Background paper: Ethical issues arising in research into health and climate change[1]

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1. Purpose of this paper

This paper is being published with the 2024 Global Forum on Bioethics in Research (GFBR) call for participants and case study presenters. The paper provides details on the Forum topic, scope and related definitions.

Case studies may relate to the themes in this paper or other issues that present **ethical challenges related to research into health and climate change**. They should be relevant to research in low- and middle-income countries (LMICs) and could address (but are not limited to) one or more of the questions in **Section 6** 'Ethical issues associated with research into health and climate change'. The questions highlighted in green in Section 6 are a priority. The GFBR organizers particularly encourage case studies on the priority questions.

2. Definitions and scope

This paper focusses specifically on the ethics of research into health and climate change, including research into interventions at all levels to respond to the health impacts of climate change, with a particular emphasis on low- and middle-income countries (LMICs). Research in this area ordinarily involves the use of rigorous methods to generate data with the aim of better understanding the impacts of climate change on health, including the health of non-human aspects of the biosphere, and identifying means better to protect and promote human and non-human health in the face of climate change. The interdependency of human and non-human health means that research into health and climate change is not restricted to the medical, health or life sciences. It follows that this paper takes a very broad approach to concepts of health. Research findings from areas not traditionally associated with health care, such as environmental science, entomology, the veterinary sciences and climatology may be relevant. The importance of Indigenous perspectives and voices in climate change means that this paper is also inclusive of perspectives and forms of knowledge that stand outside western scientific traditions. In terms of non-human aspects of the biosphere, the focus of this GFBR is on research that speaks to the interconnectivity of human and non-human health, rather than studies with an exclusive focus on non-human aspects of the biosphere.

Although the literature on research ethics is well developed, particularly in relation to health research involving human participants, the literature specifically on the ethics of research into health and climate change is far less so. The purpose of this GFBR is to identify and critically engage with areas of ethical challenge in this field, and to provide those involved in research with tools and approaches to respond practically and productively.

Anthropogenic climate change

This refers straightforwardly to long-term changes in climate, including increasing global surface temperatures and shifting weather patterns brought about by human activity, overwhelmingly the release of greenhouse gases (GHGs) into the atmosphere. There is now scientific consensus that anthropogenic climate change is real and presents a major, potentially catastrophic threat to human health.[2] Without urgent global mitigation and adaptation strategies, anthropogenic climate change presents an existential threat to human populations.

[2] IPCC, 2023: Sections. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 35-115, doi: 10.59327/IPCC/AR6-9789291691647. Accessed 10 Dec. 23.

Mitigation and adaptation

Mitigation refers to those measures that are taken with a view to making the impact of climate change less severe. They include reducing the emission of greenhouse gases, the protection and promotion of existing natural 'carbon sinks' such as forests and peat bogs and the development of technologies to remove existing GHGs, usually carbon dioxide, from the atmosphere. Adaptation refers to interventions designed to enable people to live better with the impacts of climate change. Examples include designing buildings that can remain cool in extreme heat, the use of methods for restraining sea-incursions and the development of crops better adapted to hotter and drier conditions.[3]

Loss and damage

Loss and damage refer to the negative effects of climate change on human societies and the natural environment, both economic and non-economic. Economic loss and damage can include damage to crops, homes or infrastructure. Non-economic loss and damage can include harm to health; loss of access to territory, of cultural heritage and of indigenous and local knowledge; and loss of and damage to biodiversity and habitats. In a slightly narrower sense, loss and damage refers to the contested political question in contemporary climate debates about how to support countries particularly vulnerable to climate change.[4] At COP 28, delegates agreed to 'operationalise' a loss and damage fund, with $700m of initial pledges from high-income countries.[5] Although presented as a breakthrough, the pledged sum is approximately 0.2% of the estimated $400 billion dollar loss and damage incurred by LMICs as a result of climate change.[6]

3. Introduction and background

Why do we need research into health and climate change?

Anthropogenic climate change is widely regarded as the single biggest health threat facing humanity.[7] The health impacts of climate change are complex, interlinked and multi-factorial. Understanding them is essential for appropriate responses, including mitigation, adaptation and the identification and allocation of loss and damages. Unless we understand how and in what ways climate change will affect health, and what interventions are likely to be effective in managing these health impacts, policy making will be unsupported by evidence. Research is therefore essential. It is broadly accepted that research into climate change and health, like all good research, must be ethical.[8] But research into climate change involves at least some unique ethical challenges and adds scale and urgency to existing ones. These ethical challenges are the focus of this paper.

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[3] Caney, Simon, "Climate Justice", *The Stanford Encyclopedia of Philosophy* (Winter 2021 Edition), Edward N. Zalta (ed.) https://plato.stanford.edu/archives/win2021/entries/justice-climate.

[4] Taken from: https://www.lse.ac.uk/granthaminstitute/explainers/what-is-climate-change-loss-and-damage/. Accessed 10 Dec. 23.

[5] Lakhani N (2023). $700m pledged to loss and damage fund covers less than 0.2% needed. *The Guardian*. https://www.theguardian.com/environment/2023/dec/06/700m-pledged-to-loss-and-damage-fund-cop28-covers-less-than-02-percent-needed. Accessed 10 Dec. 23.

[6] Lakhani N (2023). $700m pledged to loss and damage fund covers less than 0.2% needed. *The Guardian*. https://www.theguardian.com/environment/2023/dec/06/700m-pledged-to-loss-and-damage-fund-cop28-covers-less-than-02-percent-needed. Accessed 10 Dec. 23.

[7] https://www.paho.org/en/topics/climate-change-and-health. Accessed 26 Nov. 23.

[8] See, for example, CIOMS (2016). International Ethical Guidelines for Health-related Research Involving Humans. Council for International Organizations of Medical Sciences (CIOMS): Geneva. https://cioms.ch/wp-content/uploads/2017/01/WEB-CIOMS-EthicalGuidelines.pdf. Accessed 09 Dec. 23. Sheather J, Littler K, Singh J and Wright K. Ethics, climate change and

A cross-sectoral approach to the health impacts of climate change

Climate change is itself a highly complex, globalised phenomenon. Mitigation and adaptation responses that have an impact on health will be required across sectors, including, but not limited to, agriculture and aquaculture, the built environment, manufacturing, transport and energy. The health implications of climate change-linked policy in all these areas must be understood. Ethical decisions about trade-offs – identifying where and when intended harms and benefits of policy are likely to fall and deciding between their possible allocation – will be required. Research into the health impacts of climate change cannot therefore be limited to the health services or the health sciences.

The multidisciplinary nature of health and climate change brings its own ethical challenges, including questions of governance, and the interoperability of ethical frameworks between disciplines. The complexity of health and climate change also presents several challenges for this GFBR including questions of scope – of what counts as health and climate research. One Health[9] is regarded as amongst the most promising approaches to health and climate change. Like the linked approaches, Planetary Health[10] and Eco Health[11], it draws on the established insight, long-recognised by many Indigenous world views – that human health is inseparable from the health of animals and the ecosystems on which they depend. One Health and its allied approaches inevitably expand western medical understandings of health in the context of climate change. They also invite questions as to whether the concept of health – which arguably has a significant normative dimension – can be transferred without qualification between humans and ecosystems.

Setting priorities in research

Given that there are insufficient resources to answer all important research questions in health and climate change, decisions about research priorities must be made. These decisions will inevitably have repercussions concerning where the benefits of the research are likely to fall. As such, research prioritisation in health and climate change has a clear ethical dimension. Research prioritisation has been the focus of an earlier GFBR paper[12], but given its importance, they are touched upon where relevant in this paper. As we are in a climate emergency, and the health impacts are increasingly devastating, particularly in low- and middle-income countries (LMICs), we need also to decide how much of our available resources should be given to research, and how much to direct responses. It is reasonable to suggest that the most serious health threats affecting the most vulnerable populations should be given some form of priority. Arguably, research that seeks to identify these priorities should itself also be prioritised.

Obligations to translate research into substantive change

Climate change presents a real and present threat to human health and wellbeing. On current trajectories of GHG emissions, these threats will intensify, potentially catastrophically. It follows that there is an urgent moral imperative to translate research findings in climate change and health into

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health – a landscape review [version 1; peer review: 2 approved]. Wellcome Open Res 2023, **8**:343 (https://doi.org/10.12688/wellcomeopenres.19490.1). Accessed 09 Dec. 23. And: Nuffield Council on Bioethics (2023). Health, climate change and ethics: an overview. London: NCoB. https://www.nuffieldbioethics.org/assets/pdfs/Health-climate-and-ethics-paper-FINAL-12.10.23.pdf. Accessed 09 Dec. 23.

[9] https://www.cdc.gov/onehealth/basics/index.html. Accessed 09 Dec. 23.

[10] https://unfccc.int/climate-action/un-global-climate-action-awards/planetary-health. Accessed 09 Dec. 23.

[11] https://link.springer.com/referenceworkentry/10.1007/978-94-007-0753-5_4172. Accessed 09 Dec. 23. For a comparison of One Health, Planetary Health and Eco Health approaches, see: Lerner H, Berg C. A Comparison of Three Holistic Approaches to Health: One Health, EcoHealth, and Planetary Health. Front Vet Sci. 2017 Sep 29;4:163. doi: 10.3389/fvets.2017.00163. PMID: 29085825; PMCID: PMC5649127.

[12] See, https://www.gfbr.global/.

effective action. Questions therefore arise as to how this imperative might impact on research, from choice of topic, research structure, procedures of ethical regulation and oversight, through to identification and transmission of findings.

Substantive ethical questions relating to climate change

It is broadly accepted that anthropogenic climate change gives rise to a range of substantive ethical questions that extend beyond the traditional sphere of research ethics.[13] These include questions of global justice, collective action problems, intra- and intergenerational justice, global governance and the value of the non-human world. Although not restricted to research into health and climate change, they are discussed in brief in a section below and are raised in this paper where they have some bearing on research. Given their complexity, and, in relation to some of these topics, their theoretical underdevelopment, this paper also discusses the necessity of further targeted research into the ethics of climate change.

Is climate justice distinct from other questions of global justice?

A range of questions concerning justice are engaged in research into climate change and health. These include questions of global, epistemic and intra- and inter-generational justice as well as questions about what kinds of respect are owed to non-human aspects of the biosphere. An important practical and theoretical question in climate justice is whether we should consider the ethical issues posed by climate change as distinct – focussing, for example, on GHGs – or whether we need to consider them as a part or subset of other justice-related issues such as poverty, development or the impact of extractive capitalism.[14] Those who take an 'isolationist' approach argue that it is feasible to separate out questions relating to climate change, and consider questions of justice and fairness – such as in the allocation of carbon budgets – on their own. Those who take an 'integrationist' approach, argue that principles of justice are operative across a range of linked phenomenon. To consider the impacts of climate change without considering the ways its effects are intensified by poverty or other socially-determined vulnerabilities, would be practically and analytically inadequate. These questions are given some urgency in the context of health and climate change because health is complex, dependent on a range of social, environmental, genetic and personal factors. Arguably therefore it is particularly difficult to separate out questions of climate justice pertaining to health from a range of other considerations to do with justice and fairness.

Focussing on Low and Middle-Income Countries (LMICs)

Given the health impacts of climate change fall heaviest in resource-poor settings, this paper acknowledges the importance of research to address health and climate change in LMICs. Ethical obligations here extend to identifying and tackling the structural impediments to research undertaken by researchers, policy makers and practitioners from LMICs, and to strengthen the voices of knowledge generators and purveyors outside western-centric academic institutions, including local and Indigenous Peoples. Although research to identify translatable knowledge is vital, research undertaken in LMICs must, as far as possible, identify knowledge beneficial to the contexts in which it is undertaken.

[13] For an interesting early overview of climate ethics by several leading scholars working in this area, see: Gardiner SM et al (2010). Climate Ethics: Essential Readings. Oxford: OUP.
[14] https://plato.stanford.edu/entries/justice-climate/. Accessed 09 Dec. 23.

The climate impact of research

On a slightly more practical level, the urgency of climate change raises important ethical questions concerning obligations among researchers to understand – and reduce – the carbon footprint of the research projects they are involved in.[15] For example, given the carbon footprint of long-haul flights, the question of whether and how often to fly while undertaking research becomes relevant. This intersects with questions of equity, as those located at the periphery of knowledge production invariably need to take the longest flights to attend meetings.

4. Health impacts of climate change

The evidence of the health impacts of climate change is extensive and increasing at pace. Without significantly increased investment in mitigation, including large-scale reduction in the emissions of GHGs, these impacts will intensify and spread geographically. A brief outline of the identified health impacts is given below, highlighting the breadth of the possible research agenda.[16] Broadly speaking the health impacts can be separated into direct and indirect impacts.

Direct health impacts

Climate change has a range of direct health impacts on human health including injury, illness and death.

- **Extreme heat** is driving a range of health effects associated with challenges to body temperature regulation, including heatstroke, heat exhaustion and hyperthermia. Extreme heat also exacerbates chronic conditions such as cardiovascular and cerebrovascular disease, respiratory disease and diabetes-related conditions.
- **Extreme climate events** are having a direct impact on health, arising most obviously from flooding and wildfire.

Indirect health impacts

Indirect health impacts of climate change arise as a result of cumulative changes to the environment. These include the following:

- **Mental health and wellbeing** are increasingly being undermined by climate change. Eco-anxiety and 'solastalgia' – the loss associated with climate-driven changes to our home environments – are emergent forms of distress associated with climate change, particularly among younger generations.[17] Extreme heat is also a driver of altered affective states, suicidality and post-traumatic stress disorder; and extreme climate events can lead to short- or long-term impacts on mental wellbeing.

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[15] Samuel G, Richie C. Reimagining research ethics to include environmental sustainability: a principled approach, including a case study of data-driven health research. *Journal of Medical Ethics* 2023;**49:**428-433. D'Souza J, Samuel G. Clinical Research Risks, Climate Change, and Human Health. *JAMA*. 2023;330(23):2247-2248. doi:10.1001/jama.2023.23724.

[16] Taken from: Sheather J, Littler K, Singh J and Wright K. Ethics, climate change and health – a landscape review [version 1; peer review: 2 approved]. Wellcome Open Res 2023, **8**:343 (https://doi.org/10.12688/wellcomeopenres.19490.1). Accessed 09 Dec. 23. And: Nuffield Council on Bioethics (2023). Health, climate change and ethics: an overview. London: NCoB. https://www.nuffieldbioethics.org/assets/pdfs/Health-climate-and-ethics-paper-FINAL-12.10.23.pdf. Accessed 09 Dec. 23.

[17] Clark H et al (2020). A future for the world's children? A WHO-UNICEF-*Lancet* Commission. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)32540-1/fulltext.

- **Food and water** stability is increasingly threatened by climate change, particularly through excess heat and associated droughts. Falling crop yields, salination of fresh water supplies through rising sea levels and loss of agricultural labour through extremes of daytime heat have significant health impacts, including through malnutrition and shortage of local and traditional foodstuffs leading to reliance on imported foods.
- **Human displacement and migration** are increasingly being driven by climate change, and, on current trajectories of GHG emissions, they are likely to intensify. Humanitarian organisations are already factoring climate-driven migration into crisis response. The health effects of forced migration include the mental and physical effects of the disruption of traditional livelihoods, the potentially devastating health impacts of migrating, including exposure to violence, loss of access to health and other services, increased exposure to infectious diseases and other health threats during migration.
- **Existing health inequalities** are likely to be reinforced and exacerbated by climate change. Displacement, loss of traditional livelihoods and employment and education patterns, rising costs of food and other staples, poorer mental and physical health are all likely to drive increases in poverty, further undermining health and wellbeing.
- **Loss of biodiversity and the disruption of ecosystems** can lead to food instability, particularly access to local and traditional foods. They can exacerbate the zoonotic transfer of diseases and deplete natural resources for drug discovery and development.
- **Physical activity** including manual labour and recreational exercise can become more difficult where high temperatures reduce the number of hours or locations for safe physical activity with consequences for physical and mental health.

Implications for the ethics of research

This outline of the health implications of climate change gives some indication of the scale of possible research and the need for, and challenges associated with, the multidisciplinary approach required. 'Upstream' research into effective mitigation approaches to climate change, such as carbon capture and sequestration, has direct consequences for health. Identifying the pathways via which a changing climate affects health is also essential. We cannot, for example, understand the changing geographical spread of schistosomiasis or dengue fever without understanding the impact of a changing climate on the natural history of freshwater snails or the *aedes Aegypti* mosquito. These insights are critical to One Health, Planetary Health and Eco Health approaches to health and climate change, and some of the ethical challenges associated with research undertaken by these initiatives are discussed below.

As discussed, there is a considerable and growing literature relating to the direct and indirect health impacts of climate change. However, research into the effectiveness of health-based interventions, including changes to health systems in the broadest sense will also be required. It is essential that we urgently identify health interventions at all levels that show promise.

5. Crosscutting ethical challenges associated with climate change

Ethical reflection on research into climate change cannot be limited to the traditional field of 'research ethics' – ie to the ordinary standards of conduct for researchers. As mentioned above, climate change itself gives rise to a range of ethical questions and on some research-related issues, they will need to be incorporated into ethical reflection. The requirement for example to identify those likely to be benefited or harmed by research is generally accepted in research ethics. Health

will always be a basic unit when accounting for these benefits and burdens. But in relation to research into climate change and health, we cannot properly identify which benefits and burdens matter without an account of obligations to future generations or to non-human aspects of the biosphere. A brief overview of some of these crosscutting ethical issues is given below, with pointers to how and where they might be important for research.

Climate justice

The marked disparity between the countries responsible for the overwhelming bulk of greenhouse gases (GHGs) – mostly those with high incomes in the global north – and those most heavily effected by climate change – mostly LMICs – puts questions of climate justice front and centre. Climate justice is a broad field, closely related to – even a subdiscipline of – global justice. **Although not topics for proposals for this GFBR**, important ethical questions here include:

- Who should bear responsibility for the harms arising from GHG emissions?
- What obligations do historical polluters owe to those harmed by climate change?
- What obligations do wealthy countries owe to those poorer countries most harmed by climate change and lacking the resources to respond?
- How should the remaining budget for GHG emissions be allocated?

Issues emerging in climate justice are integral to the ethics of research into health and climate change. They will, for example, have a direct impact on research priorities, on obligations to research participants, knowledge co-creation and the allocation of intellectual property.

Intra- and inter-generational justice

Carbon dioxide, the most prominent of the GHGs, endures in the atmosphere for centuries, even millennia. Its effects are cumulative. Historical carbon emissions therefore contribute to the climate changes we are experiencing. This time lag between the emission of GHGs and their impact give rise to temporal ethical issues. These include whether and how to allocate responsibility for historical emissions, and to what extent obligations to both younger and future generations need to be factored into decision making. Accounts of who – including non-human subjects – matters morally, and what we owe to generations yet unborn will therefore need to be acknowledged in the ethics of research into climate change and health.

Epistemic justice

Global knowledge generation and transmission on climate and climate change are marked by significant power differentials. Elite, well-funded western educational institutions, and the scientific and economic rationalism that predominate among them, have hegemonic power. Educational institutions in LMICs tend to be at the periphery of global knowledge generation. Many groups highly effected by climate change, including Indigenous Peoples, have little if any epistemic power. It is increasingly recognised however that Indigenous Peoples and local communities have significant knowledge, both about the effects of climate change, and methods of adaptation. Many Indigenous Peoples also frequently live in, and act as custodians of, environmentally critical ecosystems. Research in health and climate change must therefore meaningfully engage with questions of epistemic justice. This also invites questions about how to translate research evidence into policy and practice given the political challenges that policy must traverse.

The moral value of the non-human world

Climate change has highlighted our absolute dependence on the earth's ecosystems. Our health and wellbeing cannot be separated from the environments we live in and draw our sustenance from. In turn this has raised questions about the moral value of the nonhuman world, including its biotic and abiotic aspects. Anthropogenic, largely western accounts of moral value that regard the non-human world simply as a resource are faltering. Insights from Indigenous and other non-Western peoples who do not normatively distinguish between human and non-human nature are increasingly acknowledged. These Indigenous world views have also influenced non-Indigenous scholars such as Aldo Leopold and Arne Naess, although questions remain about whether debts to these Indigenous perspectives have been sufficiently acknowledged.[18] Important questions with implications for research therefore include questions about the nature and strength of obligations to respect and protect nonhuman animals, landscapes, or nature.

Scientific uncertainty

Climate change is characterised by specific kinds of scientific uncertainty. The complexity of the world's climate, and the possibility for threshold events – sudden, irreversible shifts in global climate – invite questions about the reliability of climate modelling, and ethical obligations in the face of potentially catastrophic outcomes. The presence of these kinds of uncertainty strengthens moral obligations to undertake research, along with obligations rapidly to translate findings into effective practical responses. The scale of uncertainty relating to the modelling of climate change, and the nature of the risks involved, also increase moral obligations to identify areas of research likely to have significant practical implications and to address the most pressing problems. The IPCC has highly developed deliberative processes for integrating risk and uncertainty into climate change policy and these can assist researchers.[19]

6. Ethical issues associated with research into health and climate change

Having outlined the context of health and climate change and introduced a range of ethical issues associated with climate change more broadly, the paper now focuses specifically on ethical issues arising in research in health and climate change.

Asking the right research questions

Given the scale and urgency of the impacts of climate change on health and the limited resources to address them, questions of what we should research and why are critical. As touched on briefly above, decisions about which research is undertaken will determine those populations most likely to benefit from its findings. Priority setting is therefore an ethical as well as a technical practice. This extends to identifying which among the health impacts of climate change are the most serious and therefore warrant research. Additional questions here include:

[18] Whyte, Kyle, How Similar Are Indigenous North American and Leopoldian Environmental Ethics? (March 1, 2015). Available at SSRN: https://ssrn.com/abstract=2022038 or http://dx.doi.org/10.2139/ssrn.2022038.

[19] Kunreuther H., S. Gupta, V. Bosetti, R. Cooke, V. Dutt, M. Ha-Duong, H. Held, J. Llanes-Regueiro, A. Patt, E. Shittu, and E. Weber, 2014: Integrated Risk and Uncertainty Assessment of Climate Change Response Policies. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

- How can the research agenda in health and climate change meaningfully address the needs and interests of those most vulnerable to its impacts, and who have traditionally lacked the power to influence global research agendas?
- How can the choice of research topic, including the location in which the research is carried out, help build research capacity in regions and populations where it is underdeveloped?

Who gets to ask the research questions?

Ethical questions are not just restricted to the choice of research question – of which research topics we prioritise. There is also the question of who should be involved in setting research priorities, who gets to choose who should be involved, and what the scope of their involvement will be? Important questions for potential case studies in this context include:

- How we can address unequal representation, under-represented voices and promote interdisciplinary approaches including via meaningful approaches to power-sharing and co-creation when setting the research agenda in health and climate change? How can power imbalances and inequalities be addressed? These questions are particularly urgent in relation to Indigenous Peoples, local groups and those who have been historically marginalised, and already experience disproportionately poor health.
- How can the ongoing effects of epistemic injustice – the systematic devaluing of certain forms of knowledge, knowledge producers and knowledge transmitters – be addressed in the setting of the research agenda in health and climate change?
- Should some groups have special authority in setting the research agenda because of specific expertise, lived experience or vulnerability to the effects of climate change?
- Colonialism has played a significant part in driving vulnerability to the health effects of climate change. How should this be acknowledged and addressed in research into health and climate change? How can we address the historical links between colonial and post-colonial resource extraction and historical emissions of GHGs in relation to health-linked loss and damages? How can grassroots perspectives actually be heard, not just as mediated by leaders, elites and intellectuals?

Addressing the climate impact of research

Research is a large, global, multi-institutional undertaking with its own environmental impacts. Ethical obligations arise to reduce and/or mitigate these impacts. Key questions here include:

- How can the climate impact of research into health and climate change be reduced?
- How can trade-offs between the social value of research and its climate impact be negotiated?
- Should carbon-offsetting practices be required for this kind of research, where appropriate?
- What changes should be made to research governance practices to ensure that the long-term effects of such research on the climate are taken into consideration?

Addressing perverse value flows

It is well established that global health research gives rise to challenging practical and ethical questions relating to potentially extractive research and the flow of value away from resource poor settings. It is vital therefore that we address questions about how to ensure fairness in the flow of intellectual and other goods arising from research into climate and health, and co-operation and fairness of collaboration between resource-rich and resource-poor research institutions.

Climate change, health and the social value of research

Most health-related research draws on concepts of social benefit directly linked to human concerns and goods. As the CIOMS guidance on ethical research involving human participants states:

> *The ethical justification for undertaking health-related research involving humans is its scientific and social value: the prospect of generating the knowledge and the means necessary to protect and promote people's health.*[20]

Ethically it is the anticipated social value of research – often linked to any direct benefit to human participants – that justifies the enrolment of human participants. But as we have seen, it is increasingly acknowledged that human health is linked to and dependent upon the 'health' of ecosystems and the species and processes that constitute them. This invites questions about whether we need to re-draw our concepts of the social benefit of research to incorporate these non-anthropocentric interests.[21] One Health is widely seen as an effective approach to a range of public health threats associated with climate change and environmental degradation, with near-universal backing from international and regional health organisations, including the WHO[22]. There is a considerable and growing literature of research undertaken under a One Health banner. Consider the following definition of One Health given by the United Nations One Health High Level Expert Panel (OHHLEP).

> *One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent. The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development.*[23]

The social value of research in the disciplines of One Health and its associated approaches – Eco Health and Planetary Health – plausibly extends beyond the value of the research to humans.[24] This invites several questions with ethical dimensions including:

- How can we incorporate the value of non-human individuals, species, systems and ecosystems into a plausible account of the social value of research in climate change and health?
- What, if any, moral discounting is defensible in considering possible trade-offs between human and non-human health when assessing the social value of research?
- Who can speak for non-human interests when assessing the social value of research, under what authority and what factors should they take into account?

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[20] CIOMS (2016). International Ethical Guidelines for Health-related Research Involving Humans. Council for International Organizations of Medical Sciences (CIOMS): Geneva. https://cioms.ch/wp-content/uploads/2017/01/WEB-CIOMS-EthicalGuidelines.pdf. Accessed 09 Dec. 23.

[21] See, for example: Samuel G, Richie C. Reimagining research ethics to include environmental sustainability: a principled approach, including a case study of data-driven health research. *Journal of Medical Ethics* 2023;**49:**428-433.

[22] See, for example: https://www.who.int/news-room/fact-sheets/detail/one-health. Accessed 10 Dec. 23.

[23] One Health High-Level Expert Panel (OHHLEP), Adisasmito WB, Almuhairi S, Behravesh CB, Bilivogui P, Bukachi SA, et al. (2022) One Health: A new definition for a sustainable and healthy future. PLoS Pathog 18(6): e1010537. https://doi.org/10.1371/journal.ppat.1010537.

[24] See, in this context: Coghlan, S., Coghlan, B.J., Capon, A. *et al.* A bolder One Health: expanding the moral circle to optimize health for all. *One Health Outlook* **3**, 21 (2021). https://doi.org/10.1186/s42522-021-00053-8.

- How can, and to what extent – if at all – should the social value of research for future generations of human, non-human individuals and species, and the future of systems and ecosystems be taken into account?

Fairness of burden and benefit

The identification of likely benefits and burdens involved in the selection of study populations and their equitable distribution, so that no group or class of persons bears more than its fair share of burdens, is a key ethical obligation in research. According to the CIOMS guidelines, those responsible for the research process must ensure that the benefits and burdens of research are distributed equitably:

> *Groups, communities and individuals invited to participate in research must be selected for scientific reasons and not because they are easy to recruit because of their compromised social or economic position or their ease of manipulation. Because categorical exclusion from research can result in or exacerbate health disparities, the exclusion of groups in need of special protection must be justified. Groups that are unlikely to benefit from any knowledge gained from the research should not bear a disproportionate share of the risks and burdens of research participation. Groups that are under-represented in medical research should be provided appropriate access to participate.*[25]

In some circumstances, the benefits or burdens of research may be apportioned unequally among individuals or groups. In these cases, 'the criteria for unequal distribution should be scientifically and ethically justified rather than arbitrarily or conveniently chosen'.[26]

Given the focus of the CIOMS guidelines, the emphasis is on benefits and burdens to people. Humans, and only humans, are the sole focus of moral concern, either as individuals or as populations. Even when this is broadened out to include concerns about the integrity of the scientific record, what matters are the potential human benefits of that record. As we have seen in the above section on social value, research into health and climate change must invite the question: what kinds of benefits and burdens and for which moral subjects? The obligation to reduce the carbon cost of research arises in part because of the impact of climate change on human wellbeing. But on many accounts the environment, or parts thereof, have independent moral standing that also gives rise to these obligations. Certainly, this would be in step with the views of many Indigenous Peoples and local groups. These insights give rise to several questions in relation to research into health and climate change, including:

- What kinds of non-human interests matter morally in decisions about the distribution of benefits and harms in research into health and climate change? On the basis of what criteria can we assess the nature of a benefit or a burden?
- How can we incorporate benefits and burdens to non-human parts of the environment into obligations to ensure fairness in their distribution?
- To what extent should the current generation of humans take into account the benefits and burdens of research for future generations of human and non-humans?

[25] CIOMS (2016). International Ethical Guidelines for Health-related Research Involving Humans. Council for International Organizations of Medical Sciences (CIOMS): Geneva. 7. https://cioms.ch/wp-content/uploads/2017/01/WEB-CIOMS-EthicalGuidelines.pdf. Accessed 09 Dec. 23.

[26] CIOMS (2016). International Ethical Guidelines for Health-related Research Involving Humans. Council for International Organizations of Medical Sciences (CIOMS): Geneva. 7. https://cioms.ch/wp-content/uploads/2017/01/WEB-CIOMS-EthicalGuidelines.pdf. Accessed 09 Dec. 23.

Stepping away from these higher-level questions, given the extremes of global health inequality, and of vulnerability to the health impacts of climate change, additional questions include:

- How can we ensure that marginalised, vulnerable or at-risk groups are not over- or under-represented in research into health and climate change that exposes participants to risks?
- In relation to the benefits that accrue from research, how can we ensure research is non-extractive – that it does not transfer its benefits away from the populations being involved in the research, or from those it is intended to benefit, to those in more resource-rich regions, or those for whom the climate emergency is less immediate?

Different kinds of research raise different ethical questions

As discussed in more detail in the section below on multidisciplinary research, the search for generalisable data can take a variety of forms. Given the complexity of both climate change and health, it is likely research into this field will involve a particularly wide range of practices and approaches. Although all research raises general ethical questions, different types of research raise them in different ways or with greater or lesser intensity, and with varying degrees of ethical research governance. All research must, for example, be designed in such a way as to have a reasonable chance of answering or addressing the research question, but research that directly involves people, requires direct intervention into people's lives, or uses their identifiable data, generates specific ethical obligations. Identifying and properly responding to ethical issues that different kinds of research give rise to is essential.

Questions here include:

- What kinds of research are being deployed to respond to the impacts of climate change on health?
- Do these research approaches give rise to any new or particularly demanding ethical concerns?
- Do we need any new ethical guidance or frameworks for this research? What can we learn from the UNESCO and COMEST climate change principles in this regard? What can we learn from Indigenous ethical perspectives in this regard?

Respect for participants

It is well established that among the primary obligations of researchers is to ensure as far as reasonably possible the wellbeing of research participants. Some forms of research into the health impacts of climate change will inevitably involve those highly exposed to the impacts of climate change. As we have seen, these are likely to include groups subject to existing health inequalities, lacking the resources for adapting to the health impacts of climate change and with limited ability to influence decision making. Research involving participants at some degree of risk raises important questions about obligations to mitigate or respond to that risk. If, as seems likely, we accept that there are responsibilities, what is their scope or extent? It also gives rise to difficult ethical questions about trade-offs between research and support for participants: what does a fair allocation of resources between research and support look like? Furthermore, how can we include the risks to non-human aspects of the biosphere emerging form research? What impact does the presence of researchers have on ecosystems and how can negative impacts be guarded against or mitigated?

Research involving populations at risk gives rise to obligations to identify research topics that are reasonably likely to provide direct benefits to the population in reasonable timeframes, and that are minimally burdensome, bearing in mind that some populations might consider benefits to their

descendants a true benefit even where they will not directly benefit themselves. Even where research may not give rise to immediately applicable findings, it would ordinarily be indefensible to involve at-risk participants in research from which there is no possibility that they could directly benefit. As discussed further in the section on participatory research, these obligations must meaningfully and respectfully involve individual participants and the populations from which they are drawn.

One way of thinking about moral obligations to participants is in terms of respect for rights. As the first CIOMS guideline states:

> *All research with humans must be carried out in ways that show respect and concern for the rights and welfare of individual participants and the communities in which research is carried out. This respect and concern is manifest in requirements for informed consent, ensuring that risks are minimized and are reasonable in light of the importance of the research... Research must also be sensitive to issues of justice and fairness. This concern is manifest in choosing whose health needs are investigated; how risks, burdens, and anticipated benefits of individual studies are distributed; and who will have access to any resulting knowledge and interventions.*[27]

A rights-based approach further highlights obligations to ensure respect for the choices and wellbeing of participants, to promote as far as possible meaningful involvement in the choice of research topics and the design of the research, and to ensure fair distribution of the outcomes of the research.

Research involving some populations, such as Indigenous Peoples and local communities may present particularly acute ethical challenges. In some circumstances, ontological, epistemological and cultural differences between researchers and participants may be acute. Where the health of Indigenous Peoples or local communities may be a key feature of the research, conceptual issues regarding the meaning of health may require clarification. Climate change may also present some of these communities with existential threats, which will involve distinct ethical challenges. Questions here include:

- What obligations do researchers have to research participants exposed to dangerous climate risks? What do these obligations entail? How can they be addressed by researchers and funders? What if these risks are extreme and may even involve existential threats?
- How can research be responsive to the worldviews, needs, and interests of Indigenous Peoples and local communities?

As research in this area necessarily extends beyond human participants to include non-human aspects of the biosphere, difficult questions arise about what kinds of obligations arise toward non-human participants.

Interdisciplinary, multidisciplinary and transdisciplinary research

Although not an area highly developed in the literature on research ethics, research into climate change and health will in some instances involve interdisciplinary, multidisciplinary and transdisciplinary approaches. Although sometimes regarded as loosely interchangeable, they are distinct approaches. As Choi and Pak argue:

[27] CIOMS (2016). International Ethical Guidelines for Health-related Research Involving Humans. Council for International Organizations of Medical Sciences (CIOMS): Geneva. 7. https://cioms.ch/wp-content/uploads/2017/01/WEB-CIOMS-EthicalGuidelines.pdf. Accessed 09 Dec. 23.

> *Multidisciplinarity draws on knowledge from different disciplines but stays within their boundaries. Interdisciplinarity analyzes, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole. Transdisciplinarity integrates the natural, social and health sciences in a humanities context, and transcends their traditional boundaries.* [28]

As we have seen, One Health and its allied disciplines seek to bring together animal, human and ecosystem health. Research into the impacts of climate change on vector-borne diseases requires input from public health, veterinary health, entomology and other disciplines along with the more traditional human life sciences. Questions here include:

- To what extent are ethical frameworks and approaches interoperable between disciplines engaged in research into climate change and health?
- To what extent are existing ethical frameworks and approaches sufficient for the necessary interdisciplinary, multidisciplinary and transdisciplinary research in this field?
- How can we ensure equality of respect for all disciplinary and methodological approaches involved in research in this field?
- How can interdisciplinary, multidisciplinary and transdisciplinary research respect the value of non-human aspects of the biosphere?
- What structures of co-operation and governance can help usefully address the ethical challenges of interdisciplinary, multidisciplinary and transdisciplinary research in this field?

Participatory research and community engagement

Participatory research is a broad field that seeks to involve research participants and stakeholders in the formulation, delivery and dissemination of the research and its findings. It has been defined as:

> *an umbrella term for a school of approaches that share a core philosophy of inclusivity and of recognizing the value of engaging in the research process (rather than including only as subjects of the research) those who are intended to be the beneficiaries, users, and stakeholders of the research.*[29]

The requirement to ensure that research is participatory, including using established techniques for community engagement is widely acknowledged. As the CIOMS guidance on participatory research states:

> *Proactive and sustained engagement with the communities from which participants will be invited to participate is a way of showing respect for them and the traditions and norms that they share. Community engagement is also valuable for the contribution it can make to the successful conduct of research. In particular, community engagement is a means of ensuring the relevance of proposed research to the affected community, as well as its acceptance by the community. In addition, active community involvement helps to ensure the ethical and social value and outcome of proposed research. Community engagement is especially*

[28] Choi BC, Pak AW. Multidisciplinarity, interdisciplinarity and transdisciplinarity in health research, services, education and policy: 1. Definitions, objectives, and evidence of effectiveness. *Clin Invest Med*. 2006;29(6):351-364.
[29] Cargo M, Mercer SL. The value and challenges of participatory research: strengthening its practice. *Annu Rev Public Health* 2008; 29: 325-50.

important when the research involves minorities or marginalized groups, including persons with stigmatizing diseases such as HIV, in order to address any potential discrimination.[30]

Although there is consensus on the importance of participatory research, and an established literature on methods of seeking participation[31], it is far less clear that in practice research is genuinely participatory. Questions for the GFBR include the following:

- How can research into health and climate change achieve genuine and meaningful participation and co-creation?
- How can we reorient our ontological frameworks to ensure proper inclusion of Indigenous populations?
- What kinds of tools or other resources or practices are required to ensure that all those who participate or engage in the research process can do so effectively?
- How can we represent the interests of non-humans and possibly even the biosphere as a whole in any approach to research participation?

Research governance and ethical approval

Research ethics paradigms have traditionally focussed on identifying and managing risks to participating individuals and ensuring respect for their welfare, rights and interests. As we have seen, climate change has challenged this individualised, anthropocentric approach to health, highlighting human interconnectedness and interdependence with the non-human world. As with questions of social value discussed above, a key issue for research ethics governance is how these non-human interests can be incorporated into approval and oversight. It is also increasingly acknowledged that ethical approval needs to incorporate questions about the sustainability and environmental impact of the research itself.[32]

On a slightly more procedural level, it is well established that all research involving human participants must be reviewed by an appropriately constituted research ethics committee, unless there are good grounds for exemption.[33] Research ethics review committees can function at a variety of levels, including institutional, local, regional, national and international levels. The process of ethical review has been criticised by some researchers and commentators for being cumbersome, bureaucratic, restrictive, sluggish and at times failing properly or proportionately to focus on issues of ethical concern arising in the research.[34] Concerns have also been raised about the qualifications and expertise of members of some research ethics committees and whether they can properly address the scientific, ethical and governance issues engaged, particularly in relation to complex

[30] CIOMS (2016). International Ethical Guidelines for Health-related Research Involving Humans. Council for International Organizations of Medical Sciences (CIOMS): Geneva. 7. https://cioms.ch/wp-content/uploads/2017/01/WEB-CIOMS-EthicalGuidelines.pdf. Accessed 09 Dec. 23.

[31] See, for example: Duea SR, Zimmerman EB, Vaughn LM, Dias S, Harris J. A Guide to Selecting Participatory Research Methods Based on Project and Partnership Goals. J Particip Res Methods. 2022;3(1):10.35844/001c.32605. doi: 10.35844/001c.32605. Epub 2022 May 23. PMID: 35799626; PMCID: PMC9258244. See also: Ann C Macaulay, Participatory research: What is the history? Has the purpose changed? *Family Practice*, Volume 34, Issue 3, 1 June 2017, Pages 256–258, https://doi.org/10.1093/fampra/cmw117.

[32] Samuel G, Richie C. Reimagining research ethics to include environmental sustainability: a principled approach, including a case study of data-driven health research. *Journal of Medical Ethics* 2023;**49:**428-433.

[33] CIOMS (2016). International Ethical Guidelines for Health-related Research Involving Humans. Council for International Organizations of Medical Sciences (CIOMS): Geneva. 87. https://cioms.ch/wp-content/uploads/2017/01/WEB-CIOMS-EthicalGuidelines.pdf. Accessed 09 Dec. 23.

[34] https://www.hra.nhs.uk/approvals-amendments/what-approvals-do-i-need/research-ethics-committee-review/think-ethics/re-thinking-ethics-review-our-new-public-conversation-runs-13-june-until-23-september/. Accessed 17 Dec. 23.

studies.[35] The Covid-19 pandemic saw widespread adaptations of ethical review, driven by a global public health emergency.[36] Health research during the pandemic saw 'unprecedented scientific and regulatory efforts to speed development of and access to new COVID-19 interventions.'[37] Among the many lessons learned during Covid include the need for rapid collaboration across sectors, a focus on and support for the highest-priority research, the requirement to urgently adopt rigorous and innovative trial designs and the importance of the rapid sharing of reliable information. Given the possibility of the arrival of catastrophic climatic tipping points because of warming global surface temperatures, guidelines, systems and protocols for extremely urgent research into climate and health need to be developed in advance.

As already discussed, Indigenous Peoples and local communities are key stakeholders in health and climate change. Research governance involving groups who may be highly suspicious of state regulatory structures and systems presents challenges for both participatory research and ethical regulation and oversight. This suspicion looks to be justified. As Samuel and Richie argue:

> *Multiple authors have pointed to the abusive practices and problematic studies conducted with tribes, indigenous populations, and minoritised and marginalised communities worldwide over the past decades, which have failed to consider community harms associated with violating widespread trust or taking ownership of a community's stories*.[38]

Questions we need to ask include:

- Are the criteria and procedures for research ethics oversight adequate to the complex ethical challenges of research in the climate and health field? What adaptations may be necessary?
- How can research governance better respect the interests and perspectives of Indigenous Peoples and local communities? What changes and adaptations might be required? What opportunities are there for the co-creation of forms of ethical oversight?
- How can research ethics committees incorporate the moral value of the non-human world in research oversight? What sources, including from Indigenous communities, can inform how we do this?
- Are research ethics committees in the current format appropriately equipped to review this type of research?
- How can research ethics committees meaningfully incorporate obligations to future generations?
- How can questions of sustainability and the environmental burden of research be incorporated into research ethics oversight?
- How can we respond to the challenges presented by multidisciplinary research governance?
- What guidance, procedures and processes should be developed for researchers in anticipation of potentially catastrophic climatic 'tipping points'?

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[35] Ainembabazi, P., Castelnuovo, B., Okoboi, S. *et al.* A situation analysis of competences of research ethics committee members regarding review of research protocols with complex and emerging study designs in Uganda. *BMC Med Ethics* **22**, 132 (2021). https://doi.org/10.1186/s12910-021-00692-6.

[36] Lynch HF, Caplan A, Furlong P, Bateman-House A. Helpful Lessons and Cautionary Tales: How Should COVID-19 Drug Development and Access Inform Approaches to Non-Pandemic Diseases? *Am J Bioeth*. 2021;21(12):4-19. doi:10.1080/15265161.2021.1974975.

[37] Lynch HF, Caplan A, Furlong P, Bateman-House A. Helpful Lessons and Cautionary Tales: How Should COVID-19 Drug Development and Access Inform Approaches to Non-Pandemic Diseases?. *Am J Bioeth*. 2021;21(12):4-19. doi:10.1080/15265161.2021.1974975.

[38] Samuel G, Richie C. Reimagining research ethics to include environmental sustainability: a principled approach, including a case study of data-driven health research. *Journal of Medical Ethics* 2023;**49:**428-433.

- In the light of how climate change is a 'lagged phenomenon', how should obligations to future generations influence questions about sustainability and the environmental burden of research?

The normativity of concepts

Some of the concepts used in this paper and throughout the field of health and climate change have normative aspects. These can present acute challenges where research takes place across cultures and worldviews. 'Health', 'wellbeing' and 'illness' are clear examples[39]. Concepts of mental health and mental illness are subcategories where some of these normative issues become more visible. Looser concepts such as 'wellbeing' seem straightforwardly normative. Concepts of health are also applied to non-human aspects of the biosphere – we talk quite comfortably about the health of ecosystems – and the usage feels to some degree metaphorical. Clarifying these concepts and identifying their meanings and normative content is important for ensuring reasonable precision of thought. Questions that arise here include:

- How can we increase alertness to the implicit normativity in our core concepts such as 'health', particularly where they may mean different things in different places?
- Are our concepts of health sufficiently portable across different cultures? If not, what conceptual adaptations might be required?
- Are there other, potentially implicit normative issues in research that need to be identified?

7. Research into the ethics of climate change and health

As this paper has demonstrated, the field of research into climate change and health gives rise to a range of direct and indirect ethical issues, including intra- and inter-generational justice, collective action problems, respect for non-western value systems and the value of non-human aspects of the biosphere. Although these issues are discussed in the broader literature on the ethics of climate change, their applicability to research in health and climate change is less-well developed. It might therefore be helpful to identify where further analytical or clarificatory thought may be required to ensure that these concepts can be meaningfully applied.

Appendix

UNESCO principles of climate change

In November 2017, UNESCO adopted a declaration of ethical principles in relation to climate change. The Declaration is based on the six ethical principles given below. The full document can be accessed here.

Prevention of harm: To better anticipate the consequences of climate change and implement responsible and effective policies to mitigate and adapt to climate change, including through low greenhouse gas emissions development and initiatives to foster climate resilience.

[39] Hausman, Daniel M., 'Normative Conceptions of Health and Its Measurement', *Valuing Health: Well-Being, Freedom, and Suffering*, Population-Level Bioethics (New York, 2015; online edn, Oxford Academic, 23 Apr. 2015), https://doi.org/10.1093/acprof:oso/9780190233181.003.0003, accessed 17 Dec. 2023.

Precautionary approach: Do not postpone the adoption of measures to prevent or mitigate the adverse effects of climate change on the grounds of a lack of definitive scientific evidence.

Equity and justice: Respond to climate change in a way that benefits all, in a spirit of justice and equity. Allow those who are unjustly affected by climate change (due to insufficient measures or inadequate policies) to access judicial and administrative proceedings, including redress and remedy.

Sustainable development: Adopt new paths for development that make it possible to sustainably preserve our ecosystems, while building a more just and responsible society that is more resilient to climate change. Special attention must be paid to areas where the humanitarian consequences of climate change can be dramatic, such as food, energy, water insecurity, the oceans, desertification, land degradation and natural disasters.

Solidarity: Support, individually and collectively, the people and groups most vulnerable to climate change and natural disasters, particularly in the Least Developed Countries (LDCs) and Small Island Developing States (SIDS). Strengthen timely co-operative action in various areas, including technology development and transfer, knowledge-sharing and capacity-building.

Scientific knowledge and integrity in decision-making: Strengthen the interface between science and policy to optimally aid decision-making and the implementation of relevant long-term strategies, including risk prediction. Promote the independence of science and widely disseminate its findings to as many people as possible, for the benefit of all.

COMEST ethical principles for climate change: adaptation and mitigation

In 2015, the World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) set out ten ethical principles for climate change adaptation and mitigation. The full report and statement can be found here.

1. Biological diversity
2. Cultural diversity
3. Interdependence of life on Earth
4. Intellectual and moral solidarity of humankind
5. Global justice
6. Resilience
7. Sustainability (frugality, renewable energy, reforestation, water resources)
8. Precautionary principle
9. The duty to share scientific knowledge, and
10. Integrity of scientific research.