

The Environmental Impact and Response to the COVID-19 Pandemic

ACBA7007 Strategic Management for Conservation

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Introduction

On 31st December 2019, World Health Organisation's China Office accessed a website press release by the Wuhan Municipal Health Commission on cases of 'viral pneumonia' in Wuhan. By 11th March 2020 this would be declared, by the Director General of the WHO, a global pandemic that by 12th March 2021 would have led to 118,268,575 confirmed cases and 2,624,677 deaths worldwide (WHO, 2021a). The pandemic has led to the near shutting down of international travel, lockdowns of entire countries including the closure of factories, offices, shops and schools and severe restrictions on the movements of human populations.

COVID-19 is the latest in a not insignificant list of pandemics and epidemics that have had a global impact from the plague of the Middle Ages through smallpox; measles; the diseases of poor sanitation, such as typhoid and cholera; Spanish flu; and more recently, AIDs; Ebola; and respiratory diseases SARS and MERS (Jones, 2020) These often-overwhelming events have immediate negative impacts on society but often have the power to deliver profound change and progress in their aftermath because of the response of governments and society; whether it is medical breakthroughs, improvements to urban infrastructure, an increase in international cooperation or changes in social attitudes.

Global or national events and external shocks such as wars, recessions, human-induced or natural disasters have also caused huge economic, social and environmental impacts in the past; but also can be a trigger for a positive change and can help predict the implications of this pandemic. Over the past sixty years conflicts have raged over more than two-thirds of the world's biodiversity hotspots (Hanson *et al.*, 2009). Most have a negative impact; from the direct killing of wildlife during the destruction of habitat, the harvesting or trading of natural resources for survival or to fund the conflict, to the prevention of conservation work. There are also examples where long-term military zones such as Ministry of Defence land in the U.K. and North Korea's demilitarized zone act as a refuge where wildlife flourishes in the absence of humans (Gaynor *et al.*, 2020).

The cholera and yellow fever epidemics of the 1800s drove the development of clean water provision, the construction of sewage systems and urban planning to incorporate large city parks and wide, open streets and boulevards in London, Paris and New York (Klein, 2021). In the U.K., the end of World War 1 heralded the 1919 Housing Act and the design of the first council house to provide 'homes for fit for heroes.' The 2nd World War paved the way for the creation of the National Health Service. The 2008 global recession led to a 10% fall in U.S. energy-related carbon dioxide emissions (Gillingham *et al.*, 2020). (Rinscheid, 2015) cites the example of Germany's shift away from nuclear power following the accident at the Fukushima nuclear power plant in 2011 as demonstration of this event-driven impetus leading to policy change.

This evaluation of the COVID-19 pandemic will assess the immediate impact on different aspects of environmental and conservation efforts; whether these are likely to be short-

term or will they have long-term implications and cause structural change to how the environment is protected in the future.

2. Environmental Impacts of the Covid-19 pandemic

2.1 Greenhouse Gas Emissions

The impact of severe country wide lockdowns led to an average drop in daily CO₂ emissions of 17% at the height of restrictions of which transport accounts for nearly half (le Quéré *et al.*, 2020) and overall, their analysis predicts a 5.7% reduction in CO₂ emissions for 2020. This may seem significant, but it is the kind of annual decrease required to limit global warming to 1.5°C (UNEP, 2019) and the IMF are predicting a rebound of +5.8% in 2021 (IMF, 2020) and demonstrate the scale of the structural change needed to tackle climate change. In the U.S., the largest reductions were in the consumption of air fuel (50%), gasoline (30%), whilst electricity dropped by less than 10% suggesting that reduction in electricity use from industry and commerce was somewhat offset by increases in household demand (Gillingham *et al.*, 2020).

The pandemic itself will cause delays to the reduction of greenhouse gas emissions by knocking back the installation of renewable electricity generation, a one-year delay to renewable energy investment would outweigh the ‘gains’ of March to June 2020; falling electric vehicle sales (43% reduction) and the loss of 600,000 green energy jobs by April 2020 in the U.S. alone (Gillingham *et al.* 2020; WoodMac 2020; BW Research Partnership 2020). The post-pandemic economic recovery could deliver huge progress in the switch to renewables if the E.U., U.S., U.K., Japan and South Korea do indeed ‘build back better’ as trailed and focus stimulus efforts on clean energy.

The pandemic has also impacted our ability to move forward with global efforts to combat climate change by causing the postponement by a year of the COP26 UN Climate Change Conference, now due to be held in November this year in Glasgow (UNFCCC, 2020).

2.2 Air Quality

The World Health Organisation estimates that fine particulate air pollution is responsible for 7 million deaths per year (WHO, 2018) and the 91% of the world’s population live with air pollution exceeding WHO guidelines disproportionately affecting low- and middle-income countries due to conditions such as heart disease, strokes, respiratory infections, etc. (WHO 2021b).

The global lockdown had an immediate impact on air quality. Analysis of NASA satellite images taken over industrialised nations indicates that nitrogen dioxide (NO₂), Sulphur dioxide (SO₂) and other pollutants have reduced between 20-38% compared to 2019 (Knowland *et al.*, 2020 as cited in (Bashir, Ma and Shahzad, 2020) and (Conticini, Frediani and Caro, 2020) states that particulate matter pollution (PM_{2.5} & PM₁₀) had gone down in Italy by as much as 30% based on the air quality index.

Turkey has some of the poorest air quality in the world (World Air Quality Index 2020) and is the cause of over 10 deaths per three hours (Temiz Hava Hakki 2019). The closing down of the country led to a reduction of 34.5% of PM2.5 by the end of April 2020 with an estimated reduction in pollution-related deaths of 7000 in the first three months of lockdown (Aydin *et al.*, 2020).

Temporarily improved air quality in the U.S. has saved approximately 200 lives per month which is dwarfed by the deaths from the virus itself but demonstrates what can be achieved in public health with a shift to renewables and tighter air quality controls (Gillingham *et al.*, 2020). Data from California following the lockdown showed an up to 60% drop in pollution (Parodi and Liu, 2020) but research from California also suggests that poor air quality increases susceptibility to diseases such as COVID-19 in the first place and accounts for why it has been one of the states most affected by the pandemic (Bashir *et al.*, 2020).

The pandemic caused the postponement of new air quality measures in several U.K. cities, such as clean air zones (CAZs) in Leeds, Bath and Birmingham, an Oxford zero emission zone and the suspension in London of congestion charges and low emission zones, admittedly at a time when traffic levels have plunged to levels not seen for 50 years (The Guardian, 2020).

The cleaner air and reduction of smog because of the pandemic demonstrates what air quality controls could do if implemented in the future and there is an economic case to be made for using these controls for alleviating the costs of poor health and premature deaths both to industry, health services and the state and protecting particularly the elderly during future outbreaks of respiratory diseases.

We do not know the full extent of the temporary improvements in air quality on wildlife but (Manenti *et al.*, 2020) demonstrated that the breeding success of the aerial, insect feeding common swift benefited from the reduction in air pollution. Industrial contaminants such as Nitrogen dioxide reduces insect biomass and general fitness (Campbell and Vallano, 2018). Results from Manenti *et al* (2020) showed that improvements in air quality led to a 45% increase in the number of nests containing 4 eggs compared to the breeding seasons of 2017-2019. If replicated in other species, this shows that even a temporary, short-lived improvement in air quality this year will have delivered longer term benefits.

2.3 Noise Pollution

Long term exposure to excess noise causes a variety of wellbeing issues from sleeplessness to mental disorders and issues with concentration (Arora, Bhaukhandi and Mishra, 2020). Their research showed considerable drops in noise levels across Indian cities, primarily caused by the emptying of roads as a result of lockdowns with noise reductions ranging between 35% and 68% between 8am and 4pm.

(Zambrano-Monserrate, Ruano and Sanchez-Alcalde, 2020) state that as well as causing health problems for humans, noise pollution impacts on the natural environment. This reduction in anthropogenic noise has led to anecdotal evidence of 'deafening levels of birdsong' and the first cuckoo heard in Osterley, West London for 20 years (National Trust 2020). (Derryberry *et al.*, 2020) found that the reduction in traffic sound in San Francisco Bay led to a change in song frequency in white-crowned sparrows as they reclaimed the

frequencies vacated by human noise and were able to perform their highest performance and most effective song demonstrating the speed that species regain behaviours even after decades of unfavourable conditions.

The marine environment is particularly vulnerable and impacted because sound moves more efficiently than through light and many species particularly, cetaceans, rely on sound to communicate, navigate and locate food. The last time the oceans went quiet was 2001 following the September 11 terror attack. Research on the North Atlantic right whales found evidence of a reduction in the release of stress-related hormones (Rolland *et al.*, 2012). This time researchers in Monterey Bay are using hormone samples and acoustic levels during and after lockdown to calculate the impact of anthropogenic noise on the wellbeing of whales. In another project, the ecologist hypothesises that as a result of the reduction in underwater noise due to the global shutdown, the humpback whales will have much more complex communication without the constant noise of humanity (Welch, 2020).

2.4 Water quality

As well as air quality, water quality has been impacted by the pandemic. In India, all the major rivers showed an improvement in water quality (Singhal and Matto, 2020). The Ganga river was transformed by the lockdown in India and within 10 days data from the Central Pollution Control Board (CPCB) showed that 27 points out of 36 along the river were now suitable for the breeding of fish and other aquatic organisms, with dissolved oxygen (DO) levels having increased by 79% at one site in Varanasi with levels increasing from 3.8 mg per litre to 6.8mg/l (Arora, Bhaukhandi and Mishra, 2020). The CPCB drinking water standard is a DO of greater than 4 and these improvements were attributed to 500% reduction in sewage and industrial effluent due to closed manufacturing but also a reduction in water extraction diluting pollutants further, a collapse in tourism and stay at home orders preventing people from washing clothes and bathing in the river according to the CPCB (Arora, Bhaukhandi and Mishra, 2020) (Yunus, Masago and Hijioka, 2020) found a similar impact at the fresh water lake Vembanad, where soluble microbial products were found to have reduced by 15.9% on average. Here, domestic sewage rates remained constant, so the cause was suggested as being from the drop in tourism and industrial activity.

The COVID-19 virus is known to be present in the faeces of both symptomatic and asymptomatic patients and the virus was found to be present in samples of untreated wastewater in Australia (Ahmed *et al.*, 2020). They suggest that this sampling could be developed to form a method of detecting disease outbreaks in the future, locating clusters of the infections and estimating infection rates in a community. Evidence from Turkey suggests that following normal sewage and water treatment such as chlorine, UV and ozone, there was no discernible changes in water quality prior to and during the pandemic (Aydın *et al.*, 2020) and the WHO has stated that there is no evidence for the transmission of COVID-19 via wastewater (WHO, 2020).

2.5 Waste

The pandemic has led to an explosion in the use of single-use medical personal protective equipment (PPE). At its height, Wuhan produced 240 metric tonnes of medical waste per day against a pre-covid estimate of 50 tonnes (Saadat, Rawtani and Hussain, 2020), such was the scale that

authorities commissioned a new medical waste facility to deal with the excess and help control the epidemic (Nan, 2020) and the creation of 46 mobile waste treatment facilities.

Hong Kong, one of the first cities to deal with the pandemic, has seen new deposits of medical waste being washed in with every tide, severely affecting coastal areas (Bashir *et al.*, 2020). The U.S. has seen an increase in the PPE component of waste particularly disposable gloves and masks (Calma, 2020). The World Wildlife Fund estimates that every month over 10 million masks are arriving in the natural environment even if only 1% are not carefully disposed of and in Italy launched a public education appeal (WWF, 2020).

There have been concerns about the transfer of the virus on household waste to the extent that infected Italian residents were banned from sorting their recycling (Zambrano-Monserrate, Ruano and Sanchez-Alcalde, 2020) and 46% of UK local authorities closed waste and recycling centres (Edminton, 2020).

The rise in online shopping has increased the level of packaging of food and household products for example, Tesco moved away from carrying its food delivery in reusable boxes to using plastic bags (pers. obs 2020). The impact of a reduction in reuse and recycling contributes to further energy and resource use and waste (Varotto and Spagnoli, 2017).

In Wales, the closure of waste and recycling centres led to an increase in fly-tipping (National Resources Wales, 2020).

However, as a positive, lack of tourism has improved the condition of many beaches such as Acapulco and Barcelona (Zambrano-Monserrate *et al.*, 2020) and Loizia *et al.*, (2021) concluded that there was a reduction in micro and macro-plastics on Cyprus beaches during the absence of tourists.

There is also the possibility that the pandemic will lead to an expansion of the incinerators with energy recovery as an alternative waste strategy for medical waste instead of landfill because of the hygiene benefits, huge reduction in volume, as well as its renewable energy status (Kulkarni and Anantharama, 2020).

2.6 Conservation organisations and research

The initial threat to conservation work and organisations has been financial. In the U.K., a significant proportion of the conservation work is carried out by the charity sector and these organisations have been shown to be particularly vulnerable to a sudden financial shock. Research in March/April 2020 from Wildlife and Countryside Link, a coalition of 57 U.K. environmental charities between them responsible for over 750,000 hectares of land and 800 miles of coastline, showed that 27% of their members were at a high risk of insolvency having reserves of 4 months or less and nearly half of the charities having sufficient reserves for only six months or less (Wildlife and Countryside Link, 2020). Whilst government COVID schemes have kept conservation charities afloat, initial rules surrounding the furlough have meant that there was no flexibility to enable some staff to complete key conservation tasks whilst remaining furloughed for the rest of their hours (Wildlife and Countryside Link, 2020).

One of the U.K.'s biggest conservation charities and land-owner, the National Trust shelved £145 million of conservation projects as part of its restructuring to deal with expected losses

of £200 million in 2020 as its main sources of income – entry fees, carparking, holiday accommodation, cafes and shops evaporated with the series of lockdowns (National Trust, 2020a). Although the Trust has seen some conservation successes in 2020, mainly due to less human disturbance at reserves, i.e., best breeding season for marsh harriers at Wicken Fen, Cambridgeshire and for little terns at Blakeney Point, Norfolk; those species requiring more active conservation efforts and surveillance have fared badly, such as the arctic tern population at Long Nanny, Northumberland, that for the first time since 1980 failed to produce any fledglings (National Trust, 2020b).

For another conservation charity, the Wildfowl and Wetlands Trust, the impacts of the pandemic are “profound” and “widespread” with the lost income and influence of 1 million visits, 50,000 school children missing out on learning experiences and the monitoring work and engagement of 1000 volunteers, impacting future conservation initiatives both here and abroad (W.W.T., 2020).

At the Welsh government funded agency, National Resources Wales, the main impacts have been the cessation of non-essential field work and site visits because of social distancing and non-essential travel rules, leading to a backlog of work and delays issuing consents and permits (National Resources Wales, 2020).

Lindsey *et al.* (2020) are pessimistic about the impact of the pandemic on conservation efforts in Africa believing that the crisis will cause reduced funding leading to the less conservation monitoring and patrols and more threats to wildlife and habitats. However, Corlett *et al.* (2020) suggest from their communications with colleagues globally that practical conservation seems to be continuing, patrols are ongoing, and vulnerable species are being protected even if this is down to the dedicated staff. Their focus is that if there is a reduction in conservation funding in the future because governments and foundations redistribute money towards social and economic recovery from the pandemic, it is the practical conservation activities and ‘boots on the ground’ that need to be the sector’s priority. There are also wider concerns about the reliance of conservation funding on ecotourism and what that impact will be the longer international travel restrictions remain (Evans *et al.*, 2020).

The pandemic has also given scientists the opportunity to reflect on how they carry out conservation research. The value of citizen science projects has been highlighted by the pandemic, over 4.6 million UK citizens contribute to the Covid Symptom Study, using a phone application to track disease symptoms and spread (Covid Symptom Study, 2020). Participation in community environmental projects has seen a massive increase during lockdown ranging from reporting litter to monitoring air and water quality (Kornfeld, 2020). These projects often deliver a larger amount of data over a wider area than would be possible for a professional researcher (Crimmins *et al.*, 2020), however citizen science biodiversity data tends to be skewed towards developed countries which already have large data sets according to figures from the Global Biodiversity Information Facility (GBIF) and whilst bird data is constantly increasing, the increase in non-bird data is low (Amano, Lamming and Sutherland, 2016).

(Buxton *et al.*, 2020) suggest for most researchers moving online and staying put has brought questions about how much of their previous work-related travel was really warranted considering its carbon footprint and that the inability to collect new data has led many to make use of back-logs of existing data and data in open-access repositories. But moving online cannot replace the networking, the chance to hear about the latest developments in the field and the random interactions which can feedback into your own research that is offered by large conferences (Corlett *et al.*, 2020). This is also an opportunity to reflect on how the profession operates and how performance in the sector is measured and whether there is too much emphasis placed on publishing and not enough on practical conservation work and public engagement.

The pandemic has also pushed back the 15th COP of the Convention of Biodiversity due to take place in in 2020 until May 17th, 2021, delaying the process to develop the post-2020 framework as well as decisions on subjects such as funding and capacity building (IISD, 2021).

2.7 The Interactions between People and Wildlife

The pandemic has demonstrated the importance of access to green space and nature. Polling commissioned by the National Trust found that 68% of adults either agreed or strongly agreed that lockdown was improved by noticing nature around them improved their mood and 55% said they plan to spend more time in nature in the future when restrictions are removed (National Trust 2020c).

There have been countless examples of wildlife sightings in newly quieter urban areas across the globe; wolves in Florence, a golden eagle above Milan, coyotes near the Golden Gate bridge, goats in Llandudno and a weasel on the patio in West Wales (The Economist, 2020; BBC, 2020; pers. obs.). Whether they are emboldened by the lack of human activity and noise or that with nothing else to do humans are watching more, is less certain.

There is no doubt that the lack of traffic had a more direct impact on some populations, both common toads and agile frogs showed a dramatic reduction in mortality compared to the 2019, at sites where the amphibians must cross roads to reach breeding sites (Manenti *et al.*, 2020). Nguyen *et al.* (2020) found, using traffic collision data, that wildlife-vehicle conflict (WVC) for mountain lions in California, where they under consideration for protection because of the death rates on roads reduced by 58% for the period of stay-at-home orders. The overall reduction in road killings for the states of California, Idaho and Maine were 21%, 38%, and 44%, respectively. It is clear that the future control of traffic could be used to protect vulnerable species on some roads at key moments in their life cycles to support their survival.

The most impactful interaction of all has of course been the in the origin of the COVID-19 virus itself. It is suspected to have originated in bats and been transmitted to humans by an intermediary species, possibly the pangolin (Zhang, Wu and Zhang, 2020), the most recent in an increasing number of zoonotic outbreaks (Markotter *et al.*, 2020). Increasingly this is linked to live wildlife markets which expose domesticated animals and humans to pathogens from wild animals and increasing contact between humans and domesticated animals with wildlife due to deforestation and habitat destruction for agriculture and development (Allen *et al.*, no date). China has taken

positive steps by creating legislation that banned the consumption of most wild animals (Koh, Li and Lee, 2021) and Gabon has banned the eating of bats and pangolins (France 24, 2020). However, many livelihoods in developing countries are sustained by eating and trading wild animal-derived foods (Volpato *et al.*, 2020) and such moves have failed in the past because those reliant on bushmeat or its trade have not been compensated or given alternative opportunities (Koh, Li and Lee, 2021).

3. Conclusion

The environmental gains achieved by the halt of business as usual will mainly be short-lived and levels of pollution will rebound once this ‘anthropause’ is over (Rutz *et al.*, 2020), but the pandemic has shown society that things can be done differently. It has highlighted the vulnerability of many of our conservation organisations and services due to their reliance on commercial activities, charities, or ecotourism for their funding. It is clear that practical conservation activities grounded in local communities are the most sustainable. It has highlighted the benefits humans derive from green space and needs to lead to greater protections for these spaces and investment in the creation of more public green space particularly in urban areas, yet at the same time the pandemic has shown how well wildlife thrives when humans are kept out of protected places. The challenge will be balancing the wellbeing of protected areas with the need for paying visitors and the amenities they require.

The priority for conservationists and policy makers is to use the newfound appreciation of the environment, changes to working patterns, respect for science, enjoyment of unpolluted air to galvanise the public both to financially support conservation initiatives and pressure politicians for change.

No assessments can be made about the impact of and response to the pandemic without the acknowledgement that our treatment of the natural world had a hand in the creation of this virus that has had such a global impact. This pandemic has shown the extent of the economic and social costs of ignoring long term environmental destruction. “There is no future for business as usual – we are reaching irreversible tipping points for nature and climate, and over half of the global GDP, \$44 trillion, is potentially threatened by nature loss” (IMF, 2020).

The scale of the international response to the COVID-19 pandemic has demonstrated that that there can be a rapid, coordinated and even draconian global action (if you consider the curtailment of individual freedoms and mandated closing of businesses, schools and facilities), reliant on emerging and often uncertain science, for an unfolding crisis if the political and societal will is there and the threat is considered grave enough. This pandemic has highlighted our half-hearted response so far to the arguably bigger threat of biodiversity loss and climate change.

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