



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Postgraduate/Distance Learning Assignment coversheet & feedback form

**THIS SHEET MUST BE THE FIRST PAGE OF THE ASSIGNMENT YOU ARE
SUBMITTING (DO NOT SEND AS A SEPARATE FILE)**

For completion by the student:		
Student Name:		
Module code:	Student ID number:	Educational support needs: Yes/No
Module title:		
Module tutor:		
Assignment due date:		
If your module has multiple submissions please indicate which piece of work this is.		
1 st ☐ 2 nd ☐ 3 rd ☐ 4 th ☐ 5 th ☐ 6 th ☐		
I confirm that this is my original work and that I have adhered to the University policy on plagiarism. Signed		
Email submission: if you are submitting this form via email, please tick this box ☐ (as a substitute for your signature) to confirm that you agree to the above declaration.		
Assignment Mark		
1 st Marker's Provisional mark		
2 nd Marker's/Moderator's provisional mark		
Agreed Internal Mark:		
External Examiner's mark (if relevant)		
Final Mark		
NB. All marks are provisional until confirmed by the Final Examination Board.		

Brian M. O'Leary, BSS 2

This is a very interesting piece of work, that's

For completion by Marker 1: very well researched &

Comments: incredibly informative. That said, it tends to be quite descriptive & factual and it would be beneficial to devote more space to argumentation in relation to issues of equity - intergenerational, international & inter-species equity, for example. But overall, this is a well written, plausible & interesting essay. It is enjoyable

Marker's signature: to read, too.

Date:

For completion by Marker 2/Moderator:

65% DM.

Comments:

Marker's Signature:

Date:

AGREED INTERNAL MARK (where necessary):

Comment on process on arriving at agreed mark:

External Examiner's comments (if relevant)

External Examiner's Signature:

Date:

Assignment 2

Brian M. O'Leary Student No. 2004122

Q. Is it more important to mitigate climate change quickly or to do so equitably?

In a year of extraordinary wildfires, severe floods, and record-breaking episodes of extreme heat, the publication of part 1 of the IPCC Report, and preparations for the forthcoming UN COP26 Conference, climate change has received considerable attention.¹ The IPCC Report is the latest in a now-lengthy chain of evidence that climate change is already occurring to an extent that has grave implications for life on this planet and that immediate action is required to hold global temperature rise to 1.5°C.² In the COP26 pre-Conference statement, climate change is described as 'runaway' and 'a global priority'.³

It is unequivocal that the increase of CO₂, methane (CH₄) and nitrous oxide (N₂O) in the atmosphere over the industrial era is the result of human activities and that human influence is the principal driver of many changes observed across the atmosphere, ocean, cryosphere, and biosphere.⁴

Climate change, however, is not a new phenomenon. The Earth is a dynamic system of forces and pressures in which climate volatility is inevitable; external processes and events, such as solar bombardment and the occasional arrival of a large asteroid, contribute to volatility. In geological time, climate change is a constant feature of the functioning of the Earth. Following the emergence of hominids and the subsequent evolutionary success of *homo sapiens*, humans have been participants in the processes of climate change. Initially the impact of human activity was almost imperceptible but has advanced over time - exponentially from c.1750 CE - to the extent that the causes of

¹ *Climate Change 2021: The Physical Science Basis: Report of the Intergovernmental Panel on Climate Change: - Working Group I contribution to the Sixth Assessment Report* (9 August 2021). www.ipcc.ch/report/sixth-assessment-report-working-group-i/ (consulted 23 August 2021); 26th UN Climate Change Conference of the Parties (COP26), Glasgow, 31 October-12 November 2021: www.ukcop26.org (consulted 19 August 2021). Since the beginning of February 2021 until the present date, well over 400 articles concerning aspects of climate change have appeared in *The Guardian* newspaper. With subjects ranging from heat domes, flooding and airline emissions, to climate tipping points and rising sea levels, the extensive coverage reflects mounting concern about climate change. It is a rough, biased, sampling exercise, focusing upon just one newspaper that serves a limited, educated readership. (*Personal observation*, September 2021).

² The chain of evidence stretches back over 50 years. However, in terms of *official* international acknowledgement, the formation of the IPCC in 1988 was an acceptance of the possibility of serious climate change. The IPCC 3rd Report, in 2001, clearly warned that global warming was not an uncertainty but a risk with a very high degree of probability: Stephen M. Gardiner, 'Ethics and Global Climate Change' in: S.M. Gardiner *et al*, *Climate Ethics: Essential Readings* (Oxford: Oxford University Press, 2010) pp. 3-35 (5-7).

³ 'Introduction; COP26 Explained', 26th UN Climate Change Conference, p. 9.

⁴ IPCC Sixth Report, p. 51.

current climate change are now understood to be anthropogenic.⁵ As irreversible 'tipping points' may have been triggered, it seems inevitable that mitigation, however quick, will be insufficient to prevent further climatic metamorphosis. Nor is there any certainty in a period of runaway climate change that mitigation could be undertaken equitably. The history of negotiations concerning climate change suggests that international agreement, at COP26 in November 2021, is highly unlikely to achieve the rapid, dramatic reductions in CO₂ emissions that are required to avert further rises in global temperatures: 'the global-warming problem has a seriously tragic structure'.⁶ Attempts at mitigation will need accompanying strategies of adaptation as countries struggle to cope with the local consequences of climatic instability precipitated by human activity.⁷ Both processes - mitigation and adaptation - seem certain to impose substantial alterations in life styles, and should foster an ethic that enjoins humans to accept moral responsibility for anthropogenic harms, endorsing 'green' virtues that discourage further environmental injustice by respecting the interests of other life forms and their habitats.⁸ Ideally 'green' virtues should also respect the good of future generations of all living beings and the environments that they may inhabit. Drawing upon the work of Hourdequin, Jamieson and Sandler, I argue that individual environmental ethical obligations, deriving from these virtues, are the necessary foundation for collective action but that they may not be sufficient to avert the worst impacts of climatic changes that are already in train.⁹

As early as 1989, Jamieson warned that anthropogenic climate change could not be controlled by conventional 'management' approaches and that global environmental problems should be viewed as moral issues, requiring a reform of values that moved beyond anthropocentrism.¹⁰ Those values, Jamieson argued, should 'reflect the interconnectedness of life on a dense, high-technology planet' and would be best served by focusing upon character: we needed to nurture old values - humility, courage and moderation - and develop new ones - simplicity and conservation.¹¹

⁵ There is no standard definition of climate change, but the composition of the atmosphere is a key determinant of global climate. McNeill describes the physical interactions of the major greenhouse gases that produce global warming but is unduly optimistic about mitigation. Gardiner summarizes IPCC surveys and emphasizes the importance of the Ocean Conveyor. J.R. McNeill, *Something new under the sun: An Environmental History of the Twentieth-Century World* (New York: Norton & Co., 2001; first published 2000) pp.108-117; Stephen Gardiner, 'Ethics and Global Climate Change', pp. 5-7.

⁶ Gardiner, *op.cit.*, p. 21. His account of international negotiations and outcomes, for the period 1992-2003, summarizes the complex difficulties involved.

⁷ The terms mitigation and adaptation are often used without definition. Here, I am adopting Jamieson's versions, *viz.* mitigation refers to policies or actions directed towards reducing greenhouse-gas emissions' while 'adaptation refers to how plants, animals and humans respond to climate change (excluding their mitigation responses)': Dale Jamieson, 'Adaptation, Mitigation, and Justice' in: Gardiner *et al*, *Climate Ethics*, p. 263-283 (p. 278, n1).

⁸ The term 'green virtues' is also borrowed from Jamieson: Dale Jamieson, 'When Utilitarians Should Be Virtue Theorists', *Utilitas*, 19, 2 (June 2007) 160-183 (180-182).

⁹ Marion Hourdequin, 'Climate, Collective Action and Individual Ethical Obligations', *Environmental Values*, 19, 4 (November 2010) 443-464; Jamieson, 'When Utilitarians'; R. Sandler, 'Ethical Theory and the Problem of Inconsequentialism: Why Environmental Ethicists should be Virtue-Oriented Ethicists', *Journal of Agriculture & Environmental Ethics*, 23 (2010) 167-183.

¹⁰ Dale Jamieson, 'Ethics, Public Policy, and Global Warming', *Science, Technology, & Human Values*, 17, 2 (Spring 1992) 139-153 (142-146;150). His article is based upon a speech in 1989.

¹¹ Dale Jamieson, 'Ethics, Public Policy', 150-1.

I.

Scientists from a range of disciplines have established a convincing account of changes in climate across the aeons of Earth's existence. Periods of intense warming, volcanic activity, glaciation, rising and falling seas, and the movement of continents have formed modern environments.¹² In recent geological time, the migrations of hominid species, to occupy the different continents, was almost certainly a response to changes in climate, ebbing and flowing in accordance with favourable or deteriorating conditions. A popular account of the geographical and environmental circumstances that supported hominid expansion into different parts of the world theorizes that, by the time when agrarian and city-based cultures commenced, humans had exterminated most larger species of animals - almost completely so in the Americas, Australasia, and Eurasia.¹³ The anthropogenic removal of large numbers of species had a considerable impact upon local environments, changing vegetation patterns.¹⁴ The development of agriculture and domestic animal grazing led to large-scale deforestation in some parts of the globe, again contributing to changes in climate.¹⁵ Nevertheless, the impact of anthropogenic climate change, in the pre-industrial period, was relatively limited and outweighed by natural shifts that continue to affect environments - oscillations in ocean currents, the tilt of the Earth's axis, volcanic activity, and methane emissions from wetlands. A distinction may be made between slower processes, like glaciation, and the abruptness of a particular event such as a volcanic eruption that triggers climate change, albeit short-lived.

Interdisciplinary studies of pre-industrial periods have found evidence of differing phases of climate stability and instability that significantly influenced human societies. From c.100 BCE to c.200 CE, 'exceptional climate stability' provided 'unusually favourable conditions' during the period when the western Roman Empire was at its height - the Roman Optimum.¹⁶ Thereafter, less stable climatic conditions prevailed, including cooler, drier intervals, periods of above-average rainfall, severe volcanic eruptions (causing cooling and harvest losses) and a decades-long drought that may have been a major factor in the westward migrations of pastoral tribes that invaded the western Roman Empire.¹⁷

¹² The plural of environment is used deliberately in recognition of the relative nature of the term: John Benson, 'Environments and Environmental Ethics' in: John Benson, *Environmental Ethics: An Introduction with Readings* (London; Routledge, 2000) pp. 9-29.

¹³ Jared Diamond, *Guns, Germs & Steel: A short history of everybody for the last 13,000 years* (London; Vintage, 2005; first published 1997).

¹⁴ A study of the extermination of bison on the American plains in the 19th century illustrates how a complex mixture of human interactions rapidly eliminated an old ecology dating back some 10,000 years: Dan Flores, 'Bison Ecology and Bison Diplomacy: The Southern Plains from 1800 to 1850', *The Journal of American History*, 78, 2 (September 1991) 465-485.

¹⁵ Methane emissions -(CO₄)- from domestic farm animals are a major source of emissions contributing to warming. The relative significance of various greenhouse gases is outlined by McNeill, *Something new*, pp. 52-54; 108-117.

¹⁶ Michael McCormick *et al*, 'Climate Change during and after the Roman Empire: Reconstructing the Past from Scientific and Historical Evidence', *The Journal of Interdisciplinary History*, 43, 2 (Autumn 2012) 169-220 (174); Kyle Harper, *The Fate of Rome: Climate, Disease & The End of An Empire* (Oxford; Princetown University Press, 2019) (first published 2017) pp.13-16.

¹⁷ Michael McCormick *et al*, 'Climate Change', 190-191.

A second example of the relationship between humans, their environments, and climate change is provided by the 'Little Ice Age' that commenced c.1300 CE and lasted until the middle of the 19th century. It has been described as 'an endless zigzag', 'an irregular seesaw' of climatic shifts, in which conditions oscillated from intense cold to years of heavy spring and summer rainfall, Atlantic storms, and mild winters: the zigzag was driven by 'complex, little understood interactions' between atmosphere and oceans.¹⁸ Heavy rainfall, storms, advancing glaciers, and icy winters were interspersed with periods of better conditions and successful harvests. Living conditions were often precarious for most of the poor, and famines occurred throughout the period.

A final, abrupt example, happened in the nineteenth century, when a series of volcanic eruptions caused temporary, major climate change. At least three occurred, in the Caribbean, the Philippines and, in 1815, in the East Indies. The latter, Mount Tambora, has been described as the greatest volcanic eruption in the past millennium, 'cascading worldwide weather disasters' for at least three years, and was possibly the most destructive volcano in human history, far outweighing the better-known Krakatau of 1883 CE.¹⁹ Tambora's eruption, occurring shortly after other volcanic activity, reinforced the earlier, cooling events, and possibly initiated significant social changes.²⁰

It is doubtful that, in the pre-industrial past, humans were aware of the relationship between the processes of climate change and their environments, and thus their daily lives.²¹ Intergenerational knowledge identified that past weather patterns were tougher or kinder. And abrupt events, such as the eruption of a volcano, may have been associated with the immediate impact upon the local environment. However, there does not appear to be any surviving evidence that atmospheric and oceanic conditions were understood to affect climate. The first rational attempts to describe the nature and origins of the physical world, in Ancient Greece, sought explanation in terms of basic 'stuffs' (air, water) and processes (condensation, rarefaction) but lacked the theories and apparatus to measure that, in the modern industrial era, would produce climate science.²² There are hints that some philosophers in the ancient world thought about human relationships with their environments, particularly followers of Pythagoras, who seems to have believed in a form of (spiritual) kinship with animals. Later, some

¹⁸ Brian Fagan, *The Little Ice Age: How Climate Made History 1300-1850* (New York; Basic Books, 2002) (first published 2000) p. xiii.

¹⁹ Gillen D'Arcy Wood, *Tambora: The Eruption that Changed the World* (Oxford; Princetown University Press, 2015) (first published 2014) pp. 2; 42-44.

²⁰ *ibid.*, p.41. D'Arcy Wood cites evidence that the 'Little Ice Age' may have been triggered by 'a spasm of major volcanic eruptions' that set up a self-reinforcing cycle of colder temperatures that continued throughout the period: pp. 40-41.

²¹ Remarkably, Theophrastus (fl.330 BCE) grasped the concept of anthropogenic climate change, identifying drainage and deforestation as causes, but the knowledge did not outlast him: J. Donald Hughes, 'Theophrastus as Ecologist', *Environmental Review*, Special Issue: Roots of Ecological Thought, 9, 4 (Winter 1985) 296-306 (302).

²² C.C. Taylor (ed.) *From the Beginning to Plato: Routledge History of Philosophy* Vol.I (London; Routledge, 2003) (first published 1997); G.S. Kirk, J. Raven & M. Schofield, *The Presocratic Philosophers: A Critical History with a Selection of Texts* 2nd edition (Cambridge; Cambridge University Press, 2007 (first published 1957; 1983).

Very interesting, indeed.

followers of Stoicism thought that it was wrong to plunder the Earth's material resources for fear of provoking 'Nature'.²³

Subsequently, the establishment of monotheism, in the varying forms of the Christian, Jewish and Muslim faiths, across an area (roughly) corresponding to the territories of the Eastern and Western Roman Empires, re-established creation mythology, and raised questions about the dominion of human beings over the Earth and its creatures. A controversial article by Lynn White pinned responsibility for the present environmental crisis upon 'orthodox Christian arrogance' that insisted it was 'God's will' that humankind exploited the Earth.²⁴ The article has provoked considerable discussion about the validity of the claim and whether he underestimated the tradition of stewardship in safeguarding nature.²⁵ Recent appraisal has relocated White's work in the context of medieval environmental history, while also supporting his fundamental claim that religious belief strongly influences 'how human societies relate to the natural world'.²⁶ For Harrison, the reinterpretation of the Genesis text 'Have dominion', that occurred in the seventeenth century, inspired by 'the new sciences', changed attitudes to the natural environment, with 'catastrophic consequences'.²⁷ However, he qualifies that view by finding that the early modern ethical approach to the environment was based upon belief that the Earth could be 'restored to its prelapsarian order and perfection'; dominion and stewardship shared a common goal - 'to preserve or restore the natural condition of the earth', which, he argues, is similar to the aims of contemporary environmentalists.²⁸ While Attfield thinks it is a mistake to contrast dominion with stewardship, he notes that belief in the latter is now thought to be 'a reasonable interpretation of what the Old Testament (Genesis included) has to say about the relation of humanity to Earth'.²⁹

It would be a considerable time before 'the new sciences' were developed sufficiently to provide accurate explanations of climate and its potential instabilities. At the end of the eighteenth century, Benjamin Franklin proposed a connection between volcanic activity and a drastically altered climate.³⁰ At the beginning of the next century, Humboldt identified deforestation as a catalyst of 'human-induced climate change', an action that could affect future generations. He was the first scientist of the modern era

²³ D. Dunn, *In The Shadow of Vesuvius: A Life of Pliny* (London; William Collins, 2019) pp.100-102.

²⁴ Lynn White, 'The Historical Roots of Our Ecological Crisis', *Science*, New Series, 155, 3767 (10 March 1967) 1203-1207. White was prescient in predicting in 1967 that 'our present combustion of fossil fuels threatens to change the chemistry of the globe's atmosphere as a whole, with consequences which we are only beginning to guess'. (1204).

²⁵ The theological aspects of White's claim are examined in: Peter Harrison, 'Subduing the Earth: Genesis 1, Early Modern Science, and the Exploitation of Nature', *Journal of Religion*, 79, 1 (January 1999) 86-108. Harrison challenges the assumption of Christian anthropocentrism.

²⁶ Elspeth Whitney, 'Lynn White Jr.'s "The Historical Roots of Our Ecological Crisis" After 50 Years' *History Compass*, 13, 8 (2015) 396-410 (396; 400; 403).

²⁷ Harrison, *op.cit.*, 96.

²⁸ Harrison, *op.cit.*, 103; 107-108.

²⁹ R. Attfield, *Environmental Ethics: An Overview for the Twenty-First Century* 2nd edition (Cambridge; Polity Press, 2014) p. 22.

³⁰ G. D'Arcy, *Tambora*, pp.1-2. Franklin's 'Meteorological Imaginations and Conjectures' was read to the Manchester Philosophical Society in 1784. He was not believed.

to explain 'the fundamental functions of the forest for the ecosystem and climate'.³¹ Lyell, author of *The Principles of Geology*, drew upon Humboldt's work to illustrate the connection between geological and climate changes.³² The geographer, George Marsh, also indebted to Humboldt, described how humans had modified their physical environments through time, frequently destroying them. While acknowledging that scientific measurement of much of the functioning of the Earth was (then) not yet possible, he cited a list of contemporaries who had discussed 'the subject of climate change, with and without reference to human action'.³³ By the late nineteenth century, scientific experimentation had irrefutably established that burning coal released carbon dioxide and might contribute to warming of the atmosphere. In the first quarter of the twentieth century, Wegener, responsible for the discovery of Continental drift, and for advances in atmospheric physics, with other scientists developed a detailed history of climate change that allowed modern comparisons to be made.³⁴ However, despite further discoveries of the relationship in the following decades, broad scientific consensus about anthropogenic climate change was not reached until the 1960s and 1970s. Throughout the long period of industrialization, taking place between c.1750 and the 1960s, at varying pace in different locations across the planet, the prevailing environmental ethic (in industrializing nations) supported human exploitation of the Earth's resources, with little restraint, and global warming proceeded unabated.³⁵ Humboldt's warning that humankind had 'the power to destroy the environment' had been forgotten or disregarded.³⁶

II.

The development of preservation - for example, the late 19th century respective founding of the RSPB and the National Trust in Britain - amounted to a form of stewardship, a concern to protect non-human creatures and the environment from destruction by human action.³⁷ Religious and secular beliefs that humans 'do not own the earth but hold it as a trust' promoted responsibility to care for the Earth.³⁸ However, general public awareness that human action was capable of altering the climate and destroying planetary life was initially awakened by the dangers presented by nuclear weaponry, following the Second World War. CND campaigning and marching, from 1957 onwards attracted much attention.³⁹ Coincidentally, Leopold's advocacy of the need for a holistic land ethic was an important stimulus to the development of

³¹ Andrea Wulf, *The Invention of Nature: The Adventures of Alexander Von Humboldt, The Lost Hero of Science* (London; John Murray, 2015) pp.57-60. Humboldt also invented isotherms, used by modern scientists still, in research on climate change, pp.177-179.

³² *ibid.*, pp.177-179.

³³ George Marsh, *Man and Nature; Or, Physical Geography as Modified By Human Action*, (Amazon reprint; George Marsh Classics, 2020) (first published 1864) p. 239, n.3; Wulf, *op.cit.*, pp. 283-297.

³⁴ M.T. Greene, *Alfred Wegener; Science, Exploration, and the Theory of Continental Drift* (Baltimore, USA; Johns Hopkins University Press, 2015) pp. 468-477.

³⁵ The dramatic, exponential rise in warming since World War II is depicted in Appendix A.

³⁶ Wulf, *op.cit.*, p. 60. Wulf declares Humboldt 'the father of the environmental movement', p. 58.

³⁷ It is noteworthy, although beyond the scope of this essay, that these early forms of modern stewardship were initiatives led by female activists in a world heavily dominated by men.

³⁸ Attfield, *Environmental Ethics*, p. 21.

³⁹ The renowned philosopher, Bertrand Russell, was the CND President at that time.

ecology, both as a science and as a political movement that helped motivate the formation of Green parties in the Western world in the 1960s and 1970s.⁴⁰

By the 1970s, in response to Leopold's work, and reacting to the newly emerging scientific consensus on climate change, philosophers were debating whether a new environmental ethic was needed.⁴¹ That disputation continues to the present day.⁴² Given the present scale of the climate crisis, many of those debates may seem scholastic. Other discussions about anthropogenic climate change were under way, in various disciplines - economics, politics, sociology, anthropology, international relations, engineering, ecology - which may have seemed more relevant as governments across the world considered concrete proposals for mitigation. However, responses to climate change are necessarily interdisciplinary and, while not always apparent, the work undertaken by philosophers has influenced those debates. Proposals to control and reduce emissions - for example, by allocating carbon budgets or using geo-engineering - raise fundamental ethical questions about equity, the interests of non-human beings, and the potential harm to future generations. Unfortunately - and it is a central theme of the argument presented here - global politics and conflicts, universal competition for resources, and the economic and social forces driving modern consumerism, have undermined or weakened attempts to reach enforceable international agreements on mitigation, thus ensuring that the impact of climate change will exceed the range of outcomes predicted by scientists.

A form of mitigation that has strongly influenced policy makers is the 'precautionary principle'. A standard version is the Wingspread Statement of 1998:

When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically.⁴³

The precautionary principle underpinned the recommendations of the first five IPCC Reports, when scientists were not able (or willing) to definitively attribute climate change to human activity. Subjected to much criticism - 'vacuous, extreme, and irrational' - the core principle has been defended on the grounds that climate change 'satisfies the conditions' for its application.⁴⁴ The principle has been incorporated in legal frameworks and policy documents but, as evidenced in the recent history of international agreements, from the Rio Earth Summit of 1992, when the Framework

⁴⁰ Aldo Leopold, 'The Land Ethic' in: A. Leopold, *A Sand Country Almanac and Sketches Here and There* (Oxford: Oxford University Press, 1987) (first published 1949). pp. 201-222 *passim*. He was heavily involved in wildlife conservation and there is a link with stewardship in his thinking.

⁴¹ Disputation to 2011 is summarized in: Robin Attfield, 'Beyond Anthropocentrism' (Philosophy and the Environment) *Royal Institute of Philosophy Supplement*, 69 (October 2011) 29-46. The analysis is updated and extended in his later book: *Environmental Ethics*. pp. 30-69.

⁴² See, for example: D. Dzwonkowska, 'Is Environmental Virtue Ethics Anthropocentric?' *Journal of Agricultural & Environmental Ethics*, 31 (2018) 723-738; Helen Kopnina et al 'Anthropocentrism: More than Just a Misunderstood Problem', *Journal of Agriculture & Environmental Ethics*, 31 (January 2018) 109-127; Helen Kopnina, 'Anthropocentrism and Post-humanism', *The International Encyclopedia of Anthropology*, 2020/www.academia.edu/40627771/Anthropocentrism_and_Post-humanism (consulted 01.07.2021).

⁴³ Gardiner, 'Ethics', p.13; Attfield, *Environment Ethics*, pp.156-160.

⁴⁴ Gardiner, *op.cit.*, p.13.

Convention on Climate Change was adopted to stabilize greenhouse gas concentrations, to the Kyoto Protocol in 1997 that required a reduction in emissions, targets were not achieved. Undermined by the withdrawal of the USA and hampered by lack of clarity and the absence of 'an effective compliance mechanism', Kyoto failed to achieve substantial mitigation: emissions of greenhouse gases caused by human activity continued to increase.⁴⁵ Gardiner highlights a crucial - and continuing - problem arising from the failure that still affects attempts at mitigation, namely the intergenerational aspect. Identifying fossil-fuel use as the main driver of climate change, he notes that the benefits are enjoyed in the short to medium term by the present generation (heating, lighting, transport, food production etc.) but that long-term costs will fall on future generations.⁴⁶ That intergenerational effect is already underway; existing generations are experiencing impacts of climate change occasioned by past use of fossil fuel. A more nuanced view of the precautionary principle distinguishes between weaker and stronger forms; Kyoto was an example of the former, at risk of 'excessive attenuation' when cost-benefit analysis was employed. Stronger forms are designed to prevent direct harm from more obvious dangers, such as flooding or regulating potentially dangerous substances.⁴⁷

A combination of fossil fuel combustion and deforestation has produced the build-up in the atmosphere's carbon dioxide levels.⁴⁸ In search of large-scale mitigation, scientists and policy-makers have proposed geo-engineering schemes, such as extensive tree-planting for carbon dioxide removal, and carbon capture and storage.⁴⁹ One such scheme, envisaged for the United Kingdom, calculates the potential for removing carbon dioxide by restoring agricultural land, currently used for farm animals, to forestry: the authors estimate that the restoration of native forests would allow the country to meet its commitments under the UK Climate Change Act and align with the 1.5°C target set by the UN 2015 Paris Agreement.⁵⁰ In addition to meeting emission targets, the proposals would bring benefits for health, food security, and wildlife habitats. However, many of the schemes under consideration have inbuilt risks that are potentially hazardous and even overwhelmingly counter-productive to mitigation efforts.⁵¹ For example, international reforestation could increase global food prices by 80%, by 2050, because of the huge amounts of land required for the numbers of trees needed to offset emissions.⁵² The costs would be borne mostly by the less-developed countries and by

⁴⁵ *ibid.*, pp.19-21.

⁴⁶ Gardiner, 'Ethics', p. 21.

⁴⁷ Attfield, *Environmental Ethics*, pp.157-158.

⁴⁸ McNeill, *Something new*, p.109. Curiously, none of the authors cited here mention that fossil fuels are derived from the decomposing remains of earlier life forms that inhabited the planet.

⁴⁹ Attfield, *op.cit.*, pp. 212-216.

⁵⁰ H. Harwatt & M. Hayek, *Eating Away at Climate Change with Negative Emissions: Repurposing UK agricultural land to meet climate goals*, Animal Law & Policy Program, Harvard Law School (11 April 2019). www.animal.law.harvard.edu/wp-content/uploads/Eating-Away-at-Climate-Change-with-Negative-Emissions-Harvard (accessed 09.08.2021)

⁵¹ Attfield, *op.cit.*, pp. 213-215.

⁵² Aditi Sen & Naftkote Dali, 'Tightening the Net: Net zero climate targets -implications for food and land equity', *Oxfam Briefing Paper* (August 2021) (Oxford; Oxfam International, 2021). <https://oxfamlibrary.openrepository.com/bitstream/handle/10546/621205/bp-net-zero-land-food-equity-030821-en.pdf;jsessionid=30D3305353F50BF5E17ED3BA394873A7?sequence=1> (accessed 03.08.2021). The Report states that the amount of land required for mitigation would be equivalent to all the farmland on the planet, an area five times the size of India. (p.7).

the global poor, yet the attempted mitigation would be undertaken mainly to offset the past and present actions of the more-developed countries. Paradoxically, rising temperatures, driven by global warming, are associated with a dramatically increased risk of wildfires - as has occurred widely in 2021 - greatly reducing the ability of forests to remove carbon dioxide from the atmosphere.⁵³ There are several other problems - forest monoculture; replacement of ancient woodlands; destruction of established wildlife habitats; the impact of insect-borne diseases in a warming climate. Overall, despite its prominent status in mitigation plans, reforestation is a complex process, neither equitable nor quick.⁵⁴

Parallel to the various geo-engineering schemes to remove CO₂, such as reforestation, soil carbon sequestration, wetland restoration, and direct air capture and storage, carbon budgeting - limiting emissions of CO₂ - has featured as a major focus of mitigation. Curtailing CO₂ has been viewed as the best hope for restricting the rise in global temperatures to 2°C above pre-industrial levels.⁵⁵ Yet the failed attempts to apply internationally agreed levels of emissions illustrate the profound difficulties in obtaining equitable outcomes for current and future generations. Accounting for emissions already built up in the atmosphere since c. 1750, scientists have estimated that (to avoid global warming above 2°) the total carbon budget available is already more than half-used.⁵⁶ Some nations, early to industrialization, have already emitted considerable quantities of CO₂, and accounting for historical emissions has proved contentious: in the search for global justice, the 'Polluter Pays Principle' has been a common response.⁵⁷ Calculations for equitable allocation of the remaining 'safe' total of emissions, that would recognize the rights of less-developed nations to enhance living standards and reduce poverty, while also permitting more-developed nations to maintain their lifestyles, have presented major challenges. The Kyoto agreement in 1997, that developed nations should bear the brunt of reducing carbon emissions, was not observed.⁵⁸ Subsequently, momentum for a scheme of greater equity has fostered the concept of equal entitlement of all humans 'to access the absorptive capacity of the atmosphere'.⁵⁹ By dividing total, permitted annual emissions by global population and allocating entitlements *per capita*, on a national basis, and gradually reducing the allowance to meet targets, a system of 'contraction and convergence' would emerge, which would also allow countries not using their full entitlement to trade the surplus.⁶⁰

⁵³ A. Pelligrini, 'Decadal changes in fire frequencies shift tree communities and functional traits', *Nature, Ecology & Evolution*, 5 (2021) 504-512.

⁵⁴ Research continues, examining peat bogs, biochar, and enhanced rock weathering, alongside tree-planting, to find large-scale methods of removing greenhouse gases from the atmosphere: 'UK invests over £30m in large-scale greenhouse gas removal', UK Research and Innovation (24 May 2021). <https://www.ukri.org/news/uk-invests-over-30m-in-large-scale-greenhouse-gas-removal/> (accessed 31 August 2021).

⁵⁵ Attfield, *Environmental Ethics*, pp. 204-205. The current target is 1.5°C. but Attfield rightly predicts that a 2° increase 'may well be the smallest that is feasibly attainable'. (p. 205).

⁵⁶ *ibid.*, p. 209. The figures are already out of date and, as emissions continue to rise, the remaining carbon budget shrinks by the day.

⁵⁷ S. Carney, 'Cosmopolitan Justice, Responsibility, and Global Climate Change' in: S. Gardiner *et al*, *Climate Ethics*, pp.122-145 (pp.123-126).

⁵⁸ Attfield, *op.cit.*, p. 210. Gardiner, 'Ethics', explains the complex reasons for the failure of the Kyoto agreement, p. 21.

⁵⁹ Attfield, *op.cit.*, p. 207.

⁶⁰ *ibid.*, p. 207.

Differing versions of equal distribution have been considered with many complications identified, such as issues around increasing populations; the trap, for less-developed countries of selling quotas to pay down debts; the 'basic needs' argument that states that - for example - countries in colder regions would need higher allocations for heating purposes; and emissions used for the production of inessential goods.⁶¹ Aside from the problems of equity and enforcement of quotas, it is certain that the world's nations would not agree to anything below the maximum total of available emissions, thus creating the considerable danger of overshoot.⁶²

III.

Although a sequence of international meetings has endorsed mitigation of climate change through reductions in emissions, many countries remain heavily committed to fossil fuel consumption for years ahead, including China, India, and the USA.⁶³ The concept of reaching 'net zero' by c.2050, through the use of alternative energy sources and technological innovation, embraced by a number of countries and many corporations, conveniently projects meaningful reductions of emissions years into the future. Proposals that less-developed countries should be assisted, with technological expertise and funding, to 'leap' the fossil fuel stage of development, have not been adequately supported. And the experience of vaccine distribution, during the current coronavirus pandemic, indicates that individual countries will protect their own interests ahead of international co-operation, even when the advantages of solidarity are obvious.⁶⁴ Governments are reluctant to risk losing popular support by confronting their populations with the realities of anthropogenic climate change. Those in industrialized countries remain unwilling to introduce radical, immediate steps to curtail consumer demand for goods and services that propel emissions; governments in less-developed countries avoid sharing the uncomfortable truth that similar consumer life-styles are now neither attainable nor desirable.⁶⁵ If existing constraints of economic and social conditions are thus restricting the vital processes of mitigation, strong, individual commitment to an environmental ethic that embraces 'green' virtues is an essential requisite for overcoming the obstacles. ✓

The seeming insignificance of decisions and actions by individuals has persuaded the majority that their own behaviour has little or no effect upon environmental problems, creating the problem of inconsequentialism, the common response being to assume that

⁶¹ Gardiner surveys proposals for allocating future emissions: 'Ethics', pp.16-19; Henry Shue, 'Subsistence Emissions and Luxury Emissions' in: Gardiner *et al*, *Climate Ethics*, pp. 200-214.

⁶² Gardiner, 'Ethics', p.17.

⁶³ For example, since taking office in January 2021, the American President has granted over 2000 new permits for drilling and fracking on federal land: Wenonah Hauten, 'Is Biden serious about climate?' *The Guardian*, 12 August 2021. <https://www.theguardian.com/commentisfree/2021/aug/12/is-biden-serious-about-climate-his-2000-drilling-and-fracking-permits-suggest-not> (accessed 12.08.2021).

⁶⁴ As Shue notes, 'nations and firms have behaved as if each of them had an unlimited and unshakable entitlement to discharge any amount of greenhouse gases that it was convenient to release': H. Shue, 'Subsistence Emissions', p. 207. ✓

⁶⁵ The Government's Committee on Climate Change has called for policies to encourage 'modest lifestyle changes', such as eating less meat and buying electric cars. That simply reinforces expectations that current ways of living can continue with minimal disconnect from consumptive behaviour. Johnathon Watts, 'UK's top climate adviser says criticism of net zero goal is 'defeatist'', *The Guardian*, 2 September 2021, <https://www.theguardian.com/environment/2021/sep/02/uks-top-climate-scientist-warns-against-defeatist-net-zero-goals> (accessed 03.09.2021). ✓

only political solutions are feasible.⁶⁶ The mediated nature of the relationship between individuals and their natural environment, and the pressures of market forces, ensures that they do not feel responsible for environmental harms.⁶⁷ However, although developing only gradually since the 1960s, there is now a substantial shift in the attitudes of growing numbers of the public in western democracies and, perhaps, elsewhere. Participation in recycling; support for conservation, preservation, and rewilding; increasing preference for plant-based diets; acceptance of alternative energy; and growing rejection of single-use plastic, while neither universal nor sufficient to combat climate change, amount to 'green' virtues. Those virtues conflict with consumptive actions that are encouraged by commercial marketing but, as the impacts of anthropogenic climate change become more frequent and challenging, a significant number of individuals are demonstrating resistance to the concept of perpetual economic growth. Many now accept at least some measure of responsibility for environmental harms and it is possible that we are witnessing the early stages of the evolution of a new ethic, the long-awaited 'ecological turn'. As governments, awakening to the severe disruptions that climate change will bring, are compelled to rapidly abandon fossil fuel use, imposing necessary restrictions upon personal liberties - for example by rationing meat consumption or flying - a new environmental ethic may ensure that public acceptance of the policies is more readily forthcoming.

Summary and Conclusion

Climate change is a constant factor in the Earth's existence even if, at times, the process seems imperceptible; life forms have always been subject to its vicissitudes. Since c.1750 CE, industrializing nations have been responsible for historically disproportionate emissions of greenhouse gases, due to fossil fuel use and wholesale deforestation, inducing intense anthropogenic climate change not seen before.⁶⁸ The consequent 'greenhouse' effect has had a critical, warming impact upon the atmosphere, producing rapid, dramatic changes that are severely disruptive and, in the foreseeable future, may render parts of the planet uninhabitable. To achieve equitable, global mitigation, the industrial nations have a moral duty to curtail fossil fuel consumption, undertake large-scale reforestation, and meet the costs of adaptation required to reduce the impact of anthropogenic climate change in less-developed countries (which are likely to encounter some of the more severe impacts) as well as assisting them to 'leap' the fossil fuel stage of development. The scientific projections indicate that mitigation and adaptation must be undertaken urgently, immediately, to reduce the threats to existing and future life forms. However, to date, international agreements on national responsibilities and mitigation have been inadequate, hindered by political considerations, friction among global powers, and a reluctance to acknowledge the implications for current lifestyles in the developed nations.

As green virtues strengthen, in reaction to the crisis, and influence the consumptive actions of the general public, the acceptance of individual environmental ethical obligations should become a persuasive determinant for collective mitigation and adaptation to reduce the global impacts of anthropogenic climate change. History,

⁶⁶ Ronald Sandler, 'Ethical Theory and the Problem of Inconsequentialism', p.168.

⁶⁷ Barnabas Dickson, 'The Ethicist Conception of Environmental Problems', *Environmental Values*, 9 (2000) 127-152.

⁶⁸ Much of the deforestation has occurred in less-developed countries, to meet demands for timber and cheap food in the industrial world.

though, suggests that socio-economic structures obstruct impartial responses to crises. Additionally, the intergenerational problem, described by Gardiner, may prove a formidable barrier to equity for future living beings. The response to anthropogenic climate change needs to be quick but is unlikely to be equitable.

Brian M. O'Leary

04 September 2021

(4042 words, excluding title, footnotes, bibliography, and appendix A.

Bibliography

- Attfield, Robin 'Beyond Anthropocentrism' (Philosophy and the Environment)
Royal Institute of Philosophy Supplement, 69 (October 2011) 29-46
- Attfield, Robin *Environmental Ethics: An Overview for the Twenty-First Century*
2nd edition (Cambridge; Polity Press, 2014)
- Carney, Simon 'Cosmopolitan Justice, Responsibility, and Global Climate Change' in:
S. Gardiner et al, *Climate Ethics*, pp.122-145
- D'Arcy Wood, G. *Tambora: The Eruption that Changed the World*
(Oxford; Princetown University Press, 2015) (first published 2014)
- Diamond, Jared *Guns, Germs & Steel: A short history of everybody for the last 13,000 years*
(London; Vintage, 2005) (first published 1997).
- Dickson, Barnabas 'The Ethicist Conception of Environmental Problems',
Environmental Values, 9 (2000) 127-152.
- Dunn, Daisy *In The Shadow of Vesuvius: A Life of Pliny*
(London; William Collins, 2019)
- Dzwonkowsa, D. 'Is Environmental Virtue Ethics Anthropocentric?'
Journal of Agricultural & Environmental Ethics, 31 (2018) 723-738
- Fagan, Brian *The Little Ice Age: How Climate Made History 1300-1850*
(New York; Basic Books, 2002) (first published 2000)
- Flores, Dan 'Bison Ecology and Bison Diplomacy: The Southern Plains from 1800 to 1850'
The Journal of American History, 78, 2 (September 1991) 465-485.
- Gardiner, Stephen 'Ethics and Global Climate Change' in:
S. M. Gardiner, et al, *Climate Ethics*, pp. 3-35

- Gardiner, Stephen
et al *Climate Ethics: Essential Readings*
(Oxford; Oxford University Press, 2010)
- Greene, M.T.
Drift *Alfred Wegener; Science, Exploration, and the Theory of Continental Drift*
(Baltimore, USA; Johns Hopkins University Press, 2015)
- Harrison, Peter 'Subduing the Earth: Genesis 1, Early Modern Science, and the Exploitation of Nature', *Journal of Religion*, 79, 1 (January 1999) 86-108.
- Harper, Kyle *The Fate of Rome: Climate, Disease & The End of An Empire*
(Oxford; Princetown University Press, 2019) (first published 2017)
- Hourdequin, M. 'Climate, Collective Action and Individual Ethical Obligations', *Environmental Values*, 19, 4 (November 2010) 443-464
- Hughes, J. Donald 'Theophrastus as Ecologist', *Environmental Review*, Special Issue: Roots of Ecological Thought, 9, 4 (Winter 1985) 296-306
- Jamieson, Dale 'Ethics, Public Policy, and Global Warming' *Science, Technology, & Human Values*, 17, 2 (Spring 1992) 139-153
- Jamieson, Dale 'When Utilitarians Should Be Virtue Theorists' *Utilitas*, 19, 2 (June 2007) 160-183
- Jamieson, Dale 'Adaptation, Mitigation, and Justice' in: Gardiner *et al*, *Climate Ethics*, p.263-283
- G.S. Kirk, J. Raven
M.Schofield *The Presocratic Philosophers: A Critical History with a Selection of & Texts* 2nd edition
(Cambridge; Cambridge University Press, 2007 (first pub. 1957; 1983)
- Kopnina, Helen
et al 'Anthropocentrism: More than Just a Misunderstood Problem', *Journal of Agriculture & Environmental Ethics*, 31 (January 2018) 109-127.
- Leopold, Aldo, 'The Land Ethic 'in: A Leopold
A Sand Country Almanac and Sketches Here and There
(Oxford; Oxford University Press, 1987) (first published 1949).
pp.201-226
- McCormick, M.
et al 'Climate Change during and after the Roman Empire: Reconstructing the Past from Scientific and Historical Evidence',

The Journal of Interdisciplinary History, 43, 2 (Autumn 2012) 169-220

- McNeill, J.R. *Something new under the sun: An Environmental History of the Twentieth-Century World* (New York; Norton & Co., 2001) (first published 2000)
- Marsh, George *Man and Nature; Or, Physical Geography as Modified By Human Action* (Amazon reprint; George Marsh Classics, 2020) (first published 1864)

- Pelligrini, A. 'Decadal changes in fire frequencies shift tree communities and functional traits' *Nature, Ecology & Evolution*, 5 (2021) 504-512.

- Sandler, Ronald Ethical Theory and the Problem of Inconsequentialism: Why Environmental Ethicists should be Virtue-Oriented Ethicists, *Journal of Agriculture & Environmental Ethics*, 23 (2010) 167-183.

- Shue, Henry Subsistence Emissions and Luxury Emissions in: Gardiner *et al*, *Climate Ethics*, pp.200-214.

- Taylor, C.C. (ed.) *From the Beginning to Plato: Routledge History of Philosophy* Vol.I (London; Routledge, 2003) (first published 1997)

- White, Lynn 'The Historical Roots of Our Ecological Crisis' *Science*, New Series, 155, 3767 (10 March 1967) 1203-1207

- Whitney, Elspeth 'Lynn White Jr.'s "The Historical Roots of Our Ecological Crisis" After 50 Years' *History Compass*, 13, 8 (August 2015) 396-410

- Wulf, Andrea, *The Invention of Nature: The Adventures of Alexander Von Humboldt; The Lost Hero of Science* (London; John Murray, 2015)

Online sources:

- IPCC *Climate Change 2021: The Physical Science Basis: Report of the Intergovernmental Panel on Climate Change: - Working Group contribution to the Sixth Assessment Report*. (9 August 2021)
- www.ipcc.ch/report/sixth-assessment-report-working-group-i/

- Harwatt, H. & M. Hayek *Eating Away at Climate Change with Negative Emissions: Repurposing UK agricultural land to meet climate goals*, Animal Law & Policy Program, Harvard Law School (11 April 2019) www.animal.law.harvard.edu/wp-content/uploads/Eating-Away-at-Climate-Change-with-Negative-Emissions-Harvard.
- Hauten, Wenonah 'Is Biden serious about climate?' *The Guardian*, 12 August 2021 <https://www.theguardian.com/commentisfree/2021/aug/12/is-biden-serious-about-climate-his-2000-drilling-and-fracking-permits-suggest-not>
- Kopnina, Helen 'Anthropocentrism and Post-humanism' *The International Encyclopedia of Anthropology*, 2020 www.academia.edu/40627771/Anthropocentrism_and_Post-humanism
- Sen, Aditi & Naftkote Dali, Tightening the Net: Net zero climate targets -implications for food and land equity , *Oxfam Briefing Paper* (August 2021) (Oxford; Oxfam International, 2021) <https://oxfamlibrary.openrepository.com/bitstream/handle/10546/621205/bp-net-zero-land-food-equity>
- UK Research & Innovation 2021) UK invests over £30m in large-scale greenhouse gas removal (24 May 2021) <https://www.ukri.org/news/uk-invests-over-30m-in-large-scale-greenhouse-gas-removal/>
- United Nations 26th UN Climate Change Conference of the Parties (COP26), Glasgow, 31 October-12 November 2021 www.ukcop26.org
- Watts, Jonathon 'UK's top climate adviser says criticism of net zero goal is 'defeatist', *The Guardian*, 2 September 2021, <https://www.theguardian.com/environment/2021/sep/02/uks-top-climate-scientist-warns-against-defeatist-net-zero-goals>.

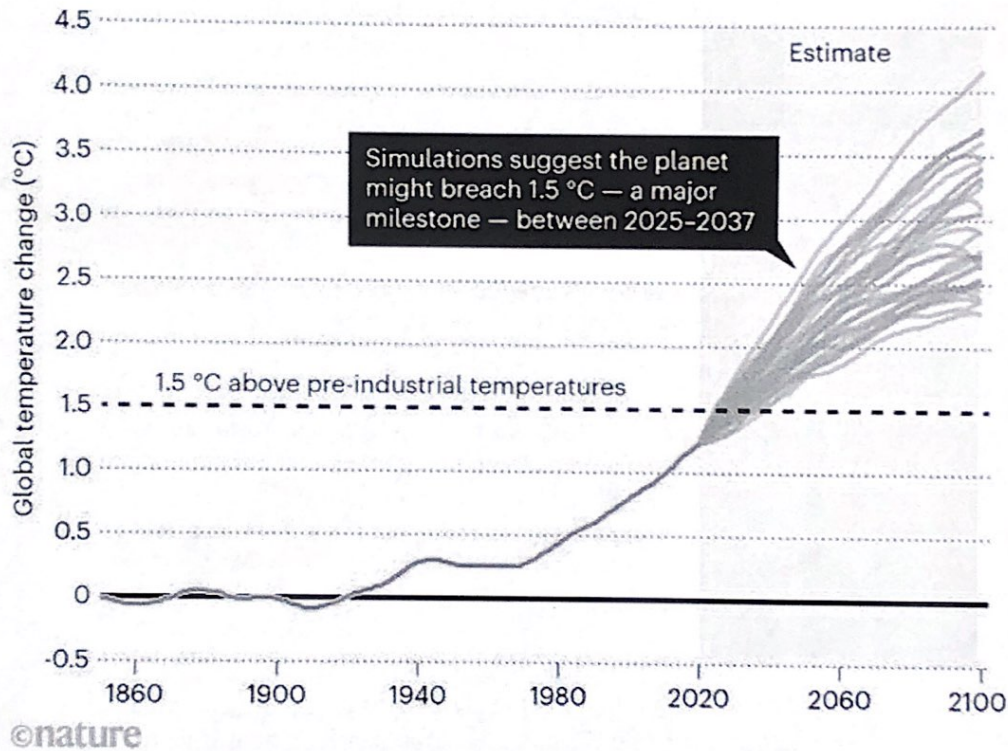
APPENDIX A Global Warming

The latest assessment from the Intergovernmental Panel on Climate Change offers a sobering view of the planet's shifting climate. Dependence on fossil fuels is warming the world at a pace unprecedented in the past 2,000 years, and concentrations of greenhouse gases have risen by around 50% since pre-industrial times. By some estimates, the world is on track for nearly 3 °C of warming unless governments do more to curb emissions.

(Source: Zeke Hausfather/Coupled Model Intercomparison Project Phase 6)

WARMER WORLDS

To bolster confidence in their projections, climate scientists align their simulations with available historical observations. The latest simulations from 33 research groups around the globe project that Earth will warm by between 2.3 °C and 4.1 °C by 2100 in a middle-of-the-road scenario with little change in global and technological development trends.



Source: *Nature Briefing* 17 August 2021 (weekly newsletter)