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# DISTRIBUTIVE JUSTICE AND CLIMATE CHANGE: THE WHAT, HOW, AND WHO OF CLIMATE CHANGE POLICY

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Distributive Justice and Climate Change: The What, How, and Who of Climate Change Policy

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Abstract: The goal of this paper is to examine climate change through the lens of distributive justice. In doing so, it will attempt to answer how three important questions of distributive justice apply to climate change policy. These questions, what is the object of distribution, how should this object be distributed, and among whom should this distribution take place, will be the topics of the topics of the first, second, and third sections respectively. Through this examination, it is the hope of this paper that certain policy recommendations and climate change strategies can be developed which adequately take into account both the goods that contribute to the well-being or capabilities of people, as well as the negative impacts climate change has on them. It will be argued that when we view climate change in this way, it can be seen as a capability depriving force that limits development, and that climate change policies that focus on technology transfer and energy innovation are most equipped to deal with these problems.

**Introduction:**

Climate change is perhaps the most interesting and complex ethical issue that the world faces today. It is a problem that the vast majority of people have contributed to in some way, one that affects everyone and everything on the entire planet in varying degrees. It has political, ethical, economic, scientific, and technological facets. It has been correctly labeled "A Perfect Moral Storm"[1] by Stephen Gardiner and is an issue that can be viewed in a myriad of ways. This paper will examine climate change from a distributive justice standpoint. The goal of looking at climate change in this way is to take a closer look at the distribution of harms, benefits, and responsibilities, and how these should influence international climate change policy. In doing so three questions of distributive justice will need to be answered: What is the object of distribution, how ought it best to be distributed, and finally among whom should this distribution take place, or to say it more simply, who should be the beneficiaries and benefactors of this distribution.

Section 1 will argue for the appropriateness of such an approach to the climate change problem and proceed to look at the "what" question of distributive justice. Section 1 will suggest that the object of distribution ought to be benefits from emissions. In doing so, it will show how fully accepting this as our object of distribution changes climate change policy. Section 2 will then examine how benefits from emissions can and should be distributed and will argue in favor of international technology transfer programs as being the most fitting approach. Finally, section 3 will look at among whom this distribution should take place. More specifically it will address who should pay for technology transfer programs, who should receive them, and why this is the case. It will

argue that developed nations who have most benefitted from emissions are not only the most capable of leading technology transfer programs, but that they have a moral responsibility to do so.

The main goal of this paper is not to argue for very specific actions to take or principals to follow, but instead to show some of the benefits of viewing climate change as a distribution and poverty problem that affects capabilities and development. In framing the climate change problem this way, we may be able to identify areas where current climate change policy is lacking.

**Section 1.0: The Appropriateness of Using Distributive Justice**

The practice of distributive justice is usually called upon when there is a limited amount of some desired good that is spread out amongst a given population in a seemingly unjust or unfair way. The appropriateness of using this type of thinking to examine climate change is made evident in Peter Singer's essay "One Atmosphere." Just as his title suggests, Singer argues that we all share one atmosphere. He compares the current situation of atmosphere pollution to a village where everyone puts their waste down a sinkhole. At first this hole seemed so large that some of the people in the village, who were better off, and had higher rates of consumption, used the sinkhole much more than others in the village. As time went on it became clear that this excessive usage of the sinkhole led to an overflow of waste. In addition to rendering the sinkhole full and no longer a valid site for waste, this overflow led to a foul odor and an increase in sickness in the town. Those who overused the sinkhole, without regard for the consequences of doing so, did not leave enough sinkhole space for other contemporary, or future, villagers. In this example the limited sinkhole space becomes a resource or good that needs to be monitored and distributed more evenly amongst the villagers. Some redistribution or control appears to be needed in order to preserve the health of the sinkhole and the health of the village.

Singer here draws from Locke's idea of leaving "enough and as good" resources for others.[2] In Singer's village example the villagers that are contributing more than their fair share of waste to the sink hole are leaving neither enough space for other current and future villagers, nor are they leaving behind a condition that could be classified as being "as good" as the one they experienced. Singer states, "For the sink belongs to us all in

common, we are depriving others of their right to use the sink in the same way without bringing about results none of us wants."[3]

As the effects of climate change have become more evident and as climate science continues to project the disastrous possibilities of the continued pollution of the atmosphere, it is clear that our one atmosphere is a limited resource that perhaps has already been used past its limit. As we pass carbon dioxide levels of 400 parts per million, which is over 100 parts per million more than the earth has experienced at any point in the last 400,000 years[4], we are seeing noticeable effects this unprecedented increase is having on temperature, sea level, ocean acidification, more extreme weather events, and decreasing amounts of ice mass. This combined with the fact that certain groups of people are using up far more of this atmosphere than others, and that everyone will experience changes in their quality of life regardless of how much they have contributed to the shrinking of this resource, make climate change a ripe topic for distributive justice to examine.

There are many ways to go about examining climate change from this distributive justice standpoint. It is an unfortunate fact of climate change that the distribution of contributions to climate change and the distribution of experienced climate harms do not align. Those that contribute to the problem the most are not the ones who will be forced to face the extreme consequences of these actions. In fact, just the opposite seems true. As Dale Jamieson points out, it is the rich who are disproportionately using a global public good and it is the poor who will be disproportionately harmed.[5] The distribution of present and future climate harms is such that many of the nations that do not contribute to climate change, such as those in the Alliance of Small Island States who

emit about 1 half of 1% of the global emissions[6], will have to deal with the most extreme impacts and losses, such as sea level rise, drought, and more frequent extreme weather events.[7] Examining the fairness and distribution of contributions and harms is one way distributive justice can help us unpack the climate change issue.

Henry Shue utilizes another consideration of distributive justice when he asks questions such as what are fair allocations of the costs to prevent and cope with climate change effects, what background allocation of wealth would ensure that this international bargaining is a fair process, and finally what is a fair allocation of emissions of greenhouse gasses.[8] Examining fair allocations and what background allocations ensure a fair process are key distributive justice issues. In applying this line of thinking to climate change, one could say that it is most fair to have those who have contributed to climate change the most pay for prevention and adaption efforts. Someone who supported such a view could argue that a country whose emissions have contributed greatly to the climate change problem, like the United States, ought to fund the relocation efforts of those in the Pacific Islands who will lose their homes at no fault of their own.

This paper will primarily view climate change as a development limiting force that has arisen from an uneven distribution of contributions to climate change. In pursuing their own development goals, nations such as the United States have contributed greatly to the creation of current and future climate harms, which negatively influence the development options of lesser-developed nations. To invoke Singer and Locke again, through uneven contributions to climate change, the developed nations have not left "enough and as good" development potential for the many struggling nations. It may now be against the best long-term interests of these undeveloped nations to pursue

development through carbon based energy sources. Although it may benefit these nations in the short-term, developing in this way could contribute to future extreme climate harms, and possibly the destruction of their entire way of life. Like the villager in Singer's example who has an immediate desire to increase consumption, but is forced to worry about the future impacts this consumption could have on the health of his village, these nations have been unfairly dealt limited development options. This dichotomy of climate change policy and development planning needing to deal with short-term interests as well as long-term effects will be a constant consideration throughout this paper.

In summary, an uneven distribution of development related goods, has led to an uneven distribution of climate related harms. Analyzing these two uneven distributions, examining what object of distribution can lead to the creation of these goods while not contributing to the harms, and discussing what sorts of changes in distribution or compensation for harms ought to happen, is the primary objective of this paper.

**Section 1.1: The Object of Distribution**

Often discussion of distributive justice in climate change go immediately to the "how" and "among whom" questions. Singer also moves to this step after establishing the appropriateness of viewing climate change from a distributive justice standpoint. He discusses strategies such as implementing tradable carbon credits distributed based on population size, which would discourage a continued usage of fossil fuels in developed nations while giving those lesser-developed nations some bargaining chips. This and

other strategies make the reasonable assumption that emissions are the object of distribution. This is the assumption that I wish to contest here.

There are two key considerations of distributive justice that we must keep in mind. The first deals with the distribution of goods and can be thought of as the positive consideration. In this positive aspect, there is an object of distribution that should be a good or resource that a certain population lacks. The object of distribution should be scarce, lacking, or limited in some sense, since obviously if it were unlimited, or easily accessible to all, there would be no need to distribute it. The object should be some resource or good since if it has no use or value it would not really matter if it were distributed in some unjust manner. Similarly, the object should be beneficial to or desired by those in the population it will be distributed among. If some portion of the population has no desire or use for the good in question, it would not make much sense to give it to them. Even though yachts are a limited good which may be desired by many, distributing all the yachts in the world evenly amongst the entire earth's population would not be sensible since large portions of the population would have no water to use one on. There are certain objects of distribution that may not meet all of these positive criteria, but I will take those that do meet them to be the most suitable objects of distribution.

The second consideration of distributive justice deals with the distribution of harms and contributions to these harms, and can be thought of as the negative aspect of distributive justice. It is important to keep in mind the point mentioned earlier about the distribution of contributions to climate harms. It is often the goal of distributive justice to examine ways to limit the amount of harms one group can cause, how to distribute the cost of compensating for these harms, and even ways to distribute the harms that will

inevitably come. This again goes back to the "enough and as good" idea and will examined more fully in sections 2 and 3. We must not only be concerned with distributing goods and benefits but also with distributing and controlling climate harms, the ability to cause these harms, and with providing compensation for, and protection from, these harms.

The next step then is to determine if emissions meet these criteria of what an object of distribution ought to be. While emissions were at one time not considered to be a limited resource, in that we can seemingly produce as much emissions as we please, it is clear that emissions should be capped or held to a limit for the sake of the planet and those inhabiting it. Allowable emissions are then, in a sense, limited.

We could perhaps find it useful to draw on Henry Shue's distinction of "subsistence emissions" and "luxury emissions."[9] After determining what a reasonable per capita emission cap should be, we could then define anything over this as being "luxury emissions" that could then be taxed or punished in some way. In this sense emissions do seem to satisfy the criterion of being limited. Emissions appear to be useful in that they lead to certain goods or benefits such as faster travel, refrigeration, air conditioning and heating, and entertainment. However, this connection is not as strong as it could be since each of these can be achieved in many ways that do not rely on carbon emissions, namely through alternative energy sources. Emissions appear to be necessary contributors to the harms we are concerned with distributing, but not necessary contributors to the benefits we are concerned with. Therefore it is unnecessary to view emissions as though they are, and always will be, a necessary element of our day-to-day lives that we need to figure out how to distribute justly. Emissions are not a resource that

leads to a good; instead they appear to be a harm that results from one way of creating some good.

Going back to Singer's village comparison, we can see that the waste in the village, like emissions, is a harm that results from pursuing some good. It is not a desirable resource, good in and of itself, that ought to be distributed. If the waste were redistributed so that every villager created an equal amount of waste, the problems in the village would still continue since the sinkhole is already overflowing with waste. Even so, the village may succeed in reducing and more evenly distributing the waste by establishing some excess waste tax or tradable waste credits. One of these may be the best strategy for the village since, presumably, the waste being created is a necessary byproduct of the villager's daily life.

Drawing again from Shue, we could distinguish between "subsistence waste" and "luxury waste." The villagers will necessarily produce some waste just as a by-product of actions needed for survival. They should not be punished for this necessary waste, but perhaps some distribution strategy could be implemented to discourage the creation of any "luxury waste." Since Singer says that some of the villagers consume much more than others, and thereby, produce more waste, there does seem to be a need to redistribute or redefine how much waste is acceptable for a villager to produce. Since the waste is a necessary byproduct, which means that there cannot really be any strategies that change the way of life of the villagers in order to produce a different type of waste, these types of distribution strategies may be the best course of action.

Carbon emissions do not appear to be at the same level of necessary existence as the villager's waste. Carbon emissions are not fundamentally necessary for sustenance,

and the vast majority of the ways we use carbon emissions for current sustenance could be obtained through the uses of other forms of energy. While current practices or technologies may make this improbable, it is in theory true that all the ways in which we currently use carbon to fuel our desires and needs could also be satisfied by some combination of wind, solar, nuclear, and other non-carbon based energy sources. Just like in the village, the problems of climate change will continue even if we begin to distribute emissions more justly across the globe.

This is not to say that emissions distribution is not an important piece of the climate change puzzle, as they aren't completely going away any time soon. Emissions have played a crucial and necessary part in the creation of the climate change problem, so it makes sense to think they need to play a part in its resolution. It is important to both distribute the rights to emit equitably and to persuade certain countries to emit less or use less carbon intense energy sources. Methods like carbon trading and carbon taxing, which are emission focused approaches to climate change, may help in slowing, and perhaps eventually stopping, climate change effects. All I am hoping to point out here is that emissions do not appear to be the most optimal object of distribution. Emissions are ultimately an unnecessary means to a desirable end and I believe the problems of climate change can be better answered if we instead examine other means to these desirable ends, as well as these ends in and of themselves. Strategies that focus on emissions as our object of distribution may lead to desirable changes and outcomes, but I think if we change what we are focusing on distributing, these desirable changes and outcomes can be achieved more directly and efficiently. It is unnecessary and in many ways counter-productive to view emissions as crucial to our positive aspects of distribution, i.e.

development, and as a good that ought to be distributed. What we are in search of, and what should be our main focus, is something that can provide this development, while not further contributing to unnecessary harms.

Lukas Meyer and Dominic Roser in their article, "Distributive Justice and Climate Change. The Allocation of Emission Rights" also ask the question "what is to be distributed?" They state it is "Emissions of course" but qualify that what they are really interested in are the "benefits from emissions" or more precisely, "the benefits from emission generating activities."[10] They make this distinction and then swiftly move once again to talking about emissions trading, perhaps not fully realizing the importance of their distinction. The word that should be focused on in the phrase "benefits from emissions" is benefits, not emissions. And if it is benefits, such as faster travel or refrigeration, with which we are really concerned, once again we can point out how unnecessary emissions really are. There is no need to lump these benefits and emissions into the same object of distribution as if they are inseparable. With ongoing innovations in energy production it is becoming clear that there are many alternatives to emission producing energy sources that can lead to these same benefits, or will be able to replace these carbon based energies in the somewhat near future. Since emissions are neither necessary, nor the most optimal object of distribution, especially with regards to the positive aspect we are concerned with, why don't we just focus on what Meyer and Roser are really interested in: benefits. And since we have divorced benefits from being always and necessarily conceptually linked to emissions, we are not ultimately concerned with what Meyer and Roser call "benefits from emission generating activities" but instead with benefits from any reliable and sustainable form of energy.

**Section 1.2: Defining Benefits**

We have already touched on what some of these benefits might be. Things like faster methods of travel, refrigeration, electricity, and even many forms of entertainment. For the sake of time and practicality, an attempt to list off every benefit someone can gain from having an energy source is not desirable. We must attempt to define these benefits in another way. It seems most of the benefits one gets from having an energy source take the form of energy leading to some technology which enables the person to do something faster, easier, better, or something entirely new. These benefits are often connected to the general welfare or well-being of the person. However, while I'm sure a solar panel could be hooked up to a device that charges an electric toothbrush, we should be concerned with more substantial benefits. These benefits could be something like energy leading to a way to distribute medicine faster so as to increase length of life, the refrigeration of food to cut back on waste and certain illnesses, or even the ability to interact with other people via phone or the internet, which encourages an exchange of ideas and perhaps political participation, are. The OECD (Organization for Economic Co-operation and Development) measures well-being in terms of available jobs, health, housing, civic engagement, and health of environment,[11] and are the sorts of characteristics I have in mind.

These types of benefits are closely related to what Amartya Sen and Martha Nussbaum promote in their versions of the capabilities approach. Essentially, this approach focuses on improving the level of functioning a person has, and their ability and freedom to achieve this functioning. Sen defines functionings as "beings and doings"

where beings are states like being healthy or being educated, and doings consist of actions such as the ability to travel or participate in politics. Capabilities, according to Sen, are then the real possibilities of freedom a person has to achieve a variety of functionings of their choosing. To put in his words capabilities are, "the substantive freedoms he or she enjoys to lead the kind of life he or she has reason to value."[12]

Nussbaum provides a list of what she calls, "central human capabilities." These central human capabilities include things like, not dying prematurely, good health, the ability to move around as one pleases, having adequate education, having control over one's environment, ability to participate in political decisions, ability to hold property, and the ability to enjoy forms of entertainment. In the realm of climate change this could also include having safety against future climate harms. Again I am not sure if attempting to come up with a specific list is the correct way to go about defining capabilities or, for our purposes, benefits, since there are an innumerable amount of capabilities and benefits across a myriad of cultures that would be hard to capture under some basic activity or title. Nevertheless, Nussbaum's list gives us an idea of what types of things we have in mind when speaking about capabilities. Anything that results in a person, "Having greater freedom to do the things one has reason to value,"[13] and their abilities to actual accomplish these things, would be an improvement and increase in capabilities.

Having a reliable form of energy can surely lead to an increase in the possible functionings and capabilities a person has, or an improvement in the capabilities and functionings they currently have. Having a lamp which stores energy throughout the day so it can be used at night to allow a child to read or study for school is an example of an energy source leading to a certain benefit or improvement in this child's human

capability. An energy source leading to a person being able to digitally receive news of a political decision or governmental meeting may lead to this person increasing their participation in the politics that affects their life, leading to an increase in control this person has over their environment and context. In his book "Development as Freedom" Sen calls poverty "capability deprivation." (87) Since areas that don't have a reliable form of energy from which to derive benefits are typically also poor areas, the lack of reliable energy can also be thought of as a capability depriver.

Moving back to our original goal, we can take benefits from activities that result from an energy source to be very closely related to the thing that Sen is promoting his capabilities approach. These benefits are the increase in possible human functionings a person is capable of achieving that result from having a reliable source of energy. Therefore the goal of distributive justice in regards to climate change is to ensure that everyone has a reliable source of energy so as to meet a certain level of capabilities. However, since controlling and limiting emissions is still an important element of the climate change problem, we need show how this capabilities approach answers this need. For if all we cared about were increasing the level of functionings and capabilities of people in poor undeveloped parts of the world, we could achieve this through emission producing forms of energy. Since much of what has been discussed is operating at the conceptual level, it is important to refocus on the practical effects changing our distribution focus may have, were it to be accepted.

Here it is important we focus not only on the present capabilities but on future capabilities as well. Since it is clear that if we continue to pollute and emit carbon into the atmosphere the entire Earth will drastically change in ways that will destroy the

livelihoods of people across the globe, continuing our reliance on emission generating energy sources will eventually lead to a large decrease in the level of capabilities many people have. On this topic Felix Fitzroy and Elissaios Papyrakis say, "Since unhindered climate change will deprive the poorest in future generations of the basic capability of survival, for which there is no compensation, current polluting practices are simply ethically unacceptable."[14] Entire nations going underwater due to rising sea levels is really the most capability-depriving event one can imagine aside from death. People's entire ways of life and their desired functionings will be destroyed if we continue to rely on carbon emitting energy sources. The problems of the world's current energy production are obvious and this benefits/capabilities focused approach has no trouble accepting that. As pointed out earlier in our efforts to divorce benefits from emissions, benefits, or now capabilities, are not reliant on emission producing forms of technology. There is no reason not to pursue other forms of energy production, and in fact it is in the interest of capabilities that we do. Therefore the benefits we should focus on and attempt to distribute are really benefits from reliable and sustainable energy sources that lead to improvements in functionings and capabilities. Pursuing these alternative energy sources answers the concerns of both the positive and negative senses of distributive justice. It leads to the creation of present benefits while also keeping future harms in check.

It is worth briefly noting that there is some debate over whether it is truly economically worth it to spend all the money and effort on changing our current energy situation to prevent future costs and problems. Some believe that it makes more sense to address these problems when we are truly forced to face them decades in the future as we will all be more wealthy and, therefore, more able to adequately and efficiently address

them later on. The rate at which the economy will grow, how much climate damages will actually cost, and how much switching to other energy sources now will actually save us are all empirical questions that are up for debate. William Nordhaus, for instance, has promoted a discount rate such that future costs and benefits halve in less than 13 years, and suggests current action is not economically desirable.[15]

I do not claim to know what the correct discount rate should be, or what condition the economy will be in 100 years from now. Weitzman and Gollier believe that no one can even claim to know such a thing as they argue that there is no deep principle or underlying theory that support this sort of extrapolation of past returns into the distant future.[16] A complete discussion of the reasonableness of different discount rates, and whether addressing the issues of climate change now or deep into the future would be more desirable, would take quite some time to fully untangle. I will just state that I believe pursuing policy now that can lift the real capabilities and well-being of current and future peoples should outweigh any very uncertain beliefs over the trajectory of the global economy. It will also be touched upon later that innovations in energy and the switch to new energy sources can takes decades to implement. If what is argued for in this paper is reasonable then discount rates should not apply, as plans to change energy production will need to begin immediately if we are to adequately address the urgent need for climate change.

There are a few more things we should keep in mind if we are to accept this benefits/capabilities approach. One important advantage of this approach is how successfully it can accommodate differences in cultural norms and practices. Since climate change is obviously a global problem, affecting very different societies in very

different ways, our approach to solving this problem must respect and take into account this diversity. If our goal is to prescribe the increase of reliable sources of energy into the areas lacking in benefits/capabilities, we must be wary of assuming, or even encouraging, that different cultures should use these energy sources in the same ways or to the same extent as those whom developed them. Luckily, since energy can be used in a seemingly infinite number of ways, and since the desired functionings of a person or society are generated from that person or society, cultural uniqueness and traditions can still be maintained. A solar panel can be used by an Indian family to illuminate some religious shrine, or it can be used by someone in Africa to power a light that attracts and kills mosquitos. Energy can be used in cultural specific ways to pursue culturally specific functionings and prevent culturally specific harms.

One area where this approach seems possibly worse and harder to implement than the emissions focused approach is that benefits, functionings, and capabilities are not easily measurable entities. Focusing on emissions is nice in that we can directly measure how much a country is emitting and can then decide what to do about it. This is harder to do with our new approach. Although there are statistics we can use to analyze benefits and capabilities, like those used in welfare economics, it is difficult to believe they will be as empirically supported and as easy to measure as emissions are. I believe we can accept this fact and still support the benefits/capabilities approach. It seems plausible to me that a country could identify a need for an increase in some energy source to allow for some new technology, say refrigerators, and that we can support the decision to provide this new technology based on our benefits/capabilities approach. Capabilities may not be

measurable but they are certainly identifiable. This is something to keep in mind and we will come back to it when we discuss the how and among whom questions of distribution.

**Section 1.2: What This Means; Setting the Stage**

If we take benefits from emissions or capabilities to be our main focus then there will be obvious implications for how we carry out climate change policy. Here it is clear that under our new view climate change can be seen as a poverty and developmental problem in addition to being a pollution or strictly environmental problem. Although limiting emissions is an important aspect of how we need to tackle the climate change problem, this and more can be done efficiently and effectively if we change our focus. Climate change, just like poverty or oppression, is a capability depriver. It threatens ways of life, destroys homes, and exacerbates the problem of limited avenues of development in struggling nations. All of these problems can be answered through innovations in energy and distribution of these forms of energy. Whether it is nourishment from food or power generated from solar or wind, energy is the source of all action, all functioning, and all capability. Energy is the key and necessary aspect to the fulfillment of many of our desired functionings. Technology often enables us to achieve the desired "beings and doings" put forth by the capabilities approach.

Here it is important to point out that the purpose of this paper is not to argue for or against any energy source that might meet this sustainable and reliable requirement. All we must think about when it comes to choosing which energy source to use is to ask is it reliable, so as to ensure our functionings and capabilities are secure, and is it sustainable, so as to ensure that our functionings and capabilities will not be harmed in the future.

Determining whether this is best accomplished through wind or solar or nuclear is not a goal of my argument. The only point I hope to show is that carbon based energy sources do not satisfy these requirements of reliability and sustainability. While there may be controversies surrounding the use of nuclear and the benefits or risks of implementing it, we will not get into those intricacies in this paper.

If we should move away from focusing strictly on carbon emissions then it will be necessary to replace the climate strategies and policies that relied on them as their object of distribution. A policy that places emphasis on lifting capabilities, promoting development, and does not contribute to future climate harms is needed. The next section will show how the points made above manifest themselves as we put them to practice, and argue that centering international climate change policy around technology transfer is the direction in which we should head.

**Section 2.0: Why Technology Transfer**

Before we move on to discussing the specifics of how and why technology transfer is the most fitting approach to solving many of the climate change problems, it is necessary to define what I mean by technology transfer. To fit with our discussion on energy and climate change I will take technology transfer to be any strategy or program in which some developed nation is focused on improving the current and future capabilities of the citizens of some lesser-developed nation by transferring some combination of technology, knowledge, and skills. In the realm of climate change this will usually be in the form of innovations in renewable energy. Later in this section more will be said on the specifics of how this ought to be done but first it is worth pointing out some additional ways in which technology transfer programs are more successful than other frequently discussed climate change policies and strategies.

David Schlosberg makes the point that per capita emissions approaches fail to take into account the possible differences in capabilities people can have. He states,

> The per capita approach, however, does not take into account the variation in the needs of people living in different places; rather, in its equal distribution of emission shares, a basic recognition of the differences of place is simply dismissed. Yet living in unlike places and environments, and with different ways of life with varied needs, means that we might consider differential allocations, more locally defined. To give one example, a unit of carbon allocation will provide a different level of basic need to the person in a mild climate than another in a harsher environment.[17]

While it is conceivably possible for emissions focused approaches to take into account this variance, doing so will require recognizing capabilities or benefits from emissions as the key object of distribution. Having to define how much certain emissions benefit some people in comparison to others also rids emissions approaches of their one real benefit, the exactness to which emissions can be measured and distributed. Instead of

being able to distribute emissions purely based on population, defining how emissions will be used, and how beneficial they will be to certain communities, forces those who promote these strategies to have to attempt to define and measure the benefits that result from emissions as well.

It may seem that any strategy that results in some underdeveloped country receiving monetary benefits, say through a cap-and-trade strategy, would lead to an increase in the capabilities of the citizens of that country. Sadly this is often not the case. Transparency International has developed a scale that measures the amount of corruption present in the government and businesses of each nation. While they admit that no country on Earth is completely free from corruption, their research shows that much of South America, Africa, the Middle East, and Southeast Asia, register as highly corrupt.[18] These areas are home to some of the most underdeveloped nations, as well as the nations who will feel the impacts of climate change the hardest. A country like Australia needing to pay for the carbon credits of a place like North Korea may result in Australia wanting to reduce their emissions, so as to no longer need to pay for more carbon credits. However, due to the corruption present in a country like North Korea, little to nothing will be done to increase the capabilities of North Koreans, which we have determined to be our main focus. Why trust a corrupt government to do what is best for its citizens when it may be possible to work together with them?

Through technology transfer programs, a less corrupt and more developed nation will also have something at stake in the success of the strategy, and can help to ensure it is carried out accordingly. Giving a corrupt country money without any way to efficiently regulate how that money is spent to combat climate change is clearly not the most

efficient way to ensure capabilities are increased. In a perfect world cap-and-trade may be connected enough to benefits and capabilities to be a desirable option to combat climate change with, but corruption makes this an unviable choice. Through the cooperation needed to successfully implement technology transfer programs this corruption can be avoided and cultural diversity can still be respected.

This combined with the points argued for earlier, that carbon trading and taxing do not adequately address distributing benefits while also reducing harms, shows that technology transfer can succeed in areas where carbon taxing and trading may struggle. Technology transfer is more directly connected to real capabilities and well-being. Technology transfer programs are able to successfully address both the negative and positive aspects of distributive justice. These programs can distribute and provide benefits through improvements in energy and technology, which leads to improvements in welfare. These benefits can be provided while the harms resulting from the emissions of developed nations are reduced as new energy options are created and improved.

As long as these programs are done well, they will be directly connected to increasing the capabilities of real people and do not rely on the good will of corrupt governments or economic happenstance. While there will surely still be some uncertainty in how technology transfer programs pan out, since part of these programs will be in the hands of corrupt governments, and since there are still economic aspects to technology transfer in the form of investment and implementation, I believe technology transfer is still able to more directly connect with the capabilities of actual people. Technology transfer programs have the advantage of being able to be highly specific and focused. A problem that is limiting the capabilities of a group of people can be identified and then

solved through the introduction of a new technology. One of the points argued for here is that in addition to industrial scale technology transfer programs focused on limiting emissions, smaller programs designed to lift specific capabilities can and should be pursued. There are millions of people who will not feel the benefits of improvements in a nations large-scale energy efficiency, but are still in need of capability-lifting technologies.

For instance, there are areas in Africa where wood is difficult to find. Led by the International Energy Agency and the group Technology Without Borders, a German tech company provided three different types of solar stoves to sixty-six families in South Africa where there was a problem with finding wood to use in preparing food. The team involved in providing these stoves followed up by interviewing 200 households to determine which of the three stoves satisfied the criteria of being safe, user-friendly and reliable. While some work still needs to be done on this project, there are now solar stoves on sale in markets in South Africa for as cheap as $30.[19] As development continues this price will continue to go down and the stoves will become more and more commercially viable.

This technology transfer program was able to find a specific problem that was limiting the capabilities of some group of people, identify a technological solution to that problem, and conduct research to determine the success of its implementation in order to make adjustments accordingly. While there are certainly still limitations with current solar stove technology, such as energy storage and the ability to use them at night, this case of technology transfer is a good example of how these types of programs should be structured. Those working on this project noted that to help ensure success in future

programs, "Technical development must be defined by the needs of the user, assessing if a technology is suitable to a region and its people is critical, and technological modifications are often necessary to conform to local conditions."[20] Since this type of foreign aid is relatively new, it is to be expected that not all instances of technology transfer will be successful. As more technology transfer programs come to fruition, the specifics and guidelines that best ensure their success can be practiced and refined.

This is clearly more consistent with our capabilities/benefits focus than, for instance, hoping South Africa uses money gained through a carbon trading system to help these villages cook their food, or that carbon taxing leads to some innovation in a developed nation which could at some point in the future be used in a South African Village. These communities are outside the group of people who would feel the benefits of industrial scale energy improvements and are often overlooked when it comes to policies focused on emissions. Technology transfer programs are capable of satisfying a certain level of specificity that brings these communities back into the picture.

This specificity also connects back to one of the advantages of focusing on capabilities. Since a person's capabilities are reliant on their specific circumstances and desired functionings, the fact that technology transfer programs can recognize and act according to these specifics is another reason technology transfer appears to be an appropriate match. Technology transfer programs are able to identify culturally specific problems and then work together with people in that culture, like in the example of interviewing households in South Africa to determine which solar stove was the best fit and how it could be improved. Energy and technology are both powerful and highly adaptive capability promoters. They can be shaped and reshaped to address essentially

any need, improve the efficiency or possibility of any activity, and fit any culture. This ability to be specific and modifiable are two of the key reasons technology transfer programs are so apt at fulfilling the needs of international climate change policy.

Technology transfer programs have the advantage of being able to be molded into a macro strategy that can address nationwide energy improvements or into a micro strategy where particular capabilities lacking in a certain area are focused on. In sections 2.1 and 2.2 potential problems that arise with this micro approach are addressed, and in section 2.3 what is needed for success on the large scale will be discussed.

**Section 2.1: Energy With a Human Face**

In his 1973 book "Small is Beautiful: Economics as if People Mattered" E. F. Schumacher promotes the idea of "technology with a human face." Although the state of technology has changed drastically in the 43 years since Schumacher wrote about it, his views on the role technology should have in helping lesser-developed countries develop are still pertinent today. Schumacher feared that many technology transfer programs run the risk of "making human hands and brains redundant."[21] Development programs focused on technology transfer should provide tools that encourage and promote the use of "the priceless resources which are possessed by all human beings, their clever brains and skillful hands,"[22] instead of technologies that completely remove or overly expedite certain practices or traditions. Schumacher called the technology that keeps this priceless resource in focus "intermediate technology", or also, "self-help technology", "democratic technology", or "people's technology". These forms of technology are not exclusive to the ultra rich or knowledgeable and are easy to understand. They are not overly complex

but are still improvements on the ancient or indigenous technologies of those whom would receive it. Schumacher noticed even back in the 1970's that technology was becoming more and more complex and often superfluous. He believed that for things like technology transfer to actually lift the well-being of those in the undeveloped parts of the world we needed to "make things simple again."[23] What most underdeveloped countries need are tools to help them secure basic human needs and desires. Improving ways to obtain and store food, travel, communicate, and learn are some examples of these needs and can be thought of as being similar to the essential human capabilities that we noted from Nussbaum back in section 1. Satisfying these types of needs and lifting these types of capabilities should be the primary focus of the micro technology transfer programs. After these essential capabilities are met, a slow increase and evolution in technological complexity can take place if doing so will also increase capabilities.

By bringing unneeded or overly complex technologies to the third world we can run the risk of doing the opposite of what we have defined as our goals. On this point Sen states, "economic development as we know it may actually be harmful for a nation, since it may lead to the elimination of its traditions and cultural heritage."[24] Instead of lifting the capabilities of those in underdeveloped countries we may end up drastically damaging their culture and essential ways of life. I agree with Schumacher that we must be wary of diminishing the importance of "clever brains and skillful hands." For example, since many of the communities in lesser-developed nations still rely on small-scale subsistence farming, immediately assuming that providing these communities with the latest John Deere tractor and an iPhone may be harmful. Doing so could potentially lead to a destruction of many of the cultural values present in that community. While this may lift

their capabilities in some ways, by giving them more free time and the means to acquire useful information, doing so also results in a loss of the priceless resource Schumacher promoted For centuries these "clever brains and skillful hands", have been crucial tools in ensuring the capabilities of these cultures. It will often be better to provide these communities with technologies that can enhance their already defined skill sets and cultural norms, not technologies that attempt to redefine these skill sets. Again this is not to say that those developing the technology transfer programs are in a position where they can determine what is best for these other cultures. Reconciling traditional cultural values with new technologies is a pragmatic challenge that must be addressed with constant communication between the parties involved.

This again gets back to the point mentioned earlier that cultural diversity must always be kept in mind. Technology should be used to address issues identified by these cultures as being problematic and as was noted in the example on solar stoves, "technical development must be defined by the needs of the user." Imposing any technology or way of life onto a community because we, the "developed" nation believe it to be better would most certainly be detrimental to the culture of that community. Potentially harming this is a factor we must constantly be aware of. Schumacher promotes providing these small, simple, or intermediate technologies, and then letting the culture of the area take over in shaping and evolving how these technologies grow and improve.

Schumacher quotes a British Overseas Development group's definition of the aims of foreign aid as being, "To do what lies within our power to help the developing countries to provide their people with the material opportunities for using their talents, of living a full and happy life and steadily improving their lot."[25] The key words here for me

are “their talents.” These culturally specific talents are what technology transfer programs run the risk of putting in danger. Technology has the force and influence to immediately change the way of life of whoever uses it. We must be cognizant of this fact as we plan what type energy, and subsequent technologies, fit well within the cultural framework of the communities we are trying to assist. Immediately prescribing whatever technology works or is popular in New York, Tokyo, or London is both arrogant and counter-intuitive. It would be wrong to assume technology can be prescribed like a medicine that treats all diseases equally no matter where it occurs. The goal of the technologies in question needs to be well thought out and defined, and this is accomplished through constant interaction between the parties involved. There is a great deal of literature devoted to development studies and these sorts of issues. While I am not an expert of development, I believe this point on the importance of dialogue and interaction, especially in regards to these small-scale, capability-oriented technologies that are being transferred between vastly different cultures, should be uncontroversial. It may help to look at another example of a successful technology transfer program and how this dialogue and interaction contributed to its success.

In 1984 American engineer Harold Burris founded a solar energy company in Kenya whose focus was on providing energy needs for households and schools in rural Kenya.[26] Instead of developing the technology in America and using American citizens to transport and install the necessary systems, Burris developed a training and educational program for young unemployed Kenyans who were then tasked with learning about and installing the solar equipment. The fact that Kenyans themselves were the ones who understood this technology and took part in its implementation had great effect on it

spreading across the country. Sales of solar equipment rose to over 100,000 units. It currently sits at around 20,000 systems each year and there are more than 40 Kenyan manufacturers that now provide this service.[27] The fact that Kenyans were included in the process and trusted with taking it over led to the solar market in Kenya developing with little support from other nations. Since Kenyans understood the technology and were in command of its implementation, solar energy spread throughout Kenya quickly just by word-of-mouth. Seventy-five percent of those who use solar said they first learned of it by hearing about it from friends and neighbors.[28] The fact that Burris included Kenyans in on the project and worked with them in the beginning phases of this solar movement played a huge part in the success and efficacy of solar in Kenya.

Just like in the example of the solar stoves in South Africa, a constant dialogue between those involved in developing the specific technology and those who are in need of some technological assistance, in order to figure out which form of the technology is most easily understood, helpful, and relevant to the problems being faced, is necessary. This dialogue allows for those leading a certain technology transfer program to understand what type of technology is really *needed.* The culturally specific capabilities of the community, the talents of those in the community, and how the new technology will harm or reinforce these talents while still in the technological development process, can all be taken into account.

Amartya Sen is again helpful in summarizing the points made in this section as he writes, "If a traditional way of life has to be sacrificed to escape grinding poverty or miniscule longevity, then it is the people directly involved who must have the opportunity to participate in deciding what should be chosen."[29] Energy and technology both have the

ability to take into account the specific capabilities these communities may have, and can be shaped in an innumerable amount of ways. This flexibility allows them both to truly have a "human face" in the way Schumacher promoted.

**Section 2.2: Some Initial Worries**

There are a few obvious concerns that arise whenever we discuss strategies whose aim it is to aid development in struggling nations. One of the questions that pops up when it comes to technology transfer programs is how to make sure the country receiving aid does not develop some dependence on those giving the aid. Especially when it comes to technology we can run the risk of the underdeveloped country adapting to the new technology and becoming reliant on its creation and distribution. Instead of taking the technology and shaping it into their own, the underdeveloped country could just become another consumer, reliant on, and desperate for, more technological aid.

Since the goal of technology transfer programs should not be just to put a technological Band-Aid on whatever problem it is addressing but instead to introduce new tools which can lead to the creation of a new and improved environment that reduces poverty and fosters capabilities, it will be useful to take a step back and view what kind of poverty we are really focused on.

Schumacher is again useful here as he points out that there are material and immaterial forms of poverty. He believes that the material forms of poverty, like lack of wealth or property, result from the immaterial forms of poverty, such as lack of education, freedom, organization, and discipline.[30] These immaterial forms of poverty are akin to another tenet of the capabilities approach that has been mentioned earlier:

substantive freedoms. Things like the ability to live a long life, engage in political discourse, and obtain a satisfactory education are all substantive freedoms that reduce immaterial poverty and increase capabilities. On first glance it may seem like technology transfer is more concerned with material poverty, since after all, technology is often seen as a form of material wealth. But really the goal here is again to provide tools that can lift people from immaterial poverty and secure their substantive freedoms. Technology transfer can assist a community in improving important attributes beyond material wealth and possession, such as their education, health, and political participation. New technologies can assist in removing certain concerns a community may have over the security of basic capabilities, such as obtaining adequate food, and can enable them to expand their desired functionings into activities that improve these types of freedoms.

Anytime anyone receives help they, for a time, depend or rely on those helping them. This however does not mean they should not be helped. It may be true that technology transfer programs will create an initial state of dependence. But if these programs can successfully combat immaterial poverty, then those societies who once were dependent upon aid can eventually develop and flourish on their own. As mentioned earlier, eventually these societies can begin to shape the provided technologies into something new and unique to their circumstances, moving beyond the stage of dependence. As was seen in the example of solar panels in Kenya, if those receiving aid are fully a part of the initial stages of the technology transfer program, this initial dependency can be very brief or seemingly nonexistent.

There are some more practical worries that arise from the implementation of technology transfer programs. For instance, Kenneth Markowitz, a clean energy and

environmental legal consultant, states, "enforcement of intellectual property law is one of the greatest concerns of industrialized countries and private vendors when conducting business in developing economies. Companies are often unwilling to initiate projects or sell their technologies in countries where there is a reasonable likelihood that their products will be copied and sold for less money by local firms."[31] These rights have been strengthened recently as more countries involved in international trade have begun to enforce basic copyright and trademark protection. Also the risk of companies losing money due to cheaper local competition has been lessened as both international organizations, like the Global Environment Facility, and individual nations, such as India and the United States, have established financial incentives to promote the transfer of climate change related technology. On this topic Markowitz in 2007 stated, "India, for example, established financial incentives, including excise tax relief and facilitated loans, to promote foreign private sector engagement, particularly with regards to renewable energy. The U.S. Department of Commerce estimates that the market in India for renewable energy is worth $500 million, that it is growing at an annual rate of 15 percent and that with these mechanisms in place it will continue to grow efficiently."[32] These incentives and the reduction of the use of tariffs have made investing in technology transfer programs both financially and practically more reasonable. This discussion of investment and the practical needs that must predate the actual creation of technology transfer programs will be touched on more in the subsequent section.

**Section 2.3: What Needs To Be Done**

Before the most recent Conference of Parties (COP21) in Paris, Bill Gates released a document titled "Energy Innovation: Why We Need It and How to Get It." Gates starts off by saying the following:

> In 30 years the world will consume much more energy than it does today. This should be good news. Wherever access to reliable, affordable energy goes up, so does the quality of life. But today more than 1 billion people lack access to the most basic energy services. Energy keeps schools and businesses running, city lights shining, tractors plowing, and cars and trucks moving. Without plentiful energy, the poverty rate could not have dropped by more than half since 1990, and hundreds of millions of people would have been denied the opportunity to improve their lives.[33]

Here Gates seems to be agreeing with the main argument in this paper. He identifies poverty as being intricately woven into the climate change debate, the need to lift people out of poverty by improving their capabilities, and that it is best to do this through providing reliable and affordable energy. By linking reliable, affordable energy to quality of life, he sees changes in our current state of energy production as being crucial to addressing the positive side of distributive justice. Distributing reliable, affordable energy to undeveloped nations will lead to an increase in the benefits and capabilities whose importance was argued for earlier. Gates states that even if climate change did not exist energy innovation should still be one of our main priorities for these very reasons.

Gates also notes how energy innovation is crucial in addressing the distribution of, and contribution to, climate harms that have come from our current energy schemes. He writes that more than 80% of the energy used today comes from fossil fuels. In order

to limit warming to 2 degrees Celsius, which is the goal many suggest we should aim for, the world's largest emitters must reduce their emissions by 80% by 2050, and we basically need to move away from fossil fuels completely by the end of the century.[34] Since to the most recent IPCC report states that energy-related greenhouse gas emissions account for around 70% of total emissions[35], the only viable way to meet these goals, and to limit the future capability deprivation resulting from climate change, is to switch to alternative sources of energy. While alternative energy has been improving in terms of efficiency and cost, estimates coming from the IEA (International Energy Agency) show that with current wind and solar technologies we can only hope to cut the worlds annual emissions by 22% by 2050.[36] There are glaring flaws in these energy sources. For instance, ways to efficiently store the energy gained through sunlight and wind to be used while the sun is not shining and the wind is not blowing need to be addressed before these alternative energies can really take the place of carbon on the global scale. The only way around problems like these is innovation. We simply do not have the technology as of now to realistically ask the world to move away from coal. Doing so now would actually cause a reduction in capabilities in many parts of the world.

Gates believes that government and private sector investment is critical to successfully growing and improving alternative energy sources at the rate we need it to. Due to the fact that energy investments take such a long time to pay off, because of the hurdles faced in implementation and transition, it is often unwise for investors to take the risk in hoping their investment pays off decades down the road. For instance, Gates uses data from the International Energy Agency to show that the pharmaceutical and

information technology industries invest 20% and 15% of their respective revenues in research and development while the energy industry invests only 0.23%.[37]

Since this is a sad fact about the nature of energy technology, Gates believes government funding plays a crucial role in shrinking this gap. Unfortunately, the United States government, for example, has provided drastically little support when it comes to funding research and development. The U.S. government directs only 0.4% of its total energy spending into research and development. In terms of percentage, this is 22 times lower than what is spent on defense and military research.[38]

The private sector also plays an important role. Gates admits that the financial risks usually outweigh the financial rewards when it comes to investing in clean energy.[39] Here he calls on investors "who can afford to be patient, and whose goal is as much to accelerate innovation as it is to turn a profit."[40] Luckily, many other billionaire investors, who share this patience and good will, have joined Gates in the Breakthrough Energy Coalition, where they plan on investing billions in energy research and innovation.

Also joining these private investors, 20 nations, including the United States, China, Germany, India, and the United Kingdom, are vowing to double their spending on research and development. These improvements in the state of energy innovation have just taken place over the last year so we are still waiting to see how successful these initiatives will be, but it is a promising start. These leading nations moving away from carbon emitting energy sources while also innovating new ways for undeveloped nations to develop, will hopefully significantly reduce future climate harms while distributing energy benefits.

I agree with Mr. Gates that investing more in energy innovation is the way forward as it is the first step in implementing technology transfers programs and new energy sources. Since completely switching from carbon based energies to current alternative energies would result in a loss in capabilities for much of the developed world, energy innovation is necessary. However, it is also important to remember the ideas of Schumacher presented earlier in this section, and how they apply to the strategies proposed by Gates. Bill Gates may accurately tell us "why we need innovation and how to get it" but he doesn't address how we should use it.

Innovation and investment are key elements needed to improve the state of technology transfer. In regards to large-scale technology transfer programs that deal with a nation's infrastructure, basic ideals like efficiency or cost can shape how these programs proceed. However, when it comes to small scale technologies, specific human needs and desires need to be taken into account. Gates only focuses on what is needed to get energy innovation off the ground, which is important, but more needs to be said on what needs to be done to ensure that these innovations are applicable, useful, and actually desired. Improving solar efficiency or battery storage capacity are needed, but only focusing on blind improvement, and not how these energy sources will best be used by those who need them is ignoring the "technology with a human face" that Schumacher promoted. The technological innovators need to be in constant communication with those who need the technology in order to ensure the technology being created can be shaped in ways that most adequately and efficiently improve capabilities. Programs like the one mentioned earlier in the solar stove and solar in Kenya examples are essential to the success of the technology transfer process. Programs that identify a problem or need,

create ties between the manufacturers and those who will eventually use the technology, and adjust the technology being created to fit specific cultural and environmental contexts, need to be the tech transfer norm.

While there are many possible technology transfer programs that could proceed and succeed with current energy technologies, the innovation Gates is after is still needed for technology transfer to adequately address the giant problem that is climate change. Improvements in things like the storage capacity of batteries and the efficiency of wind and solar are necessary first steps that must be taken before technology transfer can really take off. Since energy on its own is in a sense "faceless," the worries of Schumacher that technology must have a "human face" can be shelved until these innovations are met, and then brought back into focus when these new and improved energy sources are used in powering technologies that will lift essential capabilities. In many ways energy is without direction until it manifests itself in powering a certain technology. While the basic characteristics of energy sources, such as relying on solar or wind, will be determined by the characteristics of the area they are being used in, it is not until these energy sources are applied to power actual technologies that our detailed concerns of culture and specific capabilities need to be discussed.

Again it is worth noting the potential this sort of approach has. In Gates' conclusion he notes that, "It is hard to overstate the impact that clean, affordable, reliable energy will have. It will make most countries energy-independent, stabilize prices, and provide low- and middle-income countries the resources they need to develop their economies and help more people escape poverty—all while keeping global temperatures from rising more than 2 degrees."[41] However, this type of approach does take time.

Innovating and then applying these innovations to address specific needs will take decades of work and communication. If we are to reduce emissions by 80% by 2050 as Gates suggests we must, our efforts must start immediately. As mentioned earlier, while innovations are underway, there are many successful technology transfer programs that could be implemented now. Even programs focused solely on increasing efficiency in large-scale power sources would be extremely beneficial. Patrick Thollander and Jenny Palm point out that, "a shift toward improved energy efficiency in industry is crucial to limiting carbon dioxide emissions."[42] Of course it will also be necessary for these nations leading innovation efforts to not only implement programs to share these innovations with developing nations, but also to transition into using these new energy sources themselves.

**Section 3.0: Who Pays and Why?**

The question of who should fund and lead technology transfer programs was touched on in the last section and has been an underlying assumption throughout. While it is obvious that developed nations are the most viable choice, since they are the ones who have the means and ability to most adequately invest in new innovations in energy, it is worth examining why they are not only the best choice due to their economic and technological abilities, but for moral reasons as well. The idea that the developed nations ought to lead the way in paying for efforts to combat climate change effects is not controversial. Dale Jamieson notes that in the Framework Convention on Climate Change (FCCC) countries committed to combatting climate change by, "assuming 'common but differentiated responsibilities' the developed countries would lead the way by reducing their own emissions and transferring technology and financial assistance to developing countries."[43] However, since these climate change policy documents are often riddled with ambiguous language and lack specifics regarding strict commitments and deadlines, not enough has been done recently to adequately address the urgency of climate change and this question of funding. Since it would be nice to not have to rely on the good will of leading nations and billionaires, reflecting on our moral intuitions and what moral responsibilities, if any, the developed nations have to assist the lesser-developed nations, may help shed some light on the "among whom" question of distributive justice, and how it applies to climate change policy.

Paul Baer, in his "Adaptation to Climate Change: Who Pays Whom," uses moral, legal, and scientific modes of thinking to examine the responsibilities and obligations the developed nations have to take the lead in paying for adaptation to, and prevention from,

climate change effects. Like Singer, Baer asks us to view the climate and atmospheric systems affected by carbon emissions as a "Life-Support Commons."[44] It is clear that all humans share in the common resource that is the atmosphere and that the health of this atmosphere is crucial to the livelihoods of everyone dependent upon it. Baer defines the climate problem here as being the fact that, "deliberate acts that create greenhouse pollution for one party's benefit will inevitably cause some amount of harm to others."[45] Baer notes the beliefs that to do something that causes harm to other people in order to benefits one's self is wrong, and that when you cause someone else harm, say by damaging their property, it is usually expected of you to pay for or repair these damages, are as close as you get to universally agreed upon ethical principles. Simon Caney also believes that if we reflect on our moral commitments we will see anthropogenic climate change, and the actions that contribute to it, violate certain human rights, such as the right to life, health, and perhaps development, and are immoral because of this. These types of moral intuitions can be found in, and defended by, many legal and moral standards of thought.

Baer refers to environmentally focused "rights-based regulations"[46] and tort law as two instances where law can be useful in analyzing harms done to a life support commons. Any actions, such as excessive pollution, which violate standards of public health, Baer says, can be "subject to criminal penalties similar to other violations of rights to protection from harm to person or property."[47] Tort law, which Baer defines as "civil law allowing harmed parties to obtain compensation from the party causing the harm,"[48] seems like a legal precedent that has a place in climate change policy. Climate change

clearly harms people, their property, and their rights so appears to be a perfect fit for this type of legal reasoning.

Unfortunately this is not the case. In fact, in 2013 the Alaskan village of Kivalina, which needs to be relocated due to the effects of climate change, attempted to sue a few energy companies, including Exxon Mobil Corp, for contributing to the increase in greenhouse gasses that rendered their area uninhabitable.[49] The case was thrown out due to the reasoning that, "the village hadn't shown causation between the alleged damage and the defendants actions." In addition to this one example, the recent agreement reached by the COP 21 in Paris states that, "the Agreement does not involve or provide a basis for any liability or compensation." These two examples show that even though many of our legal and moral everyday norms and practices seem like they could address the effects of climate change, climate change policy usually avoids applying them.

Jamieson states that the problems of climate change "swamp the machinery of morality."[50] Some reasons for this disconnect between our moral/legal intuitions and climate policy are that climate change is the type of problem whose scale and origins escape our everyday laws and ethics. Just as the court ruled in the case concerning the Alaskan village, it is hard to connect certain climate effecting actions with specific negative climate change effects. Although when I drive my car I am surely contributing, in some extremely small way, to changing temperatures and rising sea levels on the other side of the world, it is difficult to think that such a seemingly morally meaningless action can result in such a significant moral harm.

Jamieson points out three ways in which climate change is different from normal every day ethical issues. He states, "apparently innocent acts can have devastating

consequence, causes and harms may be diffuse, and causes and harms may be remote in space and time."[51] Stephen Gardiner also identifies three troubling aspects of the climate change problem as being the "dispersion of causes and effects, fragmentation of agency, and institutional inadequacy."[52] Gardiner claims that due to the vastness of climate change, we can't connect causes and effects, and therefore cannot determine agency and responsibility. Because of these challenges, there is the risk of "moral corruption." This corruption manifests in the form of distraction, complacency, doubt, delusion, and hypocrisy.[53] Also, a "tragedy of the commons" appears to be present. Gardiner states that it is both, "collectively rational to cooperate and restrict overall pollution," and also "individually rational not to restrict one's own pollution."[54] Since the negative effects one's individual actions have on the environment are relatively small, and the positive effects using pollution creating energy sources has on one's life are relatively large, developing some enforceable sanctions seems impossible. No country desires severe climate change but every country seemingly prefers to continue actions that support their own prosperity, regardless of what others do. Whether it is due to confusion, corruption, or selfish desires, a sense of responsibility and liability seems to be lacking in the context of climate change.

Baer distinguished between two types of liability: fault-based and strict liability.[55] Fault-based liability is used when a person or groups intent or negligence results in some harm while strict liability is used regardless of any fault but instead solely requires that a person or groups actions resulted in the harm in question. Applying fault-based liability to climate change is tricky. For instance, when I drive my car it is surely not one of my intentions to alter the climate in any way. I believe it is safe to say that no carbon based

energy source has been used with this harmful intention in mind. It was surely never Exxon's intent to promote and sell something that will result in the forced relocation of a small Alaskan village. The relationship between these actions and the harms they result in are much more disconnected than everyday examples that fit nicely under our moral and legal intuitions.

Although intent based liability doesn't seem to be useful here, negligence, in principle, certainly might be. Whenever I fly across the country or drive to the store I am definitely neglecting to properly examine the global impacts the emissions resulting from these actions will have on the climate. Exxon's entire existence depends on their negligence concerning what effects their actions are causing and the negligence of their customers.

Negligence is also often not discussed in climate change policy, especially since a great deal of the emissions that are now affecting the climate were from a time when those who were emitting really could not fully understand all of the harmful outcomes of their actions. To use negligence as a guide for determining liability would be difficult, especially in regards to historical emissions. However Baer points out "Such fault-based liability would clearly apply to damage caused by greenhouse pollution emitted since the time when the risks of anthropogenic climate change were widely recognized."[56]

However, if strict liability can be successfully argued for then we can avoid the difficult issues of intent and negligence. Baer states that it does at first seem reasonable to argue against applying strict liability to climate change as many would ask, "why should I be responsible for harms I couldn't know I was causing and thus could not have prevented?"[57] Baer counters with the also reasonable claim that, "if there are unexpected

harms from some activities, shouldn't the party that benefited from the actions bear the costs of the harm rather than the victims."[58] Shue also calls upon our moral intuitions as he argues that because developed nations have both the greater ability to pay, and have contributed more to the problem at hand, they ought to be leading the financial efforts to reduce these climate harms. [59]

Put back into our main focus on capabilities, it seems correct to say that if one group acts in such a way that results in an increase in their capabilities at the cost of decreasing the capabilities of another group, the benefitting group ought to bear the costs of these harmful capability decreasing results, regardless of whether the benefitting group knew they were causing this harm or not. The United States for example, which is one of the leading emitters and has benefitted greatly from emission based technologies, by all moral and legal intuitions, has a responsibility to not only limit their contributions to the problem, but also to help pay for the countries who are currently experiencing climate harm, or who will experience it in the near future. If a nation is in the position where they are able to give this kind of assistance, then they are likely in that position because of past and present emissions and the capabilities that these have created. If a nation is in this position then, as we have noted plenty of moral and legal thought points to the belief that they have a responsibility to help. Drawing from Shue again, telling these developed nations to lead the charge in fixing the problem is similar to a parent telling their child to clean up the mess they have made.[60] As this paper has argued, the best way for developed nations to address this responsibility is through energy innovation and technology transfer programs.

Energy innovation is a responsibility of developed nations since it is necessary for them to address the negative aspect of distributive justice by reducing their own emissions, and the harms that result from them. Technology transfer is also needed since the accumulation of these emissions has made it so undeveloped nations cannot develop in ways that might be easiest or most convenient. According to the IPCC, even if greenhouse gas levels were kept at year 2000 levels, the earth would still be expected to warm at a rate of about 0.1°C per decade.[61] Like Singer's sinkhole, our atmosphere is already overflowing with carbon emissions. The pollution of developed nations has harmed developing nations by removing certain possibilities of development centered on carbon, since doing so will contribute to the creation of future capability depriving harms. Technology transfer programs can compensate for this harm and provide means for adapting to, and preparing for, future climate change harms. Reducing emissions, assisting in development, and assisting in adaptation are the three main climate change responsibilities developed nations have. Likewise, excess emissions causing a disruption in possible development and inability to adapt to climate harms are the key harms with which I am concerned.

While someone like Jamieson may argue that our moral intuitions fail to adequately address climate change, I do not believe this always has to be the case. As the harms of climate change begin to unfold, as we learn more about what actions have contributed to the creation of these harms, and as we think critically about the ethical issues behind it, our moral intuitions will become more easily applicable. As Daniel Gilbert writes, currently climate change does not "violate our moral sensibilities." While

global warming is certainly bad, "it doesn't make us feel nauseated or angry or disgraced, and thus we don't feel compelled to rail against it."[62]

While this may be true for the general population who has not thought critically about climate change, many who have do feel "nauseated, angry, and disgraced." I do not believe these people are somehow inherently morally superior, but instead that when a person critically and truthfully thinks about climate change, and the actions that have caused it, they realize their basic moral intuitions can and should apply to climate change. We ought to call upon people to examine how their moral intuitions apply to the problem of climate change, and what actions ought to be done to address it. Jamieson again is useful here as he states:

> One of the most important benefits of viewing global environmental problems as moral problems is that this brings them into the domain of dialogue, discussion, and participation. Rather than being management problems that governments or experts solve for us, when seen as ethical problems, they become problems for all of us to address, both as political actors and as everyday moral agents.[63]

It is my belief that as the public awareness of climate change improves, so will its intuitions regarding it. Policy will hopefully reflect these improvements, and developed nations will feel compelled to do what our intuitions suggest.

**Section 3.1 Who Receives Aid**

While it may seem like the communities that are completely undeveloped are the ones who ought to receive aid first, really those that are already in the process of developing are the most fitting candidates. These communities are already reliant on carbon based energy in some ways but are at an important crossroads where transitioning to alternative energy sources is still very possible. Bill Gates again touches on this issue

in his paper when he states, "The opportunity is especially clear for developing countries. Their most immediate need is to keep their hospitals and schools running and help their economies grow. If forced to choose between energy that is clean and energy that is reliable and affordable, it is completely responsible to prioritize the health and welfare of their people today over the serious implications of an uncertain future with climate change. We need to resolve this dilemma by making energy reliable, affordable, and clean."[64]

In order to most adequately address climate change as well as poverty, communities that will go down the path of carbon based energy as their only means of energy if not otherwise assisted are at the top of the list as qualifying for technology transfer programs. In focusing on these nations, the greatest amount of potential harms from future pollution can be eliminated. Countries like China and India that are progressing rapidly, have the 3rd and 5th largest coal reserves in the world respectively, but still have large amounts of poverty ridden areas deprived of any energy source, are ideal places where technology transfer could be of some assistance. These are nations where the possible benefits that can be created, and the harms that can be prevented, are obvious and numerous.

It is also interesting to note here that if the moral reasons to aid these communities touched on in the last section are not persuasive, we can argue that it is in our own interest as developed nations to aid countries in pursuing non-carbon emitting energy sources, as not doing so will result in increasing our own climate harms. The United States, for example, will face many of its own extreme climate harms were these nations to go all in on carbon based energy sources. Whether it is rising sea levels forcing

relocation of major cities in Florida or extreme droughts in areas like California, if we adopt a completely self-interested view on climate change it may still be in our best interest to promote technology transfer programs in places like India and China. Even if we decide to not care at all about the well-being of people on the other side of the earth, billions of more people emitting carbon is something we should try to avoid for our own sakes. We are a global community that shares both global resources and global harms. Even if it is solely for selfish reasons, we should be concerned with how these resources are abused, and how these harms are created.

**Conclusion:**

What has been presented here provides another way of examining the problem of climate change. As was pointed out at the start, there are many ways to effectively analyze climate change and how we ought best confront it. This paper had a limited scope and, therefore, ignored many aspects of the climate change problem that are crucially important and may affect how technology transfer programs are best implemented. For example, this paper has not touched on what duties, if any, we have towards the natural world and how our energy innovation efforts must take these into account. Although this paper was focused on the anthropogenic sources of climate change, and how we can best remedy these harmful practices, the fact that climate change is largely anthropogenic does not mean our climate change policies should be anthropocentric. As David Schlosberg points out, "it may also be possible to extend recognition and a capabilities approach beyond the idea of the environmental needs of human functioning to the realm of the functioning of nature and, in particular, ecological systems."[65]

Another important area left out of this discussion, but certainly related to it, is the ability of technology to address climate change through climate engineering. Climate engineering could possibly be a part of some technology transfer programs, since engineering the climate in a certain way could definitely address and protect the capabilities of vulnerable communities. Climate engineering is full of its own ethical and practical problems so was not touched on here but could be another interesting element of the points argued for in this essay. Ignoring these and many more aspects of climate change was not to dismiss their importance but only done for the purpose manageability.

There are also many practical aspects of technology transfer ranging from specifics in international politics to global economics that are deserving of further detailed examination. These are no doubt important and crucial to the implementation of technology transfer programs. However, as stated earlier, the main goal of this paper was not to argue for some very specific guideline to follow, but instead to show the benefits of the technology transfer approach, and how viewing climate change as a poverty problem that affects human capabilities can lead us to new and interesting ways to argue for climate change action.

By looking at climate change through the lens of distributive justice we were able to notice the need to address how climate change is affecting the presence of benefits, or capabilities, in developing nations, and the existence of harms these developing nations face. We determined that climate change's impact on future development in these undeveloped nations is of crucial importance and that technology transfer programs, instead of just carbon taxing or carbon trading strategies, is the most promising strategy that can address this issue. While decreasing carbon emissions is undoubtedly a crucial aspect of the climate change issue, solutions focused on energy innovation and technology transfer programs are able to address the need for developed nations to reduce their own emissions, while also assisting nations who have been harmed by these emissions and the changing climate. The responsibility developed nations have to pursue energy innovation and technology transfer was discussed and certain potential problems these technology transfer programs could face were presented and addressed through Schumacher and two case studies.

In doing all this, this paper attempted to show that energy innovation and technology transfer programs are necessary if we are to adequately address the urgency of climate change. The climate change discussion is often too narrowly focused on limiting emissions. The Paris agreement does mention technology transfer as a viable strategy, but it is often done in passing, and not given much focus. The Paris document "requests" that technology transfer programs are considered, but lumps these strategies alongside other very broad concepts like "mitigation, adaptation, finance, and capacity building."[66] Energy innovation is also hardly touched upon even though it is described as "critical for an effective, long-term global response to climate change."[67] Throughout this paper some of the intricacies and possible challenges technology transfer and energy innovation face have been discussed. This discussion needs to carry on and is necessary if we are to adequately address the multitude of problems that arise from climate change. The Paris agreement is correct in addressing the importance of these two strategies but needs to expand the discussion and examine the specific obstacles technology transfer and energy innovation face. Even though the Paris agreement is meant to be a somewhat broad policy document, more than a quick note of the importance of these strategies is needed. Due to the complexity of the climate change problem, policy articles focused on specific aspects of specific strategies are needed if any substantial and effective change is going to take place.

Development in struggling nations and the capabilities of people living in these nations are key aspects of the climate change problem that need to be included in policy more often. This focus brings the significance of climate change justice to the forefront. Hopefully this paper showed that development and capabilities can be included into the

discussion without sacrificing anything in return. Emissions, future and present climate harms, development, capabilities, and cultural values can all be taken into account under a policy that prioritizes energy innovation and technology transfer. By adopting such an approach, the myriad of climate change related issues becomes more identifiable and manageable. While climate change is no doubt an enormous problem, in answering it we have the opportunity to create a more developed, freer, and more environmentally friendly global community.

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