in emissions in recent years. Emissions have also increased in other transport modes, such as international aviation, domestic aviation, and international and coastal shipping.¹⁷ The main exception is railways since they are powered by a significant share of electricity, rail emissions have actually declined. The 10 countries with the largest transportation emissions are (in descending order): United States, China, Russia, India, Brazil, Japan, Canada, Germany, Mexico and Iran. Together these countries contributed more than 70% of global transport emissions.

Transportation has substantial harm. The increase in motorized road traffic in most countries places an increasing incidence of accidents with 1.27 million people killed globally each year, of which 91% occur in low and middle-income countries (WHO, 2011). This may be greater than the expected annual death toll from COVID-19 in 2020. The health risks of air pollution are extremely serious. Poor air quality increases respiratory ailments like asthma and bronchitis, heightens the risk of life-threatening conditions like cancer, and burdens our health care system with substantial medical costs.

The economic reality now needs to change to accommodate the more pressing public health reality. Grounded business travelers are realising virtual business meetings work satisfactorily. Conferences are re-organising from in person to virtual sessions. Arts and cultural events and institutions are turning to live streaming to connect with audiences.¹⁸ Staying closer to home could be a catalyst awakening us to the value of eating locally, travelling less, and just slowing down and connecting to our community.

6. Prevention and control of zoonotic viruses and other 'ecological explosions'

While COVID-19 has thrown many tough challenges before us, we already knew of at least four such pandemics that had occurred during the last 100 years. Besides the infamous 1918 "Spanish flu", there were three more pandemics in 1957, 1968, and then in 2009. Theoretical predictions about zoonotic viruses and other microbes arising due to environmental intrusion by civilization have been considered by the scientific and public health communities for decades. Charles S. Elton – one of the founders of the subject of Ecology - wrote in his book *The Ecology of Invasions by Animals and Plants* (Elton, 1958), "*It is not just nuclear bombs and wars that threaten us, ... there are other sorts of explosions,ecological explosions. An ecological explosion means the enormous increase in numbers of some kind of living organism-it may be an infectious virus like influenza, or a bacterium like bubonic plague, or a fungus.... I use the word 'explosion' deliberately, because it means the bursting out from control of forces that were previously held in restraint by other forces.*" In a 1995 article in *Science*, Cohen (1995) predicted, "*As more humans contact the viruses and other pathogens of previously remote forests and grasslands, dense urban populations and global travel increase opportunities for infections to spread. The wild beasts of this century and the next are microbial, not carnivorous.*"

The 1918 influenza H1N1 virus had genes of Avian origin. The 1957 influenza pandemic and the 1968 pandemic caused by an H2N2 and H3N2 virus, respectively, were

¹⁷ https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter8.pdf

¹⁸ <https://www.nytimes.com/2020/03/13/arts/music/coronavirus-pandemic-music-streaming.html>

also Avian in origin. Then there was the 2009 swine flu pandemic caused by an H1N1 virus, killing about 20,000 people. Additionally, we had the 2003 'SARS-CoV' (Severe Acute Respiratory Disease) epidemic with the causative virus suspected to have originated in the palm civet in southern China. The 2005 'bird flu' epidemic caused by an H5N1 virus fortunately did not spread among humans, but had the potential to blow into a pandemic; and the MERS-CoV in the Middle East had originated in camels. The Ebola and the Nipah viruses, originating from bats, pigs, and non-human primates, also affected us, albeit on a smaller scale.

We were, therefore, fully aware of the potentially dangerous nature of SARS-CoV-2, the virus that is believed to have a proximal origin from an animal, possibly the bat *Rhinolophus affinis* and / or the Malayan pangolin *Manis javanica*. As the latter species is included in the IUCN "Critically Endangered" (CR) category as well as in the Appendix I of the Convention on International Trade of Endangered Species of Fauna and Flora (CITES), the issue of COVID-19 is linked with illegal wildlife trade, especially in a large area extending from Pakistan in the west to Vietnam in the east, where three species of pangolins are found and all are hunted for their scale, claw and meat. The poaching pressure can be gauged from the fact that the Malayan pangolin, which was in a relatively 'safe' "Near-Threatened" (NT) IUCN category in 1996, moved to the most highly threatened CR category with 80 % reduction in its numbers by 2019. The other two species, namely the Chinese pangolin and the Indian pangolin are in CR and "Endangered" (EN) IUCN categories, respectively. Because of these and many other species involved in the wild meat trade and appearing in the 'wet markets' of the region, it is urgently necessary for the governments of Pakistan, India, Bangladesh, Myanmar, Thailand, Cambodia, Lao PDR, Malaysia, South Korea, Vietnam and China to come together to devise 'demand reduction' in body parts and meat of not only pangolin, but all wild animals and birds.

This should include all species with a significant risk of transmitting zoonotic diseases, albeit with special attention to species included in CITES, and be carried out through both legal enforcement and dissemination of awareness and education, since many wild meats such as that of pangolin is traditionally consumed by some human communities, while body parts such as claws and scales are used in folk medicine and magico-religious rituals. Increased regional cooperation in this regard is urgently required.

All countries may adopt the "One-Health" model of healthcare, that recognizes the connections among humans, animals, and the environment as a whole. Some countries have adopted this.¹⁹

7. Intensive animal agriculture

Human populations dependent on livestock are not only most at direct risk from zoonotic disease but are most vulnerable to the indirect impacts on health of reduced production on livelihoods and food security, which exacerbates the poverty cycle. Industrial poultry production to reduce the risk of possible zoonotic transfer of avian influenza viruses to humans. There is considerable knowledge of the dangers to human health of intensive animal production, yet these practices continue to be rampant (Kanaly et al., 2020). Intensive farming exists to produce meat, eggs and dairy products as quickly and cheaply as possible. To keep production costs down the animals are given the bare minimum they need to survive. They are fattened in huge, dirty, cramped sheds and deprived of everything that makes life worth living. They can hardly stretch their wings or legs and will never be able to roam. An estimated 50 billion chickens are slaughtered

¹⁹ <https://www.cdc.gov/onehealth/basics/index.html>

for food every year – a figure that excludes male chicks and unproductive hens killed in egg production.

But whether they are raised on a factory farm or under a so-called ‘higher welfare’ method, all these animals will be killed at a time less than their natural lifespan. Animal Aid has conducted undercover investigations inside 11 randomly chosen UK slaughterhouses and found evidence of lawbreaking in 10 of them. This included animals being beaten, kicked and burnt with cigarettes. *The world's average stock of chickens is almost 19 billion, or three per person, according to statistics from the UN's Food and Agriculture Organisation,²⁰ Cattle are the next most populous species of farm animal at 1.4 billion, with sheep and pigs not far behind at around 1 billion. China's vast appetite helps make it the world leader in the number of chickens, pigs and sheep, whereas beef-loving Brazil and cow-revering India have the greatest number of cattle. Expressed as livestock per person, New Zealand lives up to its reputation as the world's most productive shepherd, with 10 sheep for each New Zealander. It is also the second biggest cattle herdsman, with the equivalent of 2.3 cows per person, second only to Uruguay's 3.7. For chickens, Brunei has the highest ratio of 40 chicken for every person.*

It is reported that because of COVID-19 there is a distribution crisis, e.g. some crops in the US are being turned back into the soil because of lack of distribution. Some pigs and other farm animals are being slaughtered and destroyed to make room for more pigs although globally there is hunger. We have to raise questions about supply chain manufacturers and the unethical business by big industries.

The intensity of animal production around the world has increased substantially during the last half-century, which has led to large problems with the disposal of manures and waste waters. There should be national policies to improve nutrient management strategies for concentrated animal feeding operation (CAFOs) where nutrients are always surplus. In intensive farming systems animals are given protein rich foods like soya, which make them grow more quickly and reach a larger size, rather than the foods they would naturally eat. For example, when cows have their grass-based diet replaced, they find alternative foods harder to digest and they remain in their system for longer, increasing the risk of infections in their digestive systems

As a result of the increased infection risk, the animals are given antibiotics to keep them healthy. There are rising concerns that the extensive use of these medicines could lead to the development of antibiotic resistant bacteria, which would make bacteria that also affect humans much harder to treat (Kanaly et al., 2010).

Overall, about 20% of the world's grazing land for meat is degraded (FAO 2006) and every year the world's farmers have to feed 77 million more people with 27 billion tons less topsoil. Animal waste also contributes towards acid rain and accounts for 64% of ammonia emissions. In the last 50 years the number of people on the planet has doubled. But the amount of meat we eat has tripled.²¹ Most of this growing demand has come from middle income countries, and particularly China, which became the world's biggest consumer of meat as its economy boomed. Agriculture is responsible for 10-12% of greenhouse gas emissions,²² The *World Economic Forum's Meat Forecast: The Future* made the obvious point that as the world's population heads towards 10 billion, the current trends in meat consumption and production cannot be sustained.²³

8. Changed approaches to conservation

²⁰ <http://www.fao.org/faostat/en/#data/QA>

²¹ <https://ourworldindata.org/meat-production#livestock-counts>

²² https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter11.pdf

²³ http://www3.weforum.org/docs/WEF_White_Paper_Alternative_Proteins.pdf

In the field of conservation, it may be more ethical and prudent to develop a new strategy. At present, we have been following a highly prioritized conservation strategy, in which we protect threatened flagship species in global biodiversity hotspots that together comprise merely 2.4 per cent of the earth’s geographic area, but contain more than 50 per cent of the world’s endemic plant species, and nearly 43 % of the endemic species of amphibians, reptiles, birds and mammals. While continuing to take care of the endemic and threatened species, we will have to also try to achieve a more diffuse and widely spread conservation including less spectacular and “Least Concern” (LC) and “Near-Threatened” species of IUCN. In other words, we have to protect outside ‘Protected Areas’ and beyond ‘prioritized’ species. It has been observed during the COVID pandemic that all kinds of wild life – both high profile species like rhinos, elephants and penguins as well as more common forms like wolves, civets, squirrels, lizards, and countless birds – have been entering inhabited areas taking advantage of human confinement.

We need to maintain our ecosystems in good health so as to provide food and shelter to all these species of living beings that share our environment with us, both from a narrower anthropocentric viewpoint but more importantly from biocentric or ecocentric recognitions. Many people have also expressed a kind of ‘ecotherapy’ by watching and interacting with these local species of wildlife, which has helped relieve the stress they were experiencing due to the confining effects of lockdown. The scheme of a more inclusive approach to conservation is given in Figure 2.

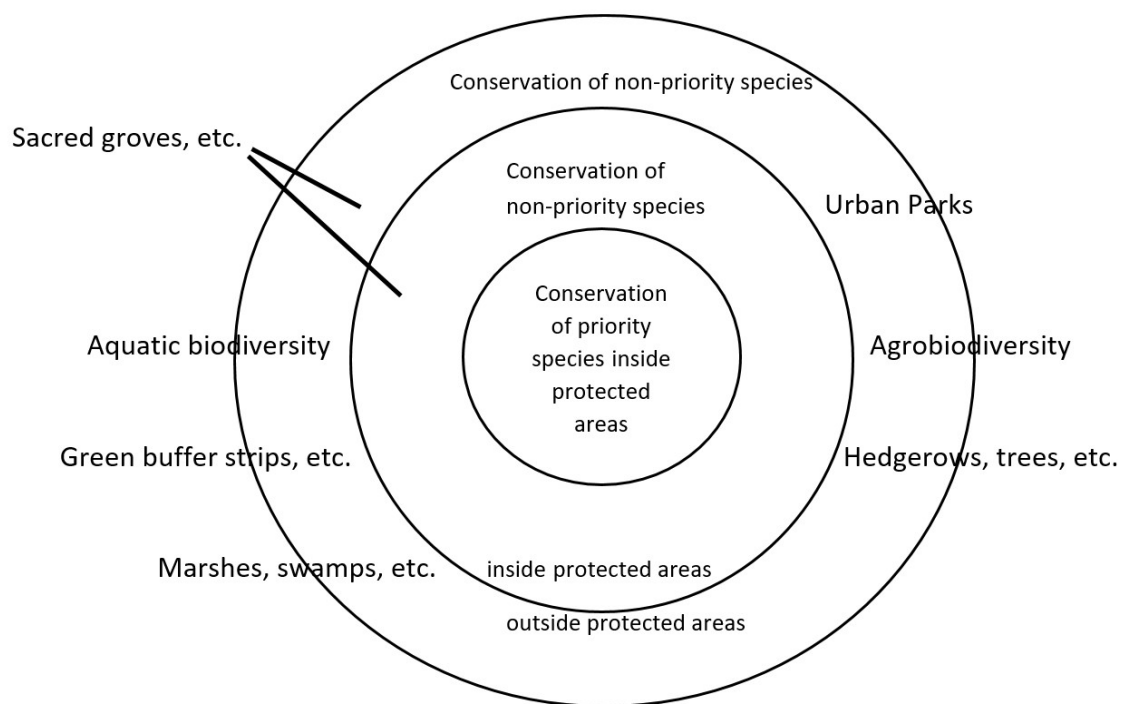


Figure 2. Post-COVID approach to conservation with emphasis on broader perspective

A more holistic approach towards conservation is expected to ensure local food security, livelihood safety net, and buffer stocks of natural capital to tide over temporary market depression / collapse in the wake of pandemics, especially for rural and urban poor in developing countries. On an ethical-philosophical plane, it is also expected to provide ‘eco-psycho-therapeutic’ support to overcome feelings of depression, isolation, and loneliness. Orientation modules could be developed for enabling people to identify with nature and recognize themselves as ‘partners’ and ‘participants’ rather than as ‘outsiders’ and exploiters (Zweers, 1994).

Maybe the renaturalization of cities can help increase the awareness of all living beings in the planet - more as a geocentric conception than simply anthropocentric, biocentric or ecocentric views. We can consider urban areas as a part of environment and overcome several prejudices, exploitation, and source of the division that people make between human beings and nature. We are part of nature and belong to nature.

Further, there have been tangible improvements in air and water quality, demonstrating the self-regulatory (cybernetic) abilities and resilience of Nature, the extent and efficacy of which we probably could not guess earlier. Thus, there is scope for an all-pervasive rejuvenation of nature, along with a restoration of local production, which we might not have realized earlier. This is the new ecosystem-centred model where global knowledge and information that will be disseminated with the aid of technology need to be coupled with local and predominantly organic agricultural production, accompanied by environment-friendly and small-scale industrial and renewable energy enterprises. These approaches should be accommodated in our post-COVID restoration plan. Conservation would have to be all-encompassing in this model, promoting sacred groves, city parks, village gardens, ponds, small streams, and other community-protected areas. One important task for this rejuvenation will be to attract the small and medium farmers back to agriculture to boost local production. Can we be imaginative and bold enough to introspect upon such a world, where co-existence with Nature along with a renewed respect for it, would become the distinguishing features? The philosophical base for this changed perspective will be provided by ecocentric worldviews, the exact nature and tenets of which will be based on the evolving perceptions about humans increasingly becoming 'partners' with and 'participants' in Nature (Zweers, 1994) in a given culture, moving away from being its owners and ruthless exploiters at times.

9. Changed and integrated economic and ecological approach to an ecocentric reorientation in economic resurgence and fair-trade

The world we live has changed dramatically in 2020. We live in the Anthropocene era in a full world where humans are dramatically altering our ecological life-support system. The traditional economic concepts were developed in an empty world. From now we need a new order of the economy and its relationship to the rest of the world that is better adapted to the new conditions we face. We need an economics which respects the planetary boundaries, that recognises the dependence of human well-being on social relations and fairness and that focuses on an ultimate goal such as real, sustainable human well-being, not merely growth of material consumption. The economy is embedded in a society and culture that are themselves embedded in an ecological life-support system. This economy cannot grow forever on this finite planet.

Ecocentrism can be interpreted in several ways. It could comprise faithfully attaching intrinsic – even religious or spiritual – values to non-human living and non-living entities in Nature. It could also transcend to an attainment of the “Self-realization” of Deep Ecology. At the same time, it could also be interpreted as eco (oikos) – centred, where we pay more attention – even to the point of reverence – to the ‘house’ (oikos) in which we live. And in doing so, we have to pay more attention to the health of the smallest units – the ecosystems – and maintain their integrity, quality and productivity.

One of the biggest stumbling blocks to a paradigm shift to ecocentrism will be our attraction to and dependence on what the Gandhian economist-philosopher J.C. Kumarappa (1957) termed as the “economy of violence” as opposed to that of “permanence” of an “economy of nature”. This barrier is also contributed by our single-minded pursuit of promoting GDP growth, which according to Costanza et al. (2014) has become a metrics that has lost its relevance and utility. These authors reason that GDP

was a relevant indicator of progress when it was first introduced in the 1940s. It signified increased economic activity that generated employment and income. However, in the present context, GDP increase has led to increased depletion of natural resources, while it hampers adoption of more sustainable models of development. As examples, they cited that the oil spills due to the Deepwater Horizon rig explosion in the Gulf of Mexico in 2010, and the effects of Hurricane Sandy in 2012 led to an increase in US GDP, because they induced economic activity in terms of rebuilding. They recommended shifting to other indicators which took into account environmental costs and benefits, net profit and wealth generation, among others.

Among the alternative metrics, Costanza et al. (2014) suggested adoption of adjusted economic measures, which take into account annual income, net savings, wealth generation, along with environmental costs, such as that accruing from pollution of water bodies or destruction of forests or wetlands, as well as benefits like pollution control measures or groundwater recharge, etc. A promising index that they had cited is the Genuine Progress Indicator (GPI), which takes into account expenditure – an essential component of GDP – but makes adjustments against factors such as volunteer work, crime, pollution, etc. It also takes into account income distribution, and therefore, the welfare of the poor and low-income groups of people. Thus, this metric may be considered more ethical and environment-friendly. A study by Kubiszewski et al. (2013) showed that GDP and GPI had high correlations between 1950 and 1978, after which they showed increasing divergence, as rising environmental and social costs began to outweigh the benefits of increased GDP.

Besides the objective metrics, subjective measures of development also need to be given more importance. Often these indicators more accurately reflect the parameters that make life more worthwhile and content and measure societal progress. Higher income boosts happiness among low-income group people, but this does not continue to increase as the income becomes higher and higher (Layard, 2005; Nettle, 2005). The World Values Survey or the Gross National Happiness Index (GNH) of Bhutan are examples of such subjective measures. The GNHI addresses nine domains: psychological well-being, health, education, time use, cultural diversity and resilience, good governance, community vitality, ecological diversity and resilience, and living standards. The GNH estimates a total of 33 indicators under these nine domains to arrive at a single index number (OPHI, 2020).

A comprehensive Weighted Composite Measure integrating both objective and subjective indicators, an example of which is the Happy Planet Index of 2006 (NEF, 2006). The inadequacy of GDP has also been pointed out by the Guardian in its analysis of the impact of coronavirus on the global economy, commenting that GDP, which lacks reliability even under normal situations, would be even more inadequate in the uncertain scenario of a COVID-ravaged world (Carlsson-Szlezak et al., 2020). The Nobel Laureate economist Joseph E. Stiglitz pointed out that on the one hand measures taken to reduce pollution may lower GDP growth, while on the other, an increase in GDP indicating a high-performing economy may not be reflected in the people's perceptions of their own standards of living (Stiglitz, 2009). The local and regional inequities of development, which have pushed the less affluent sections of the society in developing as well as many developed countries to increasing pauperization during COVID-19, is poorly reflected in GDP metrics. At the same time, the environmental gains made during COVID-19 induced economic slowdown will also not show in GDP statistics. Therefore, a mere consumption-oriented economic resurgence will not be able to properly prepare the world against any zoonotic depredations in the future.

Apart from loss of life, the COVID-19 pandemic has led to severe global socioeconomic disruption. Our present path is clearly unsustainable. We have to move to

an economy of worldview and principles of 'ecological economics'. After COVID 19 some changes are necessary including recognition that our economy is embedded in ecological life-support system and that we cannot understand or manage our economy without understanding the whole inter-connected system. True development must be defined in terms of the improvement of sustainable well-being and not merely material consumption. A healthy balance must be struck among thriving natural, human, social and cultural assets and adequate and well-functioning produces or built assets. It can be called 'capital' in the sense of a stock or accumulation or heritage – a patrimony received from the past and contributing to the welfare of the present and future. We can consider the following forms of capital:

- Natural Capital: Environment and its biodiversity can be called us ecosystem - goods providing various needs such survival, climate regulation, habitat for other species, water supply, food, fibre, recreation, cultural amenities and the raw materials required for all economic production;
- Social and Cultural capital: The web of inter-personal connections, social networks, cultural heritage, traditional knowledge, trust and the institutional arrangement, rules, norms and values that facilitate human interactions and cooperation between people;
- Human capital: People and their attributes including physical and mental health, knowledge and other capacities that enable people to be productive member of society. This involves balance use of time to meet basic human needs such as fulfilling employment, spirituality, understanding skills development and freedom;
- Built capital: Building, machinery, transportation infrastructure and all other human artefacts and services that fulfil human needs such as shelter, subsistence, mobility and communication.

Balancing and investing in all the dimensions our wealth, to achieve sustainable well bring requires that:

- We live within planetary boundaries, within the capacity of our finite planet to provide the resources needed for this and future generations;
- That these resources are distributed fairly within this generation between generations and between humans and other species;
- We use these finite resources as efficiently as possible to produce sustainable human well being, recognising its independence with the well being of the rest of nature

Growth in material consumption is unsustainable. There are fundamental planetary boundaries. Beyond certain point they are undesirable. It has negative effects on wellbeing and social and natural capital. Human needs are basic needs for subsistence, reproduction, security, affection and so on. So what world does a sustainable and desirable economy look like? Establishments that are sustainable, effective respecting the ecological limits. For example, consumption of resources from the Earth are not faster than we develop renewable substitutes. Fair distribution by reducing systematic inequalities both internationally and within nations by improving the living standards of the poor, limiting excess unearned income and consumption and preventing private capture of common wealth. Establishment of a system effective and equitable governance and management of the social commons such as cultural heritage financial systems and information systems.

As a result, ever increasing consumption is no longer considered an integral component of human needs. People pay attention other needs and desires, like joy, beauty, affection, participation creativity, freedom and understanding. Building strong community helps us meet these needs. Such an economy will be powered by renewable

energy. The Lisbon Principles give the following six criteria for sustainable governance: Responsibility, Scale matching, Precaution, Adaptive management, Full cost allocation and Participation.

There are signs during the COVID-19 pandemic of increasing altruism on the part of local communities, e.g. food banks, the “ Pandemic of Love” – people reaching out at personal levels to help each other, and numerous other examples are contributing to changing the landscape of global compassion in the human heart. Whereas in the US due to closed markets and restaurants, while there are masses of hungry people, some of whose needs are being met by food banks, and in the Philippines farmers took food carts into the cities and villages to bring food to the people.

How can we create a sustainable world that respects both human activity and sustainable flourishing environmental conditions? Will we create behavioral changes to our overconsumption, move toward local farming and food supplies, less meat consumption, more organic farming practices that respect pollinators like bees and the healthful flow of resources. In Brazil the condition of the coronavirus is currently leading to a genocide of certain indigenous peoples as they head of state is stopping delivery of food in the interests of big agribusiness interests to usurp land for meat and other crops; this is certainly not unique in historical behaviors toward indigenous communities the world over. What will it take for us to respect the inherent value of cultures both human and in nature above selfish greed and injustice?

10. Environmental education

As a result of the pandemics and cascading disasters and challenges it is even more important than before to implement environmental ethics education through ethics-based curriculum for schools and tertiary education (Baker et al., 2019). Environmental education started gaining momentum globally after the first United Nations conference on Human Environment held in Stockholm in 1972. Subsequently the United Nations Environmental programme and International programme in environmental education (IEEP) came into existence in 1975. Despite the Decade of Education for Sustainable Development, and global bioethics education curriculum (Macer, 2006), many schools fail to implement any environmental ethics education.

A universal perspective and understanding, appreciating the inherent and powerful value of life itself is important as basis of environmental education. For almost 70 years we are understanding that all of our planet and our bodies have taken extremely complex processes over billions of years to create. We do not really offer the sense of global and universal time scale and interdependent processes to the students throughout their education that enhances this understanding. As well it can offer powerful added perspectives with which to encounter and balance the challenges of life in this human culture. This kind of education can be integrated from K-12 level and beyond.

Environmental education must include important concepts in sustainable education for the earth’s sustenance such as the importance of biodiversity. At least a million animal and plant species are in danger of extinction. Overall is a fall of at least 20% native species on average. There are also dangers related to fall of amphibian species (40%) and reef forming corals (33%). Major factors that impact the environment are 1) changes in land and sea use, 2) direct exploitation of organisms, 3) Climate change, 4) Pollution, 5) Invasive species, and 6) Human behaviour. The Sustainable Development Goals (SDGs) are one framework of targets.

A number of countries have formally included environmental education into their national curriculum, and some have also included environmental issues in their constitution. India incorporated environmental concerns in the constitution through 42nd amendment in 1976. The growing concerns about environmental deterioration in India

provoked the Government of India to plan a policy for introduction of environmental education in schools.

In 2003 the Supreme Court of India gave a directions to all the States and educational agencies in the country to introduce environment as a compulsory subject in all classes in schools up to the higher secondary level from the academic year 2004-05. The University Grants Commission (UGC) instructed all its affiliated Universities and colleges to introduce a compulsory six modules course on environmental studies at all branches of undergraduate degree courses.

Globally, among important topics is agricultural use: 100 million hectares of tropical forest were lost from 1980 to 2000, because of cattle ranching (42 million hectares) in Latin America and plantations in Southeast Asia (about 7.5 million hectares of which 80% is palm oil used in food, cosmetics, cleaning products and fuel). More than 75% of freshwater is used for crop or livestock production and agricultural crop production has increased by 300%. A large amount of renewable and non renewable resources have been extracted globally from the oceans. Land degradation has reduced productivity of land by 23% while US\$ 577 billion in annual crops are at risk because of the loss of pollination. 33% of marine stocks were harvested by 2015. Urban areas have doubled since 1992. Plastic pollution has increased tenfold since 1980 and toxins amounting to 300-400 million tons of heavy metals, solvents, toxic sludge, wastes from manufacturing and industrial waste are dumped into world waters. Since 1970 the global human population had doubled (from 3.7 to 7.6 billion) and impacting the environment even more.

Contents of the link between health-environment-climate change should be integrated into the curriculum. Sustainability issues are linked with emitters of carbon dioxide and pollutants, deforestation, air and water pollution. Policy makers should bring policies related to curriculum integration of sustainability and human–environment interactions into the syllabus. Wild life trade, illegal imports of animal products and the animal rights are other important areas which should be addressed in the curriculum. The knowledge can be transferred by linking interdisciplinary knowledge and practice for health, environment and education. Currently the disciplines are taught separately and as theoretical knowledge.

Primary Level

The future of environmental education should include stewardship ethics based environmental education so that the world family is not neglected whether they are migrants or refugees, as this calls for compassion to humans and adherence to human rights. The adverse effects of climate change and poverty has influenced a great shift in human settlements and human mobility. The disruption of fragile ecosystems and destruction of natural resources calls for both ethical governance and leadership. The World Bank reported that effective care of the environment and protection of the environment can reduce migration population by 80%. The report stated that the migration rate will include more than 140 million people (Sub-Saharan Africa, South Asia, Latin America) moving within their country borders by 2050 (WHO, 2020).

There are particular issues with children who are living in high poverty levels resulting in starvation, lack of nutrition and bad health. Migrant populations and disaster-stricken victims are vulnerable part of the population. Students should be taught on about stewardship ethics and ethics -based roles at school level.

Few curricula integrate ethics into the curriculum (Baker et al., 2018). Students, like adults, were not prepared for the emergency such as COVID-19 pandemic and hence emergency preparedness should be a part of the curriculum. What is missing in current curriculum is the pedagogical tools to integrate contents for peace education, collaborative and stewardship practices for global environmental health. Instead of concentrating on pollution and activities, transformational learning can include contents

related to maintenance of the purity of water, energy and soil as refurbishing elements exist naturally in the environment.

Secondary and Tertiary Levels

Education about the animal – human – plant - microorganism nexus is another important aspect to be considered which if not paid attention to, will adversely affect human (birds) and animal health through the spread of diseases such as COVID 19, Nipah Virus and SARS. The sale of wildlife in seafood market in Wuhan and the unknown exchange of viruses and bacteria from human to animals (zoonoses) has possibly caused severe loss of lives and social and economic global impact (WHO, 2020).

Ethics based Governance and Leadership

Future environmental health of the global population depends on an ethics based education of global citizens. This will safeguard global population from further challenges related to health, economic and social conditions in the face of such a pandemic as COVID-19. Transformational leadership is required to involve all stakeholders, transparent dealings and degree of experience. An ethical leader will also include communication with multicultural players and with an inclusive approach towards migrants and marginalised populations.

Indigenous and traditional wisdom for caring and spiritual global consciousness

Unfortunately, the few remaining areas which are projected by the remaining indigenous communities are also deteriorating with climate change. Biodiversity and ecosystem functions lie in the range of very large concentrations of indigenous people, who are often among the world's poorest communities in terms of modern economy. There is so much to learn from the indigenous people and local communities because they are adept at knowledge related to sustainability of very large areas, ecosystems, innovations and practices. From an ethical perspective, their positive contributions can be acknowledged through national recognition of land tenure, access and resource rights according to national legislation.

It is also imperative that there is an integration of indigenous knowledge systems (IKS) and wisdom in the curriculum. Indigenous, traditional, interfaith knowledge and wisdom are important factors to be considered for the world's environmental education system. Cajete (1994) emphasized that there is vast environmental wisdom from the accumulated body of experiences which modern societies can adapt to. The current environmental education do not integrate the sustainable ways and wisdom of traditional and spiritual healing mechanisms. This was reaffirmed in the Durban Statement on Bioethics (2018).

Inclusion of historical patterns of environmental events and communication management in building resistance to pandemics

Future generations will benefit from the knowledge and lessons learnt from the historical past of pandemics as well as the management of information to build community resilience to natural disease outbreaks and pandemics. These include epidemics in under water life, forest fire, pandemics, natural disasters, typhoons which are caused both by climate change and human impact.

Parental upbringing of children and ethics

Conscious parenting for the environment helps in creating and strengthening the bonds of the future generation of their children. This is an essential part of raising children with a social consciousness where children become the focal point for future

stewardship of the environment. The teacher-child-parent should work as a unit and they should have common goals for building a social consciousness for environmental stewardship. These should be reflected in policies for school communities.

Dynamic parenting practices can help build stewardship and well being of the society. Parents and schools should work together for achieving common objectives related to ethics-based mindful behaviours which lead to a sustainable environment .Community service activities such as cleaning the beaches, and preparing healthy meals together, and taking time to teach the negative impact of advertisements with fast food and unhealthy behaviours which impact children's health, are examples.

Educational Reforms

The opportunity to reflect on our lifestyles during the COVID-19 pandemic, and the new emphasis on distance education, provides an opportunity to spread awareness in students globally on reviving old wisdom and traditional practices from a multicultural perspective for global health. Environmental education policies also can consider information related to integration of new technology and modes of communication to develop a resilient community. Lessons learnt from past pandemics to be integrated into education

Policy makers who reconsider environmental education could integrate indicators related to ethical governance and stewardship for the environment for sustainable environment. Self -control and self- discipline have been developed in many citizens in the stay at home orders. The lessons also led us to consider self control in environmental exploitation. Policy makers may also be more willing to question the global practice of monetizing ecosystems for economic gains, as we have seen most governments value protection of the life of vulnerable persons more, with the consequence of some recession.

Educators need to prepare young leaders for intergenerational environment stewardship for a healthy planet. We refer readers to a future WeCope report on the implications of COVID-19 pandemic for education.

11. Conclusions

At the beginning of this paper are a series of recommendations. We are left with an opportunity to redefine popular understanding of sustainability, with respect, value and ethical relationship to sustainable development. The ecocentric reinterpretation or reorientation is more inclusive and recognizes socio-economic values in realistic balance with the natural world. It focuses greater emphasis on interdependence of humans as an intrinsic species of the total ecosphere.

The widespread deaths, job losses and threats to the global economy are far from the optimum path to decarbonized sustainable economy yet it is providing respite for the natural world. A major question is how we will emerge from this shut down. Will we change how we interact with the natural order, mitigating the pending climate challenge? Will we return to a malignant "norm", or change toward a sustainable future? What are lessons we have and are learning? We are analyzing historical pandemics and observing geophysical effects, sustained in geological records; the rapidly transforming ecology is demonstrating how quickly the natural order can regenerate with our cessation in polluting activities.

In this context, we may refer to the importance of free transfer of life- and environment-saving technology from the developed to the developing nations, as has been envisioned in the pivotal international agreement on climate change, that is, the United Nations Framework Convention on Climate Change (UNFCCC) (United Nations, 1992). There has to be a global consensus and a philanthropic attitude on the part of the developed nations to enable this knowledge dissemination, which should energize rather than stifle decentralized development at the lowest level of living-non-living integration

(ecosystems). Can we hope that instances of such sharing would be there among the characteristic features of a post-COVID, more ecocentric and altruistic world?

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- https://migrationnetwork.un.org/sites/default/files/docs/un_network_on_migration_wg_atd_policy_brief_covid-19_and_immigration_detention_0.pdf
- <https://www.icvanetwork.org/system/files/versions/UN%20Network%20on%20Migration%20-%20Press%20Release%20-%20WG%20ATD%20Policy%20Brief.pdf>
- https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200524-covid-19-sitrep-125.pdf?sfvrsn=80e7d7f0_2
- <https://www.worldfuturecouncil.org/press-release-study-pandemic-crisis/>
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- <https://www.unenvironment.org/news-and-stories/story/record-global-carbon-dioxide-concentrations-despite-covid-19-crisis>
- <https://www.nature.com/articles/s41562-020-0852-7>

Environmental Educational Resources (Appendix)

This appendix has examples related to environmental ethics and human values for both primary and secondary schools. This will be developed as a web-resource, and is available as an on-line resource. This is the version of 1 September 2020. New materials should be emailed to darryl@eubios.info and sumjayan@gmail.com

Primary Schools and Secondary Schools

Examples

Do natural objects and living things have a moral status? (1)

Are they worthy of ethical concerns? (2)

What ecological services do natural habitats give? Are clean, air, water and food considered as resources for human use only? (3)

Should human beings be considered as a separate species or part of nature? (4)

Should media and advertisements be followed blindly? What kind of ethical choices will you make? (5)

Do you have a role to protect the environment? (6)

What issues do you see in your local environment? What do you think is ethical and unethical about it? (7)

Discuss on ethical practices in global communities with regards to; transport use and gas emissions; loss of biodiversity in your country; water quality and resources; deforestation in your country (Adapted from Baker et al, 2019). (8)

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<https://www.khanacademy.org/partner-content/wi-phi/wiphi-value-theory/wiphi-ethics/v/moral-status>
- 3) <https://www.nwf.org/Educational-Resources/Wildlife-Guide/Understanding-Conservation/Ecosystem-Services#:~:text=Regulating%20Services%3A%20Ecosystems%20provide%20many,i n%20place%20to%20prevent%20erosion.>
- 4) <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.946.3783&rep=rep1&type=pdf>
- 5) A Model for Ethical Decision Making in Business: Reasoning, Intuition, and Rational Moral Principles
Einstein, A., B. Podolsky, and N. Rosen, 1935, "Can quantum-mechanical description of physical reality be considered complete?", *Phys. Rev.* **47**, 777-780.
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- 7) <https://study.com/academy/lesson/environmental-ethics-human-values-definition-impact-on-environmental-problems.html>
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2. Air quality

http://www.learnaboutair.com/primary_home.html

http://www.learnaboutair.com/resources/primary_guide.pdf

<https://www.epa.gov/students/lesson-plans-teacher-guides-and-online-environmental-resources-educators>

3. Water quality and resources

[https://www.globaleducation.edu.au/verve/resources/GEP Primary Water Resource Aug12 NSW.pdf](https://www.globaleducation.edu.au/verve/resources/GEP_Primary_Water_Resource_Aug12_NSW.pdf)

4. Soil

<https://study.com/academy/lesson/soil-science-lesson-for-kids.html>

5. Land use

<http://www.npi.gov.au/teachers-students/teachers/primary-years>

6. Environmental consequences of firms and consumers

<http://www.eolss.net/sample-chapters/c04/e6-99a-30.pdf>

7. Biodiversity, flora, fauna and landscape

<http://www.liaise-kit.eu/impact-area/biodiversity-flora-and-fauna>

The EU biodiversity indicators - SEBI 2010: http://ec.europa.eu/environment/nature/knowledge/eu2010_indicators/index_en.htm

The Economics of Ecosystems & Biodiversity (TEEB): http://ec.europa.eu/environment/nature/biodiversity/economics/index_en.htm

The Biodiversity Information System for Europe: <http://www.biodiversity.europa.eu/>
European Topic Centre on Biological Diversity: <http://www.cbd.int>

The European Commission, DG Research Innovation - Environment: http://ec.europa.eu/research/environment/index_en.cfm

8. Transport and Use of energy

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.828.2066&rep=rep1&type=pdf>

9. Waste production/generation/ recycling

<https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials>

10. Human limits to exploitation of the environment

- a. Deforestation and destruction of green environment for developers to build for business purposes and attract foreign buyers
- b. Importing and including more meat products and using social media to advertise

Routledge Handbook of Environment and Society in Asia

11. Developing awareness in children of pandemics and diseases using knowledge within local contexts (Nipah virus in Malaysia)

<https://www.americananthro.org/StayInformed/OAArticleDetail.aspx?ItemNumber=25631>

12. Traditional wisdom to be taught to their children (multicultural health practices taking into consideration that human mobility is increasing rapidly due to globalization)

https://www.euro.who.int/_data/assets/pdf_file/0009/334269/14780-World-Health-Organisation-Context-of-Health-TEXT-AW-WEB.pdf?ua=1

13. Create opportunities for head-heart and hands teaching and direct experiences with nature. Children should be able to sense the natural world where they enjoy nature as it is before they are asked to take care of the environment.

<https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1028&context=teachlearnstudent>

14. Teach children to go green, recycle food waste, planting home grown vegetables and herbs

<https://biofriendlyplanet.com/green-ideas/eco-friendly/5-eco-friendly-garden-ideas-for-kids/>

15. Introducing Silence and mindfulness in children's natural outdoor experiences so that they can have a deeper awareness of the beauty of nature and their healing mechanisms

<https://digitalcommons.lesley.edu/cgi/viewcontent.cgi?article=1015&context=mindfulnesstheses>

16. Preparing children to contribute to society for sustaining a healthy environment and be role models for them

<https://files.eric.ed.gov/fulltext/EJ891832.pdf>
<http://ecosensing.org/wp-content/uploads/2015/10/A-critical-pedagogy-of-place.pdf>

17. To adapt in their own life practices the respect and love for unity in diversity for environmental practices relating to others' traditions and cultures

<http://ecosensing.org/wp-content/uploads/2015/10/A-critical-pedagogy-of-place.pdf>
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4337992/>

18. Simple living and high thinking rather where they can give rather than take from the environment (Life of Gandhi as an example)

<https://digitalcommons.law.seattleu.edu/cgi/viewcontent.cgi?article=1746&context=sjsj>

19. Engage in social activities which increase a social awareness for environmental stewardship

The Role of Environmental Initiatives in Encouraging Companies to Engage in Environmental Reporting (European Management Journal)

20. Narrations of events from the past so that children understand the transcendental nature of the environment and the shift that takes place over time as a result of human exploitation of the environment

<https://elischolar.library.yale.edu/cgi/viewcontent.cgi?article=1007&context=fes-pubs>

21. Environmental Education must be developed and widely implemented that demonstrates and promotes leading from the future; Relevant Environmental Education and Bioethics for schools and the general public.

“Flagship” Example: “Eye of the Pangolin” - educative, informative in relation to COVID animal-human mismanagement, illegal trafficking to the brink of extinction and extreme exploitation

22. Environmentally conscious lesson plans

<https://www.edutopia.org/environmentally-conscious-lesson-ideas>

<https://au.fsc.org/preview.middle-3-4-lesson-plans.a-1124.pdf>

<https://www.teachervision.com/green-activities>

23. Indigenous and traditional wisdom for caring and spiritual global consciousness

<https://libguides.lakeheadu.ca/c.php?g=706710&p=5029366>

Inclusion of historical patterns of environmental events and communication management for building resistance to pandemics

<https://www.common sense.org/education/lesson-plans/epidemiology-solve-the-outbreak>

24. Guidance during the pandemics

<http://www.nysed.gov/common/nysed/files/programs/coronavirus/nysed-covid-19-first-guidance-3-9-20.pdf>

Additional videos:

- IPBES Assessment of Land Degradation and Restoration (2018): www.youtube.com/watch?v=KCt7aai17Nk
- IPBES Regional Assessments of Biodiversity and Ecosystem Services (2018): www.youtube.com/watch?v=kR0HeepbWCc
- IPBES Assessment of Pollinators, Pollination and Food Production (2016): www.youtube.com/watch?v=YwkYbeiwK5A
- IPBES Assessment of Scenarios and Models of Biodiversity (2016): www.youtube.com/watch?v=wZfcDmtGa9I

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Selected Statistics

Source: UN REPORT 6 May 2020 , PARIS

By the Numbers – Key Statistics and Facts from the Report
General

- 75%: terrestrial environment “severely altered” to date by human actions (marine environments 66%)
- 47%: reduction in global indicators of ecosystem extent and condition against their estimated natural baselines, with many continuing to decline by at least 4% per decade
- 28%: global land area held and/or managed by Indigenous Peoples , including >40% of formally protected areas and 37% of all remaining terrestrial areas with very low human intervention
- +/-60 billion: tons of renewable and non-renewable resources extracted globally each year, up nearly 100% since 1980
- 15%: increase in global per capita consumption of materials since 1980
- >85%: of wetlands present in 1700 had been lost by 2000 – loss of wetlands is currently three times faster, in percentage terms, than forest loss.

Food and Agriculture

- 300%: increase in food crop production since 1970
- 23%: land areas that have seen a reduction in productivity due to land degradation
- >75%: global food crop types that rely on animal pollination
- US\$235 to US\$577 billion: annual value of global crop output at risk due to pollinator loss
- 5.6 gigatons: annual CO₂ emissions sequestered in marine and terrestrial ecosystems – equivalent to 60% of global fossil fuel emission
- +/-11%: world population that is undernourished
- 100 million: hectares of agricultural expansion in the tropics from 1980 to 2000, mainly cattle ranching in Latin America (+/-42 million ha), and plantations in Southeast Asia (+/-7.5 million ha, of which 80% is oil palm), half of it at the expense of intact forests
- 3%: increase in land transformation to agriculture between 1992 and 2015, mostly at the expense of forests
- >33%: world’s land surface (and +/-75% of freshwater resources) devoted to crop or livestock production
- 12%: world’s ice-free land used for crop production
- 25%: world’s ice-free land used for grazing (+/-70% of drylands)
- +/-25%: greenhouse gas emissions caused by land clearing, crop production and fertilization, with animal-based food contributing 75% to that figure
- +/-30%: global crop production and global food supply provided by small land holdings (<2 ha), using +/-25% of agricultural land, usually maintaining rich agrobiodiversity
- \$100 billion: estimated level of financial support in OECD countries (2015) to agriculture that is potentially harmful to the environment

Species, Populations and Varieties of Plants and Animals

- 8 million: total estimated number of animal and plant species on Earth (including 5.5 million insect species)

- Tens to hundreds of times: the extent to which the current rate of global species extinction is higher compared to average over the last 10 million years, and the rate is accelerating
- Up to 1 million: species threatened with extinction, many within decades
- >500,000 (+/-9%): share of the world's estimated 5.9 million terrestrial species with insufficient habitat for long term survival without habitat restoration
- >40%: amphibian species threatened with extinction
- Almost 33%: reef forming corals, sharks and shark relatives, and >33% marine mammals threatened with extinction
- 25%: average proportion of species threatened with extinction across terrestrial, freshwater and marine vertebrate, invertebrate and plant groups that have been studied in sufficient detail
- At least 680: vertebrate species driven to extinction by human actions since the 16th century
- +/-10%: tentative estimate of proportion of insect species threatened with extinction
- >20%: decline in average abundance of native species in most major terrestrial biomes, mostly since 1900
- +/-560 (+/-10%): domesticated breeds of mammals were extinct by 2016, with at least 1,000 more threatened
- 3.5%: domesticated breed of birds extinct by 2016
- 70%: increase since 1970 in numbers of invasive alien species across 21 countries with detailed records
- 30%: reduction in global terrestrial habitat integrity caused by habitat loss and deterioration
- 47%: proportion of terrestrial flightless mammals and 23% of threatened birds whose distributions may have been negatively impacted by climate change already
- >6: species of ungulate (hoofed mammals) would likely be extinct or surviving only in captivity today without conservation measures

Oceans and Fishing

- 33%: marine fish stocks in 2015 being harvested at unsustainable levels; 60% are maximally sustainably fished; 7% are underfished
- >55%: ocean area covered by industrial fishing
- 3-10%: projected decrease in ocean net primary production due to climate change alone by the end of the century
- 3-25%: projected decrease in fish biomass by the end of the century in low and high climate warming scenarios, respectively
- >90%: proportion of the global commercial fishers accounted for by small scale fisheries (over 30 million people) – representing nearly 50% of global fish catch
- Up to 33%: estimated share in 2011 of world's reported fish catch that is illegal, unreported or unregulated
- >10%: decrease per decade in the extent of seagrass meadows from 1970-2000
- +/-50%: live coral cover of reefs lost since 1870s
- 100-300 million: people in coastal areas at increased risk due to loss of coastal habitat protection
- 400: low oxygen (hypoxic) coastal ecosystem 'dead zones' caused by fertilizers, affecting >245,000 km²
- 29%: average reduction in the extinction risk for mammals and birds in 109 countries thanks to conservation investments from 1996 to 2008; the extinction

risk of birds, mammals and amphibians would have been at least 20% greater without conservation action in recent decade

- >107: highly threatened birds, mammals and reptiles estimated to have benefitted from the eradication of invasive mammals on islands

Forests

- 45%: increase in raw timber production since 1970 (4 billion cubic meters in 2017)
- +/-13 million: forestry industry jobs
- 50%: agricultural expansion that occurred at the expense of forests
- 50%: decrease in net rate of forest loss since the 1990s (excluding those managed for timber or agricultural extraction)
- 68%: global forest area today compared with the estimated pre-industrial level
- 7%: reduction of intact forests (>500 sq. km with no human pressure) from 2000-2013 in developed and developing countries
- 290 million ha (+/-6%): native forest cover lost from 1990-2015 due to clearing and wood harvesting
- 110 million ha: rise in the area of planted forests from 1990-2015
- 10-15%: global timber supplies provided by illegal forestry (up to 50% in some areas)
- >2 billion: people who rely on wood fuel to meet their primary energy needs

Mining and Energy

- <1%: total land used for mining, but the industry has significant negative impacts on biodiversity, emissions, water quality and human health
- +/-17,000: large-scale mining sites (in 171 countries), mostly managed by 616 international corporations
- +/-6,500: offshore oil and gas ocean mining installations ((in 53 countries)
- US\$345 billion: global subsidies for fossil fuels resulting in US\$5 trillion in overall costs, including nature deterioration externalities; coal accounts for 52% of post-tax subsidies, petroleum for +/-33% and natural gas for +/-10%

Urbanization, Development and Socioeconomic Issues

- >100%: growth of urban areas since 1992
- 25 million km: length of new paved roads foreseen by 2050, with 90% of construction in least developed and developing countries
- +/-50,000: number of large dams (>15m height) ; +/-17 million reservoirs (>0.01 ha)
- 105%: increase in global human population (from 3.7 to 7.6 billion) since 1970 unevenly across countries and regions
- 50 times higher: per capita GDP in developed vs. least developed countries
- >2,500: conflicts over fossil fuels, water, food and land currently occurring worldwide
- >1,000: environmental activists and journalists killed between 2002 and 2013

Health

- 70%: proportion of cancer drugs that are natural or synthetic products inspired by nature
- +/-4 billion: people who rely primarily on natural medicines
- 17%: infectious diseases spread by animal vectors, causing >700,000 annual deaths
- +/-821 million: people face food insecurity in Asia and Africa

- 40%: of the global population lacks access to clean and safe drinking water
- >80%: global wastewater discharged untreated into the environment
- 300-400 million tons: heavy metals, solvents, toxic sludge, and other wastes from industrial facilities dumped annually into the world's waters
- 10 times: increase in plastic pollution since 1980

Climate Change

- 1 degree Celsius: average global temperature difference in 2017 compared to pre-industrial levels, rising +/-0.2 (+/-0.1) degrees Celsius per decade
- >3 mm: annual average global sea level rise over the past two decades
- 16-21 cm: rise in global average sea level since 1900
- 100% increase since 1980 in greenhouse gas emissions, raising average global temperature by at least 0.7 degree
- 40%: rise in carbon footprint of tourism (to 4.5Gt of carbon dioxide) from 2009 to 2013
- 8%: of total greenhouse gas emissions are from transport and food consumption related to tourism
- 5%: estimated fraction of species at risk of extinction from 2°C warming alone, rising to 16% at 4.3°C warming
- Even for global warming of 1.5 to 2 degrees, the majority of terrestrial species ranges are projected to shrink profoundly.