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Introduction

Climate change has been characterised as the 'greatest moral challenge of our time'. While the causes and impacts of climate change are now broadly understood, comparatively little attention has been directed towards the ethical challenges posed by climate change, or to how the values, beliefs and ethics of human societies drive the various actions that contribute to climate change. Nor has much attention has been given to the goodness or badness of policies designed to remedy or adapt to climate change. Indeed, most of the ethical discussion to date has been relatively theoretical. Nonetheless, discussions about the rightness or wrongness of human (in)action around climate change and its impacts – in other words about climate ethics and climate justice – have opened a veritable 'Pandora's box' of issues. Resolving these issues also presents a series of dilemmas, contradictions and paradoxes. Not surprisingly, more has been written about technocratic feasibility of interventions to minimise (mitigate) or adapt to climate change than about the actual moral correctness of those actions. This entry considers some of the emerging ethical considerations surrounding anthropogenic climate change. Beginning by briefly outlining the scope of expected impacts, the entry then discusses the various ethical aspects of the climate change crisis and its potential remedies.

Existing and expected impacts of climate change

According to the Intergovernmental Panel on Climate Change (IPCC), climate change will bring numerous biophysical changes to the Earth, with knock-on environmental, social, political and economic consequences. Rising temperatures, for instance, are expected to bring more frequent and severe heat-waves in many places. Associated urban 'heat island' effects will likely result in the deaths of tens of thousands of people across the world's cities – especially in the mega–cities of the industrialising 'South' (developing nations concentrated predominantly in the southern hemisphere). Higher-intensity storm events and associated rainfall are predicted to bring widespread flooding and concomitant property and infrastructure damage. Frequent droughts will threaten food and water supplies, and are expected to severely disrupt the livelihoods of peasant farmers in Africa, parts of South America and South-East Asia. Wildfires, desertification, and concomitant soil erosion, combined with unreliable water supplies and crop failures, will lead to large-scale abandonment of non-viable agricultural land, higher food prices, and large scale migrations to cities, in turn heightening the exposure of increasing numbers of people to impacts such as extreme temperatures and flooding. Soaring electricity costs, declining housing affordability, and escalating food costs will further harm vulnerable populations (e.g. poor, elderly, sick, indigenous people etc.). A higher prevalence of insect-borne diseases will also likely harm both crops and people, especially impacting people living in subtropical cities (as tropical disease ranges expand). And rising sea-levels will likely devastate many low-lying coastal settlements (from hamlets to megacities) by directly inundating built environments or severely disrupting the livelihoods of people who live within them (e.g. flooding coastal farmlands, severing transport linkages, destroying critical infrastructure, contaminating

aquifers). Very large numbers of people (potentially millions) will likely be displaced as 'climate refugees'.

Biodiversity is also expected to decline significantly as the expected impacts of climate change take hold. Climate change will affect the physiology of individual plants and animals, the geographic distribution of species (as climatic zones shift) and the diversity of species (as individual species become extinct due to changes in predator-prey relations, vegetation composition, fire regimes, tolerance thresholds, and associated disruptions to ecosystem processes). Specialist species will be more susceptible to impacts as they are adapted to unique ecological niches and may be unable to adjust behavioural patterns such as mating, foraging, nesting etc. and/or genetic predispositions may limit their ability to adapt to new environmental conditions (e.g. tolerance limits to temperature, pH, relative humidity, chemical exposure, pathogens etc.) within the relatively short timeframes that climate changes are expected to occur. Changes to some species will also likely flow onto other species resulting in cascading extinction episodes. For example, the bleaching of corals as sea temperatures rise and seawater increases in acidity (as oceans soak up carbon) will result in massive species extinctions (invertebrates and fish dependent upon coral will no longer have food and shelter). Alpine species are also especially vulnerable as they will not be able to simply migrate to other places given they are isolated on mountaintops.

Ethical considerations

Discussions of ethics centre upon notions of what is right or wrong, good or evil, fair or unfair etc. Ethical precepts that have been applied to climate change include: utilitarian (greatest good for the greatest number), Kantian, contractarian (surrendering individual liberties for a civilized society), doing no harm, respecting others, obligations to the vulnerable and marginalised, freedom from coercion, and taking responsibility for personal actions, among others. But there are two broad ethical dimensions to climate change problems and their potential remedies. The first – *deontological* ethics – pertain to the rightness of a particular action; the second – *consequentialist* ethics – relate to the rightness of the effects or impacts of a particular course of action. Important questions include: 'who is responsible for greenhouse gas emissions – individuals, communities, nation states, producers, consumers?'; 'who is responsible for reducing emissions and by how much?'; 'what are our obligations to future generations and non-human species, if any?'; 'what level of sacrifice should current generations make?' and 'do developed nations have a moral responsibility to accept climate refugees and to help developing nations to mitigate and adapt to climate change?'. These questions and many others address ethical concerns pertaining to distributive justice, compensatory justice, procedural justice, and equity.

Scholars generally recognise that there are several basic expressions of equity insofar as climate change is concerned, including: (i) equitable distribution—all humans should have uniform exposure to benefits or harms; (ii) compensatory equity— the most disadvantaged and vulnerable populations who are disproportionately exposed to climate change impacts should be compensated to offset inequalities – either in monetary, aid, technological or developmental assistance; (iii) procedural equity—all individuals (irrespective of class, race, gender, religion etc.) should have equal capacity to participate

in climate change negotiation and decision-making. Many scholars also argue that actions which contribute to climate change violate the Universal Declaration on Human Rights, and much of the ethical literature on climate change considers the human rights impacts of climate change. Knowing how these different versions of equity are mobilised in climate change discussions can potentially enable us to better evaluate policies, actions and remedies.

Scholars have also identified a number of ethical conundrums that arise from climate change. First, the people least–responsible for climate change (e.g. vulnerable populations in developing countries of the industrialising South and within the developed North) will likely bear the greatest burden of anticipated impacts. Second while the industrialised north is responsible for most greenhouse gas (GHG) pollution to date, limiting further emissions will have a disproportionately harsh impact on developing counties seeking to industrialise. Third, technological and market-based solutions for climate change can further entrench inequalities between the North and South, may disproportionately benefit the elites who are most responsible for the problem (e.g. venture capitalists and transnational corporations), and may exacerbate the problem itself (developing new technologies, e.g. coal gasification, can increase emissions). Fourth, abrupt and catastrophic climate change could result in a mini ice-age in Europe, raising the spectre of increased emissions to adapt to this new problem, further jeopardizing the fate of future generations. But not adapting would condemn thousands to death. Fifth, the future generations of humans and other species will disproportionately suffer from climate change impacts even though they have not caused them. Sixth, some of the potential solutions to climate change may in fact exacerbate existing problems (e.g. replacing fossil fuels with bio-fuels to mitigate carbon emissions can increase the price of grains and other foodstuffs and exacerbate biodiversity loss as fragile and/or threatened habitats are converted to crops for food and fuel). Finally – mitigating climate change to benefit future generations may place unbearable costs upon the most vulnerable people within the current generation, and conversely taking action to adapt the current generation to climate impacts (e.g. installing air-conditioners or relocating vulnerable settlements) may exacerbate climate change in the future.

Principles of climate ethics (climate justice)

Conceptions of justice typically address notions of what is right and what is fair. Climate justice has two dimensions – a social justice element an ecological justice component. When considering the social dimension of climate ethics, commentators urge that attention must be given to how multiple axes of difference (e.g. gender, class, race, ethnicity & disability), configure vulnerability or resilience to climate change impacts, the alternative knowledge and perspectives that traditionally marginalised groups might offer, and in turn how strategies to combat or adapt to climate change might empower marginalised and vulnerable communities to take their own action against climate threats.

Several principles have been posed to resolve ethical tensions arising from climate change to achieve just actions and outcomes. Many stem from the so-called ‘Bali Principles’. There is insufficient room to describe them all here, but they include:

- *Global commons* – the atmosphere is a global commons to which all species are equally entitled;

- *Do no harm* – climate change must be mitigated and harmful greenhouse gas levels reversed;
- *Polluter pays* – the people most responsible for climate change should fix it;
- *Beneficiaries pay* – the beneficiaries of past GHG emissions (e.g. industrialised nations and elites in developing nations) should bear the burden of responsibility for mitigation and adaptation – also termed *historical responsibility*;
- *Common but differentiated responsibility* – all people bear a common responsibility to halt climate change, but the greatest burden falls to those with the *ability to pay* and to those who benefit most from greenhouse-gas producing activities;
- *Compensatory equity* – powerless, disadvantaged and socio-economically vulnerable people who are worst affected by climate change should be compensated by those who have benefitted;
- *Precautionary principle* – uncertainty around the exact causes and impacts of climate change is no excuse for forestalling mitigation and adaptation action;
- *Intergenerational equity* – current generations who have benefitted from climate-harming actions have an ecological debt to future generations and must take action to ensure that future generations are not harmed by (in)actions of present generations and are able to meet their own needs (e.g. sustenance, shelter etc.);
- *Intragenerational equity* – steps should be taken to ensure that marginalised and vulnerable people within the current generation do not disproportionately suffer from climate change impacts;
- *Environmental justice* – people of colour and the poor should not bear a disproportionate impact of climate change;
- *Meeting basic needs* –people in the developing world must be allowed to generate a certain level of emissions to meet their basic requirements for shelter, food, transport etc.;
- *Affordable clean energy* – all people have a right to affordable and sustainable energy;
- *Participatory democracy* – vulnerable and traditionally marginalised groups have a ‘right to represent and speak for themselves’ in policy and decision-making;
- *Ecological justice* – non-human species have moral considerability and must be represented in climate change decision making as well as benefit from efforts to mitigate and adapt to climate change.

It is telling that few scholars have considered the *ecological justice* imperative of climate change. Important questions here include: “who represents non-human life-forms at the policy table?; “what are our obligations and responsibilities towards other species”;

"should we compensate other species who are affected by our actions, and if so, which ones, how many, and by what means?". Concepts such as ecological citizenship and Buddhist economics are beginning to address such questions – by asserting that all species are tied together in a complex web of socio-ecological relations and that humans have both an obligation and responsibility to ensure that other species are not imperilled by our actions.

Potential remedies

Potential climate change remedies take two forms – *mitigation* strategies and *adaptation* strategies. Adaptation options include actions like developing drought–resistant crops, storm resistant housing, resilient infrastructure and food and water security (e.g. recycling water and growing food locally). Mitigation proposals include reducing emissions by altering lifestyles and behaviour (e.g. driving less, reducing air travel, switching to renewable energy sources, and geo-sequestering carbon). But to be ethical and equitable, many of these potential solutions will have little effect unless they also entail transfers of wealth and knowledge from elites and developed nations to impoverished people and developing countries. Some mitigation actions can have pernicious consequences. For example, some developed nations have begun purchasing forest tracts in developing counties to function as carbon sinks. But if indigenous communities are forced out of such reserves it will only heighten inequalities. And in some ways developed nations are simply transferring their emissions problem elsewhere instead of adjusting excessive consumption behaviours and fossil-fuel dependent technologies and infrastructures that caused the problem in the first place. Moreover, preserving carbon sinks in the developing world could limit those countries development options – amounting to neo–colonialism. More ethical options may include: developing new technologies like renewable energy and transferring them to the developing world; retraining and re–skilling people currently working in carbon-intensive industries for 'green jobs'; and even radically re-working the way governments, corporations and individuals interact with each other and the biosphere.

From an adaptation perspective, we will require better medical services, alternative sources of water (such as recycling effluent), planned retreat from flood–prone land, distributing critical infrastructure – so we are less reliant on single sources for electricity, water and waste treatment and the like. But such solutions are expensive and will do little to redress inequities unless they are made available to poorer communities and individuals. Developed nations must also be prepared to change their immigration policies to accept peoples displaced by climate change.

Solutions for conservation biology are also fraught with difficulties. Establishing protected corridors between isolated habitat patches may improve the flow of genetic material and enable threatened plant and animal species to move, but such corridors also facilitate the movement of weeds and pest species and/or may increase the movement of wildfire. Revegetating degraded areas with local native species may foreclose the opportunity to plant species that will be better adapted to future climatic conditions. And warehousing vast numbers of seeds in 'seed-banks' and establishing captive-breeding programs in zoos does little to redress the cause of climate change. Nor will it enable the restoration of ecosystems that will be decimated by climate change.

The ethical issues raised by climate change are complex. Clearly there is no one single ethical position that will helps us to address all aspects of climate change and its impacts. Moreover competing ethical positions can create paradoxes and dilemmas. While there is a dire need for a globally agreed set of ethical principles to address climate change, arriving at such an agreement will be fraught with challenges. Few however, would disagree that we must find a more socio-ecologically sustainable way of life.

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Cross references

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