Climate change and energy transition

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Chapter 1

A central component to climate change is carbon dioxide, which is highly related to our energy use. Transitioning to a climate friendly global lifestyle, we must keep in mind the wish to keep our energy budget stable. Energy availability is tightly correlated with both economic growth and Human Development Index, neither of which are generally desired to reduce.

When discussing climate problems, there is an intrinsic need for an interdisciplinary approach. There are for instance questions raised by science concerning whether we have entered a new geological epoch, how we might get to a stable and sustainable system regarding climate, and how we might bring justice to those who greatly damage the climate. However, each of these questions have normative-, psychological-, and sociological- dimensions.

1.1 The Anthropocene

The concept of the Anthropocene, the age of man, wherein humans have the greatest control over the earth, is highly present in the climate change debate. While the question: "Have we entered the Anthropocene?" is a matter of natural science, the attitude towards it is a philosophical matter.

There are those who fully embrace the Anthropocene, and wish therefore to take responsibility for the maintenance of the earth.

This approach stands in great contrast one wherein the Anthropocene is despised, but seen nevertheless as inevitable. This approach typically does not lead to taking responsibility.

Belatedly, but more responsible, are those who wish to limit the Anthropocene, mitigating and reducing the negative impact humans have.

There are also other terms proposed against the term "Anthropocene", for instance Homogenocene or Eromocene. Respectively, the age of homogenisation and the age of loneliness (both referring to biodiversity loss).

1.2 Sustainability

Sustainable development is defined by the WCED as development that meets the needs of the present without comprising the ability of future generations to meet their own needs. This definition limits itself greatly to human ability, and does not properly define the needs current-, and future- generations have.

The assumption is that this “sustainability” is indeed possible, partly because the ethical and political implications of not meeting the needs to the present are too-repugnant to consider. This belief is not based in empirical evidence, but rather a matter of necessary hope.

Part I

Climate Change

Chapter 2

Values and Climate Models

There is a certain level of uncertainty regarding climate change. There are various details for which conflicting evidence exists. We do know however that we are not altogether wrong about anthropocentric climate change. Climate sceptics almost never pass even the lowest bar for counting as scientific, but then again, so do many historically-fringe opinions which we now count as fact.

While we know that climate change is largely-, if not primarily- caused by the emission of greenhouse gasses. The extent to which each affects the global rise in temperature, is not entirely known. Much like, local effects as opposed to global ones, various chemical reactions, threshold-theories, and various other facts.

One may claim that we are to simply adhere to those facts that are exposed to us through use of the scientific method. However, there are various scientific methods, whose exact parameters are not rigid. Among scientific models there are inductive-, deductive-, and abductive- ones, each with their own threshold for "truth".

2.1 Models

A large part of the scientific study of climate change is climate modeling. The aim of a model is to simplify a given environment (called "the target system") to predict the impact of various changes to said environment. Climate models in particular often combine various models, such as atmospheric-, tectonic-, and glacial- models, and various complex interactions between them.

We use our models to predict outcomes and inform action, though, due to the fact that models are – by definition – simplified, the modeled outcome rarely *entirely* conforms to reality.

An "ensemble model" is a model which combines the average output of various models which are calibrated for slightly different purposes. With an ensemble model, we can project how uncertain we are about a given outcome by analysing the divergence of each model to the ensemble model. Using an ensemble model however relies on certain assumptions, such as all models being equally good in measuring, and that each of them are scattered around the "true" value.

While there are good reasons not to use ensemble models (such a rejecting one of the assumptions made for using such models), they do show an important matter of philosophy of science, that being that no hypothesis is every entirely certain. Meaning that scientists, in accepting theories, make certain value judgements which lie outside the realm of hard-science.

There is for instance the matter of tolerating false negatives and false positives. In the case of the climate discussion, false negatives are often extremely catastrophic, whereas false positives are a matter of wasted funds. This might lead one to tolerate false positives but not false negatives (or rather a probability of a given negative being false), but this is a value judgement which ought to be made by a greater community than merely the scientific one.

Such a case is argued by Jeffrey, who states that scientists should only express their expert judgement, not their descriptive claims. Who then is left to make descriptive claims? This question is not answered to Jeffrey, though a compelling case can be made to not merely leave this up to the public, nor to a group working entirely separately from the scientists publishing the probabilistic facts.

Winsberg argues against Jeffrey and states that scientists can make value judgements *if* they are transparent about their values. To what extent we *can* be transparent though is not entirely clear. The value-leadenness of a model lies in the details, not all of which are obvious to the scientists themselves, let alone the public,

Chapter 3

Climate Economics

3.1 Social Discount Rates

In the case of averting and reverting climate change, the question of cost dispersal is a big topic. The costs of reversion are high, and the potential agents capable-, and obliged-, to pay are spatially and temporally dispersed, as are the victims. Temporal dispersion is particularly problematic, as there is no straightforward way to assign *current value* to future generations. Economists have formalized this problem as $\delta + \eta \cdot \gamma = \rho$ where

$$\begin{aligned} \delta &= \text{Pure time discount rate} \\ \eta &= \text{Marginal increase of utility per unit of wealth} \\ \gamma &= \text{Elasticity of wealth growth} \\ \rho &= \text{Social discount rate} \end{aligned}$$

3.1.1 Pure time discount rates

Using this way of calculating the social discount rate, we encounter problems, largely because this method was intended for economics. For instance, with a social discount rate of 5%, one death today would equal a billion deaths 400 years from now, and 5% is a rather modest discount rate (in the intended economic context). However, giving no social discount rate, the threat of eventual extinction – which, no matter how far off, seems currently inevitable – would overrule all current considerations.

In the discussion of social discount rates, there is a distinction to be made between pure time discounting, and growth rate discounting, with the labels speaking for themselves.

In the case of time discount rates, when applied to moral considerations, the question is asked in what way one's position in time is relevant to moral status. These arguments are particularly popular with utilitarians. In objection is said that having no time discount rate is unduly demanding for current generations, as it requires too many sacrifices on our account. To solve this, utilitarians introduced growth discounting.

3.1.2 Growth discount rate

Since future generations will have more wealth, we ought not pay for them, for it unjust for the poor to pay the expenses of the rich. This makes it such that current generations do not need to make great sacrifices, whist still maintaining that one's position in time is irrelevant to moral consideration.

While this principle on this own allows us to delay action, there are further considerations which make such delays problematic. It is for instance uncertain weather certain problem can still be solved in the future, weather future generations will be wealthier (in every sens of the world, monetarily, demographically, ecologically, etc.)

Rather than delaying action, one may instead argue for deferring costs. This would imply that we take action now, but push the cost of action to future generations. The amount of cost that may be deferred is dependent on the discount rate, and the damage caused by inaction, and non-deferral. Furthermore, not deferring costs is politically unrealistic.

Chapter 4

Sustainability

Sustainability is not necessarily a matter related to climate change, it is tightly interwoven with all matters of environmental justice. On its own, "sustainability" refers to some ability to perpetuate a certain practice without being self-destructive. Depending on the area of application, the particular matter in which sustainability is addressed differs. In commercial fields, there is often need for a comparison of different sustainable areas, such as sustainable manufacturing versus sustainable finance. In philosophy, such comparisons are less important. In both cases, sustainability combines facts about what is possible with wishes with what is desirable. A further consideration is the locality of sustainability, where certain practices are sustainable for individuals, they are not sustainable globally, and vice versa.

All of the above considerations lead to three primary question in the philosophy of sustainability. Those Being: What should be sustained, what sustainability dimension we should emphasise, and why is sustainability desirable.

4.1 What should we sustain?

The debate about what ought to be sustained is often discussed in terms of difference in capital (originating in economics). For instance, we might wish to sustain natural capital to the detriment of artificial capital. In this debate, desirability and possibility are very important.

In the debate, two types of sustainability – the weak-, and strong-conception – come forward. Weak sustainability refers to the practice of maintaining total capital. Replacing one type of capital for another is totally fine as long as the same functions are performed. The strong conception requires the individual capital stocks to be maintained. As such, even if all natal functions can be replaced artificially, a reduction in natural capital is not justifiable. Strong conceptions of sustainability might allow for exchanges within each capital stock, such as exchanging animal capital for plant capital because both fall under natural capital. Stronger versions would not allow this.

4.2 Which dimension of sustainability should be emphasised?

Typically, sustainability is viewed in three pillars, those being: societal-, environmental-, and economic- sustainability. The question then is what the proper distribution is for focusing our efforts. Such a three pillar conception is less popular amongst philosophers of sustainability, though it is prevalent amongst economists.

Philosophers focus on supply-side versus waste-side sustainability. These are not necessarily related, and one will not necessarily lead to the other.

Furthermore, depending on which concerns are included in our notion of sustainability, certain matters become possible of impossible. For instance, when interspecies considerations are included, certain interpretation make, for instance the concept of: “sustainable fishing” conceptually impossible.

4.3 For which purpose?

Sustainability ultimately comes down to human well-being. Well being must be sustained so that future generations have the ability to meet their needs, preferably just as well as we do, or better. Here too, there is a difference between economists and philosophers, as sustainable economic growth is seen my many philosophers as an oxymoron. Philosopher focus instead on human development, though this matter is also tightly linked with economic growth.

Typically, the sustainability debate becomes one of theories of justice, though with an additional ecological angle. The theories of justice considered typically include intergenerational, global, and interspecies concerns. Alongside the aforementioned ecological concerns, these theories are often called “planetary justice”.

Chapter 5

Democracy

A decision-making-process can be called "democratic" if it derives its legitimacy from the people who are affected by the decision. As a collective depiction-making-process, democracy essentially entails a kind of equality of decision makers at the vital stage of the process.

Democracy is not desirable under every circumstance, and not every variant of Democracy is equally desirable either. There is for instance often a trade-off between directness and effectiveness, where direct democracy is seen as too time consuming to be effective in large states. This leads into the discussion concerning who should be included in the decision-making-process.

In the case of environmental concerns,there are two major approaches to this latter question. The first is the cosmopolitan answer, which bases its approach on the all-affected-interests answer, which leads to a globalist approach. Alternatively, there is the eco-anarchist response, which holds that the political community has to be local, and that – in the case of environmental concerns – each ecosystem requires its own tailored approach and therefore a local governmental body.

5.1 Desirability

According to Jean-Jacques Rousseau, there is a difference between individual interests and general will. People ought to base their vote on what is best for society. Through democracy therefore, we get insight into the general will, therefore leading us to desirable outcomes. Furthermore, through the democratic process, we gain moral-, and civil-freedom through self-governance.

In modern times, the so-called “instrumental justification” is used. This does away with Rousseau’s idea that democracy produces good depictions, instead claiming that it produces better depictions than any other process. Furthermore, through engaging in the democratic process, we develop a stronger moral character.

Both of these accounts are littered with holes, as there is no obvious way in which the epistemic state of the individuals of a state are related to justice and good outcomes. This problem is reinforced by populism as well as the complexity of issues and of the democratic processes itself.

Democracy is also argued for due to its intrinsic values, such as quality, fairness, and freedom. This does not change the fact that minority opinions are rarely represented in democratic systems, and there are also various simply strong opinions represented to various extents. Resolving these problems goes against the intrinsic value of equality.

5.2 Ecological democracy approaches

A frequently proposed solution in environmental literature to the problems with democracy is the ideal of deliberative democracy. In a deliberative democracy the engagement with- and discussion of- ideas is of utmost importance. Nevertheless, democracy – of any form – cannot guarantee the realisation of adequate climate policies. As such, there are now growing voices for aristocracy where an eco-authoritarian body decides on climate policies. Such solutions however face the issues of cooperation and legitimacy.

Chapter 6

Compound problems of climate justice

Climate change is, by all accounts, a moral problem, but exactly how and where the moral dimensions of climate issues lie remains a question with many obscuring factors. Some of these confounding actors have already been covered in this course, such as intergenerational-, international-, and (to a lesser extent discussed) interspecies- considerations.

One major further problem comes from the *global* element in "global warming". This element entails that global action is necessary. One primary concern for the global community is where to focus our collective efforts, the primary options being: mitigation, adaptation and damage control. In the worst case scenario, this discussion leads to a lack of action in every area.

Collective action problems in general result from diversity in action for individuals, or – in this case – individual states. This diversity in action arises through various mechanisms, for instance through a lack of knowledge. This lack could be inherent, for instance when research on the matter at hand is inconclusive, ongoing, or simply not done. Though the lack of knowledge can also come from simple ignorance, willful or otherwise. There is also the matter of individual restrictions, where action is much more costly for some individuals than others. Lastly, there is also the matter of rational self-interest where, in a prisoners-dilemma like-scenario, it is better for a given individual not to cooperate *given* that others do cooperate. Climate change is of course a matter of collective action because it is concerned with a public good. Fundamentally though, a stable climate is not optional, but rather an essential public good, thus making action a moral *demand*, rather than a moral *desire*. Nevertheless, one can enjoy a stable climate without contributing to its maintenance.

The non-identity problems, raised by Parfit, was (and partially still is) a large part of the intergenerational concerns for climate change. Currently, this matter is often addressed in manners which still leave us with a moral obligation to future generations. Approaches include historical justification, generational overlap, and earth stewardship approaches. All of these approaches allow for the central claim of the non-identity problem, namely that we cannot have obligations for non-existing agents, because they might never come into existence, and yet require us to take action. The method that departs most from classical intergenerational approaches is the so-called stewardship approach, which postulates that we have a duty to the earth itself, rather than the future generations that live on it. The earth, as an enduring patient, carries our responsibilities to future generations. The historical justification points out that we do in fact feel and observe that humans have concern for future generations, even if this is not expressible in the analytic philosophical system. The generational overlap approach uses the fact that many generations live at one, with each having responsibilities for the rest. As such, we have no responsibility to unborn generations (as is claimed by the non-identity problem), but we do have obligations for the young and vulnerable. This considerations allows for the forming of a chain which carries through all the way to generations in the far future.

Chapter 7

Cultural-, and interspecies-considerations

Climate burdens go beyond monetary considerations as we have various mitigation and adaptation burdens which results in certain losses being exchanged for certain wins. For instance, as we transition to cleaner energy sources, and traditional jobs are lost, not only are people's well being affected monetarily, this also affects culture and identity. Likewise, culture and identity will be diminished by a lack of climate action.

In the section above, four different angles are already discussed. Concisely these are:

1. Mitigation burdens
2. Adaptation burdens
3. Impacts of climate change when mitigation is lacking
4. Implants of climate change when adaptation is lacking.

All climate concerns will likely include several of these dimensions.

Claire Heyward writes about these issues, though her analysis is largely limited to cultural loss in the case of low-emitting nations. Focusing not on cultural change or adaptation, and not on losses of high-emitting nations.

The latter half of this lecture was on interspecies considerations, I was unable to attend this part. See Plamer's text

Part II

Energy Transition

Chapter 8

Justice and Energy

While climate change is ongoing with ever increasing risks, and greater projected consequences to a lack of mitigation. A major part of our negative climate contribution is the emission of atmospheric carbon dioxide due to the burning of fossil fuels. Since the energy availability that results from the burning of these fuels leads to an overall higher state of well-being, transitioning to a new form of energy to mitigate climate change, must not lower this level of well-being through a reduction of availability.

Energy ethics and energy justice have historically taken second place, given less attention in comparison to climate justice and climate change. Despite this, the energy transition ahead of us is by par the largest, most unprecedented transition thus far, with us both using more energy than ever and more fossil fuels than ever.

Energy injustice is furthermore already present. Many people lack aces to electricity and many more depend on solid fuels, thus drastically lowering their standard of living compared to countries where electricity is pervasive. Energy production also is highly correlated with human rights abuses such as poor working conditions and forced labour.

8.1 Midway ethics

Midway ethics is an approach towards moral dilemmas where we do both historical and ethical analysis, thus energising empirical science and moral theory. This position is developed because neither self-denying idealism (qua Rawls) is not a convincing stance, though neither is self-centered realism (empirical answer).

This system does borrow a lot from both of these unsatisfactory positions, such as Rawlsian reflective equilibrium. This is a system where we reflect on principled, adjust them based on new information, and reflect again.

Chapter 9

Carbon capture and Storage

Carbon capture and storage[1] is heralded as a potentially game chaining technology, allowing for the mitigation-, or complete aversion- of climate change whilst allowing the continuation of business as usual. Despite its great promises, CCS has many problems facing its implementation including placement, financing, and cultural impact (or lack thereof). These roadblocks often lead to considerations of justice.

9.1 Implementation justice

The implementation of CCS technologies by developed countries allows undeveloped nations to have access to cheap energy, of instance through coal plants, while mitigating their climate impact. This addresses the concern of injustice in disallowing developing nations to develop, as aces to cheap and abundant energy seems to be a prerequisite for national development.

When talking about resource depletion however, the implementation of CCS would accelerate the problems regarding this. CCS facilities, both in capture, transport, and storage require energy. Therefore, for every four current coal powered plants, we would need to build a fifth just to power the CCS facility. Thus causing a 25% increase in resource depletion.

Furthermore, there are limited sites where we could store carbon underground, requiring a porous rock capped by a dense rock to keep the carbon from leaking out. These sites are also a scarce resource which will run out.

[1] henceforth CCS

Furthermore, the location of both capture and storage facilities raises issues of environmental degradation, both in terms of biodiversity loss and ascetic considerations.

9.2 Technological justice

There are also risks associated more closely with the technology itself.

There are for instance risks of leakage associated with both transport and storage of carbon dioxide. To what extent we wish to accept those risks is a matter of justice. After all, complete inaction is extremely risky, though complete inaction is not an option whatsoever. Compared then to other possible mitigation strategies, for instance how we measure the risks of implementing CCS with chance of leaking in comparison to implementing fully renewable energy production with associated risks, is not a straightforward matter.

Furthermore, most CCS technologies available now use a lot of water in the capture process, which is a resource not captured within mere-carbon-thinking. These technologies are furthermore protected under patents with the aim to financially incentivise innovation, though in practice it also reduced free and open collaboration and iterative improvement.

There is also the matter on maintenance. CCS storage facilities in particular need to be maintained for centuries if we wish to prevent leakage. This commits future generations to fix our problems in a manner not too different from requiring them to mitigate climate change directly. This discussion is often accompanied with the maintenance costs of nuclear-waste storage and associated risks.

9.3 Responsibility

There is also the question of *who* ought to implement and finance CCS. As mentioned earlier, there is a case to be made that developed nations ought to take this burden. Though there are also those arguing that the main polluters ought to pay, be that current polluters or historical ones.

There are also discussions regarding whether it is even morally good or morally required to invest in CCS. This is often based on a rights based perspective, where, due to the scarcity of resources, perhaps we ought not invest in CCS, but rather in renewable energy, as investment in CCS diverts financial assets away from morally good causes.

9.4 Inaction

One major problem with CCS and all other negative emission technologies[2] is the problem of inaction. In short, NET allows countries and companies to overshoot their carbon budgets as long as they have the crutch of CCS and NET. Worries are that large scale implementation of CCS would stifle innovation in renewable technologies. Furthermore, as CCS becomes cheaper, as emerging technologies tend to do, they will further increase the financial attractiveness of coal pants. This still leaves us with the problems of resource depletion, overconsumption, and non-carbon environmental degradation.

Prosperity without Growth; Tim Jackson

[2]Henceforth NET

Chapter 10

Nuclear energy and the far future

Nuclear energy is a core part of the energy transition discussion. Back before nuclear energy was widely developed – and critically – before the major accidents such as Chernobyl and Fukushima, nuclear energy was seen as a better, alternative to renewable such as wind and solar power due to the latter's low density. Currently, the discussion sill focuses on these aspects, though a core of the discussion is also the idea that nuclear energy may be necessary – at least as a transition technology – if we wish to advert climate change.

The risks of Nuclear facilities, aside from meltdown accidents, also include nuclear waste storage. Due to the long lived nature of depleted uranium, storage facilities need to withstand centuries of corrosion and other changes. This matter also raises the issue of how to warn sentient beings in the far future about the dangers of these facilities.

Dangers are of course not exclusive to nuclear reactors. There are even those who view climate change as one of the dangers of fossil fuel plants. Nuclear every must therefore be viewed in comparison with other energy technologies, and the risks of not having enough energy available.

Through the combination of all of these factors, the temporal dimension of Nuclear power considerations is unprecedentedly long. Due to this lack of precedent, our ethical-, and economic- theories are not well suited to address Nuclear Energy. This is influenced furthermore by the fact that the threat of climate change is both largely nebulous and far into the future.

10.1 sustainability

Depending on our definition of sustainability, Nuclear energy fits the definition to a greater or lesser extent. Critically, nuclear energy is largely sustainable when it comes to atmospheric carbon dioxide, though it is not when it comes to natural resource depletion. These two angles are incommensurable, meaning that one cannot translate resource depletion into a carbon-equivalent.

Sustainability addresses the question of the needs of future generations. Determining those needs is not a trivial matter however, especially when addressing the time frame over which nuclear energy is relevant. As the "needs" can be defined by each individual, we do not want to limit the needs of future generations by limiting things which we do not consider needs, but they might.