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# Climate Change, Risk, and Population Ethics

Forthcoming in *Global Warming, Global Ethics*, Shiizukobundoshobo Co. Ltd.  
2018

The Institute for Futures Studies is an independent research foundation financed by means of a government subsidy and external research funding. The institute conducts interdisciplinary research with a focus on future issues and works to promote public debate about the future by means of publications, seminars and conferences.

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Transcription of talk at *Carnegie Council*, New York, 29 October, 2015.  
Forth-coming in *Global Warming, Global Ethics*, Shiizukobundoshobo Co. Ltd.

It's great to be here, and thanks to Joel for organising this conference and I would also like to thank the Uehiro Foundation, Mr. Uehiro, Dr. Maruyama, Mr Onozuka, and Julian Savulescu. This is not the first time the Uehiro Foundation has been my benefactor. When Julian was setting up at the Uehiro Centre for Practical Ethics at Oxford, he asked me to be part of it, so I worked there for a couple of years as it got established. It was a great time and I have many fond memories.

It is also great to be here in this interdisciplinary setting. A year ago, I became the Director of the Institute for Futures Studies, a very interdisciplinary research institute.<sup>1</sup> Surely, the way forward in tackling humanities great challenges in the 21<sup>st</sup> century has to be interdisciplinary. Hence, I hope my talk today will also be of interest to non-philosophers.

I shall talk about value and how it plays, or should play, an important role in the discussion in the UN Climate Convention and the IPCC, the Intergovernmental Panel on Climate Change. I shall also talk about population ethics in connection with climate change, a subject of which there has been all too little discussion. Hence the title "Population Ethics in the Time of Global Warming".<sup>2</sup>

I shall start with an unusual subject for a philosopher: climate conventions. More specifically, the UN Climate Convention which has the more complicated name of the United Nations Framework Convention on Climate Change (UNFCCC), but I will refer to it simply as the UN Climate Convention. It was drawn up in 1992 at the Earth Summit and is actually, quite impressively, ratified by 195 states and by the European Union. This convention didn't place any binding demands on decreasing greenhouse gas emissions on the signatories, but it laid the groundwork for the legally binding, and more well-known, Kyoto Protocol.

Article two of the UN Climate Convention states that "[t]he ultimate objective of this Convention ... is to achieve ... stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The organization of the UNFCCC conducts international negotiations, which are guided by the aim set out in this article. Broadly, these negotiations, with regards to mitigations, have three steps:<sup>3</sup> (1) Work out what concentrations would be low enough to prevent

1. See <http://www.iffs.se/en/>

2. This talk, especially the first part, draws heavily on a talk by John Broome, "Climate change: life and death" (Broome 2014), which he has been so kind to share with me (a version of this talk is now published, see (Broome 2015)). See also (Broome 2010) where many of the points I make here are discussed in more detail.

3. I'm here setting aside the negotiations regarding adaptation, and loss and damage. Thanks to Duus-Otterström for pointing this out.

dangerous interference; (2) Work out what pattern of global annual emissions will keep concentrations below this limit; and (3) Allocate these global annual emissions among the nations.

Is there a role here for moral and political philosophy and normative reasoning in general? Clearly the step of allocating global emissions among the nations raises questions of fairness and justice: What is the fairest way to distribute the burdens and benefits of reduced emissions, as well as the costs of adjusting to the changed climate? Rich countries have emitted disproportionate amounts of greenhouse gasses which do harm everywhere. Do the rich countries owe compensation for the harm that is being done and will continue to be done by their past emissions?

Most philosophers and political theorists have focused on step three. For this reason, steps one and two have largely been left to natural scientists, economists, and the political process. This is unfortunate since these steps involve issues of value. For example, the notion of “dangerousness” is an evaluative one. It raises the question of how we should value life and death. Of course, value as well as justice is a concern of moral philosophy and in the rest of this talk, I shall concentrate on the value questions.

The role of value theory was not adequately recognized in the UNFCCC process for a long time. For example, here is a quote from the Synthesis Report of the Third Assessment Report of the IPCC (2003):

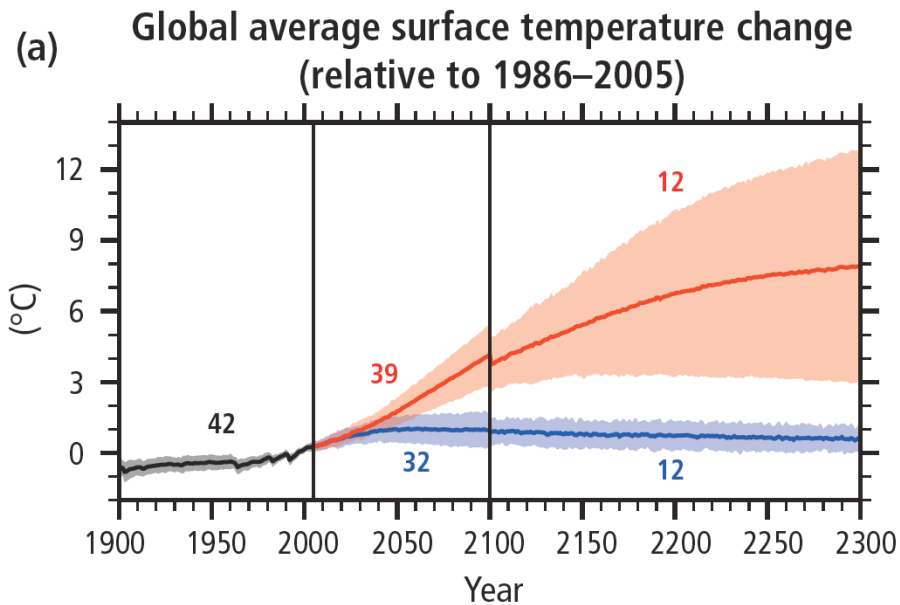
“Natural, technical, and social sciences can provide essential information and evidence needed for decisions on what constitutes ‘dangerous anthropogenic interference with the climate system.’ At the same time, such decisions are value judgments determined through socio-political processes.”

So although the Synthesis Report acknowledged that the notion of “dangerousness” is an evaluative one, it is claimed that judgments about what is dangerous should be determined “through socio-political processes” rather than involving researchers from the normative disciplines (e.g., moral and political philosophy and the normative branches of political science and economics). That’s rather unhelpful. Lately there has been some progress, however. It seems that the IPCC has realised that it needs to do more than appeal to socio-political processes, and needs to involve researcher from the normative disciplines to think through the hard value questions raised by climate change. Hence, in the latest report, the Synthesis Report of the Fifth Assessment Report of the IPCC (2014) it is now stated that:

“Decision-making about climate change involves valuation and mediation among diverse values, and may be aided by the analytic methods of several normative disciplines. Ethics analyses the different values involved and the relations between them. Recent political philosophy has investigated the question of responsibility for the effects of emissions...”

This is a welcome change in the IPCC and now there are philosophers involved in the panel, for example John Broome, Marc Fleurbaey (also an economist), and Lukas Meyer.

Let me now turn to an example. Consider the following diagram from the IPCC Climate Change 2014 Synthesis Report (p. 59):



*Diagram 1*

This diagram shows the possible global average surface temperature change for the 1900–2300 period (relative to 1986–2005) given two Representative Concentration Pathways (RCPs), namely RCP 2.6 (blue) and RCP 8.5 (red). The RCPs describe two possible climate futures, both of which are considered possible depending on how much greenhouse gases are emitted in the future.

Let’s first look at the blue line representing RCP 2.6. That’s the development we hope for but it assumes that global annual greenhouse gas emissions peak between the years 2010 - 2020 and that we are going to decrease emissions substantially thereafter compared to current rates. Indeed, after 2070 it ass-

umes negative emissions, that is, that we absorb more greenhouse gases from the atmosphere than we release. With this climate future, we are going to keep temperature change to around two degrees.

However, let's now look at RCP 8.5 which is represented by the red line and the big pink area. That is another possible development. This is the scenario when we don't succeed in halting and decreasing the increase in concentration of greenhouse gases in the atmosphere. Hence, it continues to rise throughout the 21st century. Moreover, emissions will continue after 2100. In this scenario, we will get an increase in temperature of up to eight degrees by around 2300, as indicated by the red line.

In fact, it is even worse than that because, as indicated by the pink area, what we have here is a probability distribution of possible increases in global temperature. The diagram shows how extreme the uncertainty is within 200 or 300 years. The upper range goes to above 12 degrees. Hence, we don't know exactly where we would end up and there is a significant risk that it would be over a 12 degrees increase in the global surface temperature.<sup>4</sup> At a 12 degrees increase, we are talking about a global catastrophe. With such an increase in temperature, the living conditions in all countries are going to be severely affected; it is going to be very bad. And although the probability of this scenario is small, it is still significant.

Here is one reason to believe that we face a significant probability of ending up with something like the scenario represented by RCP 8.5: It seems rather likely that we cannot reduce global emissions enough to keep global warming below 2 degrees (more on this target below). Consider the following diagram:<sup>5</sup>

Diagram 2 shows the emission profiles of China, the US and the European Union both in the past and onwards based on their pledges. The black line at the top shows a global emissions profile over time which is consistent with the 2-degree target. China has not promised anything after 2030, hence their line ends in 2030. However, even if China's emissions decline sharply after 2030, and the EU and the US keep what they promised, the diagram shows that there will be very little emissions left for the rest of the world. The rest of the world would have to reduce its carbon dioxide emissions by nine percent a year from 2014 to 2030. This doesn't seem very likely and suggests that it will be very difficult to achieve the 2-degree target and that there is a significant risk of scenarios more of the kind represented by RCP 8.5.

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4. Incidentally, it is surprising that the uncertainty band for RCP 2.6 is rather narrow.

5. Figure 2 from "Measuring a fair and ambitious climate agreement using cumulative emissions"

Glen P Peters et al 2015 *Environ. Res. Lett.* 10 105004 doi:10.1088/1748-9326/10/10/105004. I'm grateful to Göran Duus Otterström for drawing my attention to this diagram.

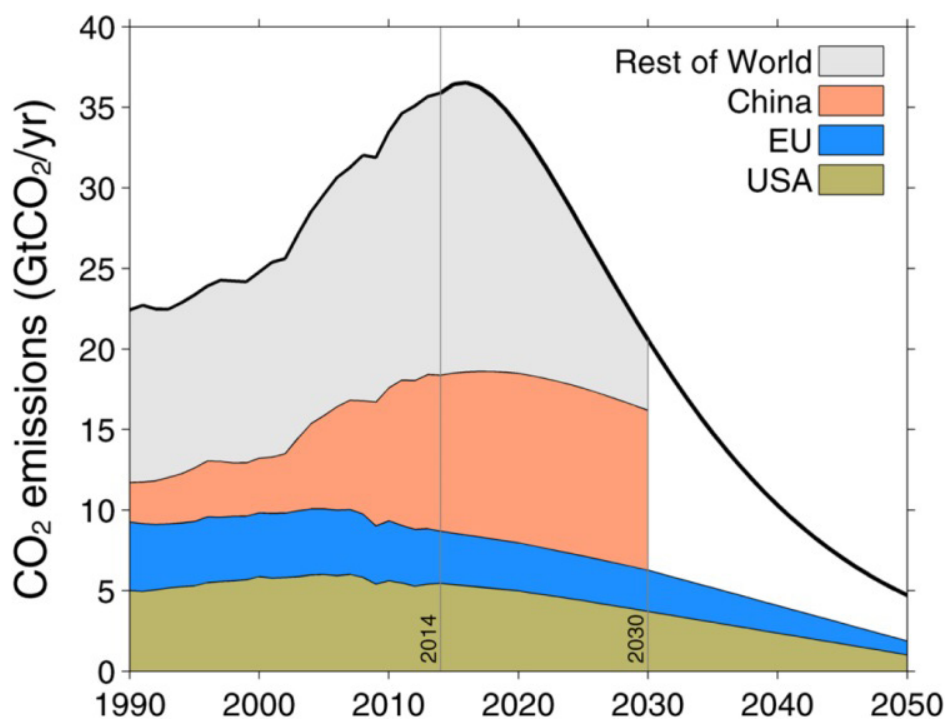


Diagram 2

So this is the main point I would like to drive home in this part of the talk: There are small but significant risks for catastrophic outcomes that haven't been taken sufficiently into account in the discussion of global warming and in the suggested policies for how to deal with it. Actually, that is even true about the policy recommendations from the IPCC. Let's have a closer look.

The latest IPCC Synthesis Report (2014) in effect gives us a limit of 1000 billion *further* tonnes of carbon dioxide that can be emitted.<sup>6</sup> What is the justification for that? Well, the grounds offered are that this will lead to a better than two-thirds chance of keeping the increase in global warming below two degrees, that is, at the lower blue line in diagram 1 above - the scenario that we hope for.

However, a two-thirds chance still leaves significant probabilities for much worse outcomes. The IPCC seems to base its recommendation on what outcomes are most likely, given the alternatives on offer, which is not a good way to make decisions. This is a bad rule since an unlikely event may be more important in a decision than the likely ones. Ships ought to carry lifeboats, even though they are likely never to be needed. It is prudent to insure your house against fire although that is an unlikely event. It is not the likely outcome, but if your house does burn down, you want to have insurance so you can afford to

6. "Multi-model results show that limiting total human-induced warming to less than 2°C relative to the period 1861–1880 with a probability of >66% would require cumulative CO<sub>2</sub> emissions from all anthropogenic sources since 1870 to remain below about 2900 GtCO<sub>2</sub> (with a range of 2550 to 3150 GtCO<sub>2</sub> depending on non-CO<sub>2</sub> drivers). About 1900 GtCO<sub>2</sub> had already been emitted by 2011" (Pachauri et al. 2015 p. 10).

build a new one. Hence, we need to take into account small but significant probabilities of very bad outcomes.

This reasoning carries over to climate change. For instance, we need to consider the possibility that we are on the trajectory represented by the red line above, that is, a temperature increase of over six or even twelve degrees, or something similar to that. And we should do that by basing our decision not on likely outcomes but on the expected values of different policies, as we do when we decide to take out house insurance or fit ships with lifeboats; and we should choose the policy that has the greatest expected value. So even for decisions concerning climate change we need to evaluate the expected harms and benefits of climate change and of different climate change policies.<sup>7</sup>

Let me take a last example, now from the IPCC's Fourth Assessment Report (2007), to drive this point home. The report describes the expected warming at different concentrations of greenhouse gases in the atmosphere, but not for all the possible outcomes. It is stated that with an increase from the current 400 to 450 parts per million (ppm) of greenhouse gases, there will be at least a two thirds probability of an increase in average temperature between 1.4 and 3.1 degrees Celsius. However, the report did not mention that the risk - based on the same assumptions - is about 7.1 percent for a warming of four degrees and 1.8 percent for a warming of 6 degrees or more.<sup>8</sup>

In order to relate this to something we are all familiar with - aviation safety - consider the following. Today, there are approximately 30 serious air accidents *per year*. An aviation accident frequency of 1.8 percent, however, would mean that there would be about 1,500 serious air accidents *per day*. We don't accept such a high level of risk when it comes to aviation safety, and we shouldn't accept it for climate change.<sup>9</sup>

I hope to have shown that climate change is in one way like the fire insurance and the lifeboat case, and that we need to think about the very bad outcomes that might happen even if the probability of their occurrence is very low. We should not think *only* about the most likely outcomes.

In the rest of this talk we shall move over to another, connected, issue: population change. I'm going to consider whether climate change involves any new and hard problems regarding value. I actually think this is true. Climate change actualises some very hard and theoretically tricky problems regarding how to value population change. Moreover, population change is, as John Broome puts it, the elephant in the room in the climate change discussion.<sup>10</sup>

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7. As stressed by (Broome 2010, 2014, 2015).

8. This point is forcefully made by (Rockström et al. 2013).

9. See (Rockström et al. 2013).

10. (Broome 2015).



The potential significance of climate change for the size of future populations is difficult to overstate. The IPCC (2014) notes that even a global warming of 2 degrees Celsius risks producing substantial and long-lasting damage to many ecosystems, threatening human and nonhuman animals alike. It is estimated that a 2 degree warming would lead to, among other things, more extreme precipitation events, more heat waves, compromised agriculture in tropical and temperate regions, and widespread species extinction. Warming of 4 degrees or more would lead to more dramatic changes still. For example, in such a world the sea level is estimated to rise by up to 1 meter by the turn of the next century, threatening coastal areas around the world. Moreover, higher temperatures constitute an elevated risk of abrupt and irreversible changes to the earth's climate system, such as a collapse of the Greenland Ice Sheet. In that case, the IPCC suggests that we can expect sea level rise of up to 7 meters. So climate change will kill and prevent the existence of future people by many means: heat waves, storms, floods, droughts, famines, increase of diseases, etc. And of course in the unlikely event of human extinction there will be no people ever again and that is also a risk we have to take into account, a kind of existential risk.

There are some very rough estimates of the number of people killed by climate change. The World Health Organisation estimates that 150,000 were killed by climate change already in 2000.<sup>11</sup> The 2009 report of the Global Humanitarian Forum indicate that every year climate change leaves over 300,000 people dead.<sup>12</sup> Admittedly, I don't know how good these assessments are. We certainly need to do more to get more accurate estimates. We need to get demographers to work on the demographic consequences of climate change. We are just starting up such research at the Institute for Futures Studies.

Now, this means that we have to take account of changes in population size when estimating the badness of climate change and the benefits of responding to climate change. We need to set a value on increases or decreases in population. Yet policy-makers seem to almost universally ignore the effects of policy on population. This is the elephant in the room of climate change valuation.

Population ethics concerns how to evaluate populations of different sizes in regard to their goodness, how to assign a value to increases and decreases in population size. The first few papers in population ethics weren't published until the late 1960s and it didn't become a significant field until Derek Parfit's famous book *Reasons and Persons*, published in 1984. It is now a very lively field of inquiry.

As I said, policymakers seem to almost universally ignore the effects of policy on population size and that's why I, following Broome, called it the elephant in room of climate change valuation. Why have they ignored it? Well, one possible

11. Cited in (Broome 2010).

12. See (Global Humanitarian Forum 2009).

explanation is that many people might have what John Broome calls *the intuition of neutrality*, which basically says that adding a person to the world's population makes the world neither better nor worse.<sup>13</sup> So having more or less people won't increase or decrease the value of a population. Hence, it's something that we don't need to think about, or if we do need to think about it, it is because it makes people's lives better or worse; other than that, having a bigger or smaller population doesn't make any difference.

There are likely to be limits to the neutrality intuition. Most people would probably agree that if population growth leads to having lots of people with very bad lives then that would make the world worse.<sup>14</sup> In general, however, the idea is that population size is neutral in terms of value and we can usually ignore it when considering different policies.

However, the neutrality intuition leads to inconsistency given some other beliefs most of us share. Consider the following two possible additions to the present population A: Population B consists of a number of people with very low positive welfare, and C is a population of the same size as B but made up of people with very high welfare. According to the intuition of neutrality, adding B or C to A makes the resulting populations equally good, given full comparability.<sup>15</sup> But surely, when other things are equal, it must be better to create people with very high welfare rather than people with very low welfare. Hence, population A+C is better than population A+B, which contradicts the intuition of neutrality. So the intuition is false. And since it is false, we cannot ignore the elephant in the room, namely the value of population change.

Now this raises the question of how we should value population change. Guy has already discussed the non-identity problem and the harm principle. The lesson I drew from Guy's talk is that we have to look for some way of aggregating welfare to measure how good and bad outcomes are. One idea is that we look at the total welfare. We might find some way to sum up individual welfare into a measure of total welfare. Alternatively, we can look at average welfare in the population. The crucial problem is that we need to find a reasonable principle and there is no consensus here. This problem is now acknowledged in the latest IPCC report:

“To plan an appropriate response to climate change, it is important to evaluate each of the alternative responses that are available. How can we take into account changes in the world's population? Should society aim to promote the total of people's wellbeing in the

13. For a more detailed discussion of the neutrality intuition, see (Broome 2004, 2010).

14. Actually, pace Broome, I don't think many people hold the intuition of neutrality but rather the more limited Asymmetry Intuition: We have no moral reasons for or against creating people with positive welfare stemming from the welfare these people would enjoy, but, on the other hand, we have moral reasons against creating people with negative welfare stemming from the negative welfare these people would suffer. Hence, we are only “neutral” about adding people with positive welfare. See (Arrhenius forthcoming, 2000; McMahan 1981; Parfit 1982).

15. Giving up full comparability isn't sufficient to save the neutrality and asymmetry intuition, see (Arrhenius forthcoming) and (Broome 2004).

world, or their average wellbeing, or something else? The answer to this question will make a great difference to the conclusions we reach.” (IPCC Fifth Assessment Report, 2014)

The IPCC is certainly right about this. Let’s look at the two alternatives the report mentions. The first is that when we evaluate future populations in respect of population change we look at the total welfare in the different possible outcomes, and rank these outcomes by how much total welfare they contain. According to this view, Total Utilitarianism as it is called, we should maximize the total amount of welfare in the world. So if there are more people with lives worth living then that’s better.

Now a problem with this idea, which Guy already mentioned, is that it leads to the *Repugnant Conclusion*. Total welfare can be increased in two ways when the size of the population is no longer given: by keeping the population at a constant size and making people’s lives better or by increasing the size of the population by adding new people with lives worth living. So, according to Total Utilitarianism, a future with an enormous population with lives barely worth living could be better than a future with a smaller population with very high individual quality of life. But the idea that it would be better to radically increase the world’s population at the expense of future people’s individual welfare seems repugnant and rather a reason to reject Total Utilitarianism. It is an instance of Derek Parfit’s infamous Repugnant Conclusion:

*The Repugnant Conclusion:* For any population consisting of people with very high positive welfare, there is a better population in which everyone has a very low positive welfare, other things being equal.<sup>16</sup>

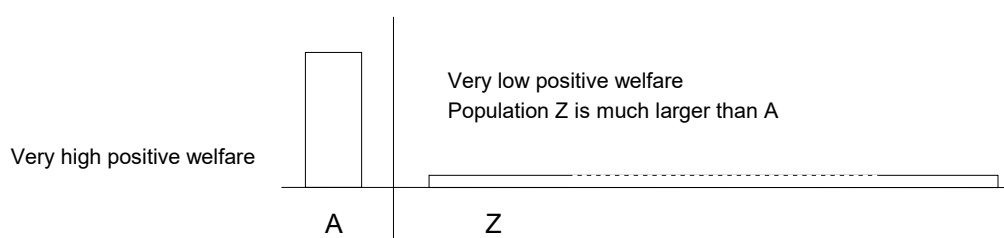


Diagram 3

In diagram 3, the width of each block represents the number of people whereas the height represents their lifetime welfare. Dashes indicate that the block in question should be much wider than shown, that is, the population size is

16. See (Parfit 1984 p. 388). My formulation is more general than his. The *ceteris paribus* clause in the formulation is meant to imply that the compared populations are roughly equal in all other putatively axiologically relevant aspect apart from individual welfare levels.

much larger than shown. These populations could consist of all the past, present and future lives, or all the present and future lives, or all the lives during some shorter time span in the future such as the next generation, or all the lives that are causally affected by, or consequences of a certain action or series of actions, and so forth. All the lives in the diagram have positive welfare, or, as we also could put it, all the people have lives worth living. The A-people have very high welfare whereas the Z-people have very low positive welfare. The reason for this could be that in the Z-lives there are, to paraphrase Parfit, only enough ecstasies to just outweigh the agonies, or that the good things in those lives are of uniformly poor quality, e.g., eating potatoes and listening to Muzak.<sup>17</sup> Or it could be that the Z-people have quite short lives as compared to the A-people. We could imagine that in A, the people live for, say, 80 years whereas in Z the average life expectancy is, say, 35 years, like in some developing countries today. However, since there are many more people in Z, the total sum of welfare in Z is greater than in A. Hence, a theory like Total Utilitarianism, according to which we should maximize the welfare in the world, ranks Z as better than A --- an instance of the Repugnant Conclusion.

As the name indicates, most people find the Repugnant Conclusion a reason to reject Total Utilitarianism. Indeed, the idea that we can make the world better by expanding the population at the expense of future people's individual quality of life seems very counterintuitive.

So now what about maximizing *average* welfare in the world? This is what Average Utilitarianism tells us to do. Actually, in the case of the A and Z populations the average principle gets the right answer since the average welfare is much higher in A than in Z. Hence, Average Utilitarianism avoids the Repugnant Conclusion. So it seems like a good proposal. Unfortunately, it has other problems. One problem with maximizing average welfare is that it implies that it can be better to add one group of people to the population rather than some other group, even if each person in the former group has a life that is not worth living and each person in the latter group has a life that is worth living. This is illustrated in the following diagram:

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17. See (Parfit 1984 p. 388) and (Parfit 1986 p. 148).

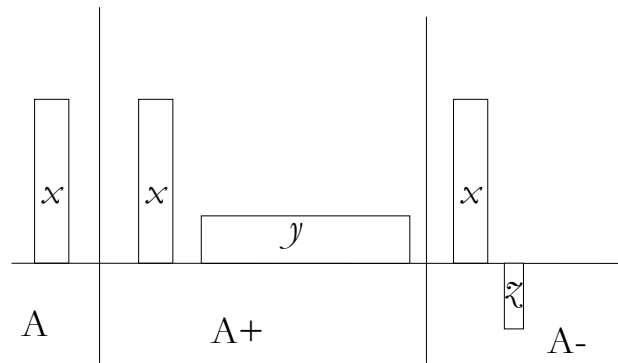


Diagram 4

Here, we have the A population where the x-people's quality of life is very high. Assume that we can either increase population either by adding the y-people that have quite low but positive welfare—their lives are worth living—or by adding the z people, all of whom are suffering horribly—their lives are not worth living.

Since adding a lot of people with very low but positive welfare can decrease the average welfare of the population *more* than adding fewer people suffering horribly, it might be better, according to Average Utilitarianism, to add the suffering lives (the z-people) rather than the lives worth living (the y-people). Again, we have a very counterintuitive conclusion on our hands. This is what I call *the Sadistic Conclusion*:

*The Sadistic Conclusion:* It can be better to expand the population by adding people with very negative welfare rather than adding people with positive welfare, other things being equal.

Now we are beginning to see the problem that they are alluding to in the IPCC report. The problem is that there may be *no principle* for evaluating populations that isn't in some way very counterintuitive. It is that there may be *no principle* for evaluating populations that isn't in some way very counterintuitive. This idea started with Derek Parfit. He presented a number of paradoxes in population ethics, and now we actually have a number of impossibility theorems that demonstrate that you can have certain very compelling adequacy conditions (principles), which almost everyone accepts, and yet these conditions cannot be mutually satisfied. Trying to satisfy all of them at the same time leads to contradiction. These conditions are of the type that we have been considering—for example, what I call the *Egalitarian Dominance Condition* which states that one population A is better than another same-sized population B if A is perfectly equal and every person in A is better off than every person in B. This condition is incompatible with several other compelling conditions, including conditions that are formulated to rule out the Repugnant and the Sadistic Conclusions.

Impossibility theorems of this kind put us up against the wall. We don't really know how to proceed in population ethics in light of these theorems, and that is one of the pressing problems here. Actually, this is to a certain extent acknowledged in the IPCC's fifth assessment report:

So far, no consensus has emerged about the value of population. Yet climate change policies are expected to affect the size of the world's population, and different theories of value imply very different conclusions about the value of these policies. This is a serious difficulty for evaluating policies aimed at mitigating climate change, which has largely been ignored in the literature.' (IPCC Fifth Assessment Report, 2014)

The research on how to interpret the impossibility theorems and what conclusion to draw from them is still in its infancy. There is now a budding literature on finding a reasonable way out of the stalemate that the impossibility theorems seem to have put us in and more work needs to be done in this area.

My own hunch, and I can only hint at it here, is that in practical contexts such as how to evaluate different responses to climate change, we might not need a full-fledged population theory but can rely on partial uncontroversial principles such as, for example, that it is better if people are better off than worse off, and that we shouldn't increase the number of suffering people. Of course, it is eminently unclear whether such partial principles will suffice for all the cases we need to compare. That in turn depends on what options are available, so we need to look into that (here, demographers can be of great help). And perhaps we should try to avoid putting ourselves in situations with alternatives for which we need more elaborated theories to determine what is the better outcome.

As I said, this is just an undeveloped hunch and it is far from clear that this approach would work in the end. There are other proposals on how to escape the challenge from the impossibility theorems but I'm now running out of time so we have to leave those to the discussion period. I hope I've at least convinced you of the importance of this area of research (and perhaps inspired you to think more about it). The results coming from the empirical environmental research suggest that we probably need to radically reconsider how we live our lives. Similarly, one might say that the troubling impossibility results from moral philosophy indicate that in this area we also need to think in radically new terms and reject entrenched and seemingly reasonable ways of thinking.<sup>18</sup>

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18. I would like to thank Tim Campbell, Göran Duus-Otterström, Johan Rockström, Orri Stefánsson, and especially John Broome with whom I've discussed these issues for over 15 years, for very helpful discussions and comments. Thanks also to the audiences at the Uehiro-Carnegie-Oxford Conference on Global Warming-Environmental Ethics and Its Practice, New York, 29 October, 2015 for useful questions and comments. Financial support from the Swedish Research Council is gratefully acknowledged.

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