Climate Change—Do I Make a Difference?

Bernward Gesang (University of Mannheim)

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Abstract

When an individual's action is only one among a large number of similar actions and does not seem to make any difference to the bad collective outcome, can it nonetheless be condemned by act utilitarianism? This question has currently regained interest with papers, e.g., by Shelly Kagan, Julia Nefsky, and Felix Pinkert. Christopher Morgan-Knapp and Charles Goodman answer the question in the affirmative for miniscule emissions in the context of climate change. They use expected utility analysis as Kagan did in consumer ethics. The assumptions about the impact of emissions vary according to some underlying empirical scenarios, all of which are possible. Individual actions might be relevant in the sense of contributing to a mere linear accumulation of emissions; or they might be relevant by leading to an accumulation in the form of crossing thresholds, be it one or several. Finally, such actions might not be relevant at all. To give an answer that solves the problem and that is based solely on expected utility analysis is impossible. Therefore, the view of Morgan-Knapp and Goodman must be rejected.

I. Sketching the Problem – Five Scenarios

Do individuals have duties to protect the climate, even if their own greenhouse gas emissions seem to be of little to no consequence? [1] In what follows, I examine this question from within an act-utilitarian framework.[2] By *act utilitarianism* I understand the following: "An act is permissible if and only if no other act open to the agent has greater utility."[3]

But given act utilitarianism, doesn't it appear to be all alright for me to go on a 100 kilometer car trip this weekend, since my emissions might not make any difference at all? The benefits of leaving my car parked, on the other hand, are unclear. What influence does, e.g., thirteen kilograms of CO_2 even have on climate change?

The focus of this paper is the attempt to answer the following central question (*Q*) regarding an individual's duty to protect the climate, "Do individuals have an obligation according to act utilitarianism to adjust their emissions behavior in order to protect sentient beings from the harms of climate change?"

Of course, empirical evidence plays a significant role in answering this question, so let me introduce five scenarios concerning the relationship between individual actions which result in the emission of CO_2[4] and any potential harm to the environment. They provide five possible pictures of our empirical reality and those scenarios are constructed to cover all the relevant possibilities.

First, there might be a "tipping point" that, if exceeded, might trigger irreversible feedback mechanisms in the carbon cycle. Once set in motion, these mechanisms may no longer be correctable by human action, such that a rise in temperature of two degrees Celsius could lead to an automatic rise of six or more degrees Celsius. Indeed, we appear to be close to reaching just

such a tipping point, according to, e.g., James Hansen and Peter Cox.[5] We can surmise that, given this kind of immense biological stress and the potential social consequences (e.g., nuclear wars over water, etc.) that could result, the continued existence of mammals might not be possible in such a world, as Mark Lynas expects.[6] Our *first scenario*, then, involves just such a case. In this world, higher life forms suffer and die out after the crossing of a particular threshold.

By contrast, in the *second scenario* I assume that there are no thresholds. For example, one might assume the existence of a *linear dependency* on which each particular emission of greenhouse gases contributes to greater rises in temperature and thus to greater harm. Each CO_2 molecule *M* reflects a proportional warming unit that contributes to, say, a rise in sea level. As long as sentient life forms exist, their suffering increases in direct proportion to the amount of trace gas molecules. In other words, there is no warming that does not have an effect, and the entire amount of warming leads to increased harm.

Likewise, one can imagine a *third scenario* that is a *hybrid* of the first two. In this scenario, there are numerous smaller thresholds, the crossing of each of which brings about a small but marked worsening of the overall state of the world. This worsening has no limits and continues as long as mammals exist. This scenario is much more probable than number one and two and its main rival is scenario number four.

In the *fourth scenario*, I change my assumptions about the possible effects of single actions and assume that such small amounts of CO_2 (e.g., thirteen kilograms) have no impact as such on a system as vast and complex as the climate and therefore no impact on the amount of harm that might result. Thirteen kilograms are simply not enough to have an impact, just as one grain of sand cannot turn a pile of sand into a heap[7]. Thus, Walter Sinnott-Armstrong argues, "So my individual act is neither necessary nor sufficient for global warming."[8]

The *fifth scenario* is a mixed form: sometimes scenario three is true, and miniscule emissions can have great effects. Sometimes scenario four is true and such emissions have no effect. This possibility is due to the chaotic nature of climate.

Of course, I can add a subtype of scenario four, call it (4b), which contends that there is absolutely no positive correlation between CO_2 emissions and possible harm (e.g., because climate sceptics are right or geoengineering will be successful). But this scenario does not need not be discussed because the result of this discussion is the same as in scenario four.

These five scenarios are constructed to reflect the spectrum of possibilities regarding the relevance of individual actions in the case of carbon emissions. Individual actions might be relevant in the sense of contributing to a mere linear accumulation (scenario two); or they might be relevant by leading to an accumulation in the form of thresholds, be it one (scenario one) or several (scenario three); finally, such actions might not be relevant at all (scenarios four), or you can have a mixed form of three and four (scenario five). It is important to note that the answers to the guiding question provided in the literature also presuppose one of the scenarios, respectively, and are valid – if at all – only relative to this respective scenario. This insight gives a new complexion to the existing response models. When it comes to answering question *Q*, I would argue that even Kagan's argument is not applicable to climate change, opposed to what Morgan-Knapp and Goodman suggest.[9]

In what follows, I undertake an analysis of the expected utility of changing one's behavior in these various scenarios, which will produce answers to *Q*. Finally, I show that this analysis does not lead to an affirmative answer to *Q*, thus failing to take into account what is reasonable to do for the utilitarian.

II. First Scenario (Single Threshold): No duty to avoid emissions

Following a strategy such as that adopted by Shelly Kagan,[10] we might say that *Q* is ultimately answerable in the affirmative via a conventional analysis of *expected utility*.[11] But can one apply Kagan's strategy to our question if we view the example from the standpoint of the first scenario? The example of democratic elections offers us a (limited) analogy to the first scenario, concerning the importance of an individual action. One vote can make a significant difference for the worse, for example, when a dangerous fascist comes to power with a majority vote. Each vote carries weight, as there is the possibility that the threshold from non-majority to majority is crossed by the casting of *one and only one* vote.

Kagan's thesis is that all threshold cases are to be decided on the basis of an expected utility analysis.[12] His argument regarding expected utility is nested within an example regarding the poultry trade. Assume the following: killing a chicken provides the consumer with an increase in pleasure (*PI*) and causes the chicken a certain amount of pain (*PD*). Further, we assume that *PI* is not sufficient to outweigh *PD*. The expected utility for the isolated individual action, *H* (harming a chicken), is thus negative. But is this also the case for buying a chicken (call it *A*)? Now the question can be raised, what happens when, in the course of a regular business day, large amounts of chicken purchases enter the picture? Does my individual purchase *A* change anything in reference to the overall daily balance of pleasure and pain? In Kagan's example, the situation is such that whenever exactly twenty-five chickens or any multiple of that amount (fifty, seventy-five, etc.) are sold, harm is exacted on a new group of twenty-five chickens. Should the sum of the individual actions constitute this critical amount, they are *all* relevant, since each action is a necessary element of the jointly sufficient condition leading to the pain of twenty-five more chickens. On the other hand, if sixty-seven chickens are purchased, all of the individual actions

are meaningless, since regardless of whether sisty-five, sixty-six, or sixty-seven chickens are sold, a fourth tranche of chickens is not harmed by these purchases and the harm produced by the first tranches is overdetermined.

Now it is clear that as far as expected utility is concerned, my action *A* has a negative expected utility when it is certain that *A* will lead to the crossing of the threshold. My action then harms twenty-five additional chickens, and to even harm one chicken has a negative expected utility. But what can we say about my action when it is unclear whether or not it constitutes a critical amount? We know that with every twenty-five purchases a threshold is crossed. Thus, the probability of constituting the critical amount is one-twenty-fifth. The total harm that my action could maximally cause is the pain of twentyfive chickens. I call the underlying thesis "the symmetry thesis".[13] The result of the reported calculation and the result of summing up all damage and dividing it by the number of contributing individuals are the same, but the ways to the results are different.[14] The symmetry thesis can be explained (a) by comparing the calculation with the case of a linear situation without thresholds. The number *twenty-five* refers, then, to the amount of harm the twenty-five individual actions would have caused if there had been no threshold. If twenty-five is the value of the threshold, then this amount is resultant from the amount of harm that would have been caused had there been no threshold. The threshold functions only as a temporal barrier. Before being crossed, no harm has been done; when being crossed, as much harm has been done as would have previously been caused without a threshold.[15] (b) The symmetry also results from the fact that the salesperson tries to reach an equilibrium of supply and demand so it is often used in consumer ethics.

It follows that the expected harm of my individual action *A* amounts to harming one-twenty-fifth times twenty-five chickens, and that is the same expected utility as harming one chicken. But we

have already said that harming one chicken has a negative expected utility. Thus, the expected utility of A^{16} is always negative, regardless of whether *A* constitutes a critical amount or not. Here one might argue that with very large cohorts (e.g., 1,000 purchases trigger the harm of 1,000 chickens) the probability of causing harm through my action is significantly reduced, but parallel to the smaller probability of *A* constituting a critical amount, the amount of possible harm is greatly increased because every new action in the game reduces the probability of crossing the threshold but increases the damage caused by exceeding the threshold. As Gaverick Matheny puts it, "This is so because the size of the threshold unit and the probability of completing it always vary inversely."[17] Thus, according to the symmetry thesis, the relation of the probability of *A*'s constituting a critical amount to the amount of total harm caused always remains the same – namely, the expected utility of action *A* (grounded in the relation of *PI* to *PD*).

When Kagan's argument is applied to climate change in the first scenario,[18] however, it might be rendered impotent because, as a matter of fact, there is very likely an *overdetermination* (*OD*) of the result of my individual action. In other words,

OD (effects as A_1)*:* Given an individual action A_1, there may exist a set *S* of individual actions $\{A_2 \ldots A_n\}$, where each element of *S* can bring about the same effects as A_1. If there exist instantiations of elements of *S*, then the effect of A_1 is overdetermined.[19]

Thus, if after several failed negotiations and a predicted drastic increase in global energy usage,[20] where we have good reason to believe that, given their current motivations, the majority of private persons, corporations, and states will not behave cooperatively,[21] then in the first scenario we might assume that the threshold for the decisive tipping point will be crossed many times

over, especially considering how close we already appear to be to crossing it (at least according to those who profess belief in the existence of such a tipping point).[22] And if this process is overdetermined, no particular individual action will increase the likelihood that the tipping point will be exceeded any *sooner* (in this scenario). Each action is only influential after its effects are not caused by other actions, and in the first scenario, it is probable that it will only do so once the tipping point has been exceeded because we are very close to crossing it, and the effects are overdetermined so many times.

But Kagan writes:

> The key to the answer lies in the thought that it is only overwhelmingly likely that my act made no difference. It is unlikely, but possible that it did make a difference – that my own act was the triggering act. But if it was, then of course it made a very significant difference indeed, for the triggering act brought about the various bad results.[23]

So it is indeed unlikely that my action will make a difference in the first scenario. But as we have already seen here, as long as it is *possible* for me to cause harm, it is not important whether this is *probable. But the amount of harm does not increase in a linear way with the number of actions in the game. Many actions have no influence because their effects might occur only after the tipping point has already been crossed.*

Kagan himself[24] admits that his argument does not hold here in any conclusive way. He describes a case where the "New Haven Friends of Chicken Consumption" inform you about the proximity of your action to the threshold and about the location of the threshold itself.[25] This special information can alter the otherwise equal probability of every action's crossing the threshold. If you know – as assumed in the first scenario – that the threshold lies between one-and-a-half and

three degrees Celsius, and if you know that the amount of emissions is so great that there is a high probability that three degrees will be exceeded, then your emission action (the 100 kilometer car trip) may have a positive expected utility[26] because of this special information. The question arises as to whether the positive answer to *Q* applies to cases where *OD* is the rule and where we have one near-lying decisive tipping point. The answer seems to be "No."[27]

Thus, Kagan's argumentation ought not persuade me not to take the car trip or to donate money to the rain forest in the first scenario. This scenario is useful because it expresses one extreme on a spectrum of views. It is one possible scenario,[28] and I wanted to show the various scenarios that are possible. Yet it is a worst-case scenario, and it is very unlikely that this scenario is real. Pierre Friedlingstein analyzes eleven studies about feedback mechanisms in the carbon cycle and notes that Cox et al. expect the greatest feedback effects. The other studies were less extreme.[29]

III. Second Scenario (No Thresholds): Reduceable to scenario three

So what can we say regarding the linear dependency scenario? This alternative is at least logically possible (John Nolt seems to defend it) and shows some arguments relevant for the other scenarios. It is difficult to see how two endpoints so far away from one another on a scale (e.g., one gram of emissions vs. billions of tons of emissions) are supposed to differ significantly in their moral value when none of the numerous intermediate steps between these endpoints in pairwise comparison (e.g., from 1,000 grams to 1,001 grams, etc.) display any relevant moral difference that would justify making a moral distinction between the endpoints.[30]

For this reason, one might assume that (either all or at least some of) the individual steps between the extreme endpoints have to contribute in some relevant way to the extreme changes in these points. That is, one might assume that these steps are causally relevant and that between (at least

some of) them the relation *worse than* must be applicable, as it is between the extreme endpoints.[31]

In this way, one can reconstruct the following "Argument from the Value of Individual Action" (AV I), which lays the groundwork for a positive answer to *Q* in the context of a linear dependency scenario:

AV I

(1) When two distant endpoints on a scale measuring trace gas emissions differ in their value, then it is impossible that none of the numerous steps between these endpoints displays any difference in value in pairwise comparison.

(C1) If there is a necessary difference in the values of the intermediate steps in pairwise comparison, then there will be a difference in value between either (a) *all* of the intermediate steps or (b) just *some* of them.

(2) If we assume a linear dependency model for the climate system, then every intermediate step of the same size, e.g., every molecule of trace gas emissions, has some effect with regard to value, and it is the same amount.

(3) Assume a linear dependency model for the climate system.

(C2) All of the intermediate steps display differences in value (i.e., there are no thresholds).

(4) The intermediate steps are brought about via individual emission-actions, and these actions share the value of the steps they cause.

(C3) *All* individual emission actions that bring about steps between the endpoints on a scale measuring trace gas emissions necessarily exhibit a difference in their value.

The upshot of AV I is that, on a linear dependency model in which each additional greenhouse gas emission is transformed into a unit of additional harm, the problem of *overdetermination* disappears, since we no longer have thresholds.[32] As Nolt puts it, "Therefore, cumulative harm (over, say the next millennium) increases more or less continuously with cumulative total emissions."[33]

However, premise two of AV I creates problems. That every molecule emitted makes a difference in value is hardly possible. Our *perceptive faculty* is not so finely grained such that a newly emitted molecule of greenhouse gas in the atmosphere which (by definition) crosses no thresholds could make a perceptible difference.[34] So we need to describe this relationship differently: any act of driving a car, be it ever so small, makes a difference, e.g., in the form of emitted molecules of CO_2. These themselves do not lead to more suffering in the world, since small amounts of molecules and their effects are imperceptible to the subject. Thus, in order for suffering or value to enter into the equation, a certain accumulation of molecules is necessary. But suffering and value are perceptible, since the best theories we have point to its consisting in subjective experiences.[35] *This may be false, but even if you have a preference- or objective-value-account of well-being, what preferences or objective values depend on imperceptible differences of molecules in the world?* They are relevant only if they accumulate. And only when this accumulation is reached we do have a perceptible difference in value, D_1. Should more molecules be emitted than are necessary for the production of D_1, we can stipulate that they contribute to the production of another harmful difference D_2, etc., such that no molecule is left unaccounted for.

So even in such a linear dependency model, *there must still be thresholds*, since an accumulation has to take place in order for the "underlying dimension" of greenhouse gas molecules to reach a perceptibly harmful state. But then the second scenario collapses into the third scenario. Thus, the idea of a linear dependency is, strictly speaking, false.

In the end, I can detect no duty to avoid emissions in the second scenario, since this scenario turns out not to be an independent scenario in the first place. Whether or not there is such a duty thus depends on what one says about the third scenario.

IV. Third Scenario (Multiple Thresholds): A duty to avoid emissions

The third scenario is a "hybrid model", in which we may assume that we have continuous emissions and accumulations of carbon molecules up to a certain threshold level, the crossing of which will then give rise to certain limited harm states.[36] When one threshold is crossed, further emissions accumulate until the crossing of the next threshold, and so on.

The crossing of many thresholds will be just as overdetermined as that of the large, near-lying tipping point discussed in the first scenario. Of course, it is possible that my action may harm someone, but only when it establishes a critical amount of emissions – and that is possible only after the overdetermination has taken place. We can assume that, after emission levels have increased over the timespan of decades, a *saturation of CO_2 emissions* will at some point be reached. The emitters' desire to emit will become weaker and weaker because further economic growth needs no great amount of CO_2 emissions. At some point in the future, it will be made possible to satisfy our energy needs without CO_2 emissions. Then, the desire to emit will die out altogether because growth needs no CO_2 emissions or we need no further growth. In contrast with the first scenario, there is more time in the third scenario because there is no near-lying tipping

point, the crossing of which would lead irreversibly to a complete system breakdown. It is also conceivable that some individuals might have certain insights that would serve as further reasons for terminating emissions. After overdetermination ceases, the emissions that have accumulated to date, and which are still present in the atmosphere, begin to count in two respects: they determine whether thresholds are crossed, and if so, when.[37]

I started my discussion with a reflection about the symmetry thesis (see above). The exceeding of the thresholds in the climate system does not cause the same amount of harm as would have existed in a linear world without thresholds and is not regulated by supply and demand.[38] In the first scenario, the crossing of the tipping point causes much more harm than any harm which may have been accumulated in a world without tipping points. Nature here sets a fixed amount of harm (or a fixed threshold unit) so that "the size of the threshold unit and the probability of completing it" do not always vary inversely.[39] Or as Nefsky remarks, "There is no guarantee that the expected utility will come out negative in every triggering case. Whether it does or not depends on the probabilities and on the goodness and badness of the relevant consequences."[40] In the third scenario, the damage after the crossing of every threshold might be different. Sometimes a storm in Siberia is caused, sometimes a flood in New York, each with totally different harm potential. Thus, it seems that one cannot calculate the expected utility for the case that my individual act triggers a threshold value, for the quality of the consequences (painful, painless, positive) can vary considerably. So one cannot rely on Kagan's analysis for climate ethics when the symmetry thesis breaks down.

But these suggestions about damage in the third scenario are false because the greenhouse gases will remain in the atmosphere for a long time. They lead to an increase in global warming and each increase in global warming (unless it is overdetermined) is a necessary condition for

exceeded threshold values thereafter (if scenario four is not true, that small units do not make a difference). Thus, my act cannot only cause a harmless storm in Siberia, but may cause 100 storms over time. On the assumption that climate change is, on balance, a process that produces a lot of suffering, there is a higher probability that the minimal global warming triggered by me will more often lead to painful than to harmless outcomes, if minimal global warming is decisive for meeting thresholds.[41] You can estimate something about the relation of dangers (immense) and probabilities to cause them (small). Hence, it is indeed possible that my action will cause considerable harm, if it causes any at all. The probability is low but can be outweighed by the scale of the expected harm as Kagan suggests because the potential for harm is immense.[42] (I hope this argumentation is clearer than that of the authors I am discussing.) The reason is, as Nolt puts it, "the harms of an individual's emissions do not, … cease with the crossing of one threshold. … It is practically certain that my emissions will contribute to the crossing of many thresholds and the causation of many harms."[43] Following Morgan-Knapp and Goodman, it is our duty in the third scenario to leave our car parked, and I would agree even if it depends only on an estimation. Further support for this position can be found by using a risk aversive argument (RA), which leads to a duty to avoid emitting.

Responsibility Argument (RA)

(1) If you can avoid possible great damages at low costs, responsibility requires that you do so.

(2) Your small contributions to climate change might result in great damages.

(3) Many of these contributions are luxury emissions, and largely easy to avoid or to be compensated at comparatively low costs.

(C) Responsibility requires that you avoid or compensate for luxury emissions.

I discuss the importance of this argument at the end of the paper. It is easy to construct counterexamples for this argument. The argument is meant to provide a hint as to how we often argue in reality and what we take to be reasonable argumentation. The argument might, nevertheless, be useful as I discuss below.You can deduce from it the same duty that Morgan-Knapp and Goodman think might be deduced from expected utility alone. In the third scenario, we have a duty to change our emission behavior and not use our car unless good consequences can be brought about in a given case (e.g., a ride to the hospital). However, it cannot be the case on a regular basis, for then there would be no collectively bad practice, as the premise states. But there is still an issue of great importance that has been forgotten.[44] There is a fourth scenario that makes it even more difficult for the utilitarian to defend the notion that miniscule emissions influence the climate.

V. Fourth Scenario (Individual Action Impotent To Cross Thresholds): No duty to avoid emissions

Emissions of, say, only a few kilograms or even some tons might in principle be too small to cause a change in the climate. Furthermore, how sensitive the climate system actually is and what size of emissions actually cause changes or harm are empirical questions that need to be posed to climate scientists. It is, however, rather unlikely that the latter are in a position to provide a uniform answer to these questions.[45] Still, the idea that the fourth scenario could be the case is a common one.[46]

Indeed, this empirical scenario might seem familiar. One way to describe it is with the help of one version of the "Sorites Paradox, the Paradox of the Heap":

The Paradox of the Heap:

(1) One grain of sand does not constitute a heap of sand.

(2) If one grain of sand does not constitute a heap of sand, then neither do two grains of sand.

(3) If two grains of sand do not constitute a heap of sand, then neither do three grains of sand.

...

(C) If 999,999 grains of sand do not constitute a heap of sand, than neither do 1,000,000 grains of sand. Therefore 1,000,000 grains of sand do not constitute a heap of sand.

Each premise of a sorites argument is plausible on its own, but the conclusion seems to be false, since there really are heaps of sand. There are two positions that one might develop from this paradox:

1) *The Tolerance Thesis*: If we have a heap, we can add a grain of sand to it or take one away from it – the heap remains a heap.[47] The concept *heap* is not so defined as to be exact to the grain of sand. Grains of sand appear to be unimportant entities in the heap paradox. Regarding piles of stones, Rolf Bertil (inspired by Crispin Wright[48]) formulates this claim as follows: "The predicate 'stone' is tolerant if for any objects x and y = (x plus one atom), 'stone' is as correctly applicable to x as to y."[49]
2) *The Sharp-Cut-Off-Point Thesis*: The opposing position maintains that somewhere in the span of the individual steps – described in premise 1 to n, a change must occur – that is, at some particular number of grains of sand, a heap comes into being. There is an *exact cut-off point*, whether we are able to recognize it or not. As Dominic Hyde puts it, "Vague terms like 'heap' or 'knowledge' … are semantically determinate so, in spite of appearances to the contrary,

there is a sharp cut-off point to their application."[50] Even one grain of sand can establish a possible cut-off point and is thus relevant.

In her critique of Kagan, Nefsky adopts a form of the tolerance thesis.[51] Her central insight is that although the adjacent intermediate steps brought into play – e.g., by the above argument (AV I) – always make some difference in an underlying dimension (e.g., trace gas molecules), it is not certain that a difference *in value* could be brought about by this miniscule change in the underlying dimension.[52] If this is right, it might follow that, in the same way that a grain of sand overextends our discriminatory power regarding the concept of a heap, one molecule of CO_2 might simply be an amount that fails to bring about any change in the climate at all, or at least any harmful change. (Nefsky and Kagan discuss the latter and do not apply their insights on climate change and nature in general. This is necessary and done here.) Like a grain of sand, one molecule (or even thirteen kilograms) might be the wrong unit of size when it comes to measuring (perceptibly harmful) changes to the climate: "Instead, the boundaries between one morally relevant outcome and another are vague, and so the difference between *n-1* and *n* acts of the relevant type can never, no matter what *n* is, make the difference."[53] One molecule does not even raise the probability that the threshold to harm is reached,[54] as the threshold doesn't react at all to such small amounts. Whether these amounts are present or not is irrelevant, according to Nefsky.

Kagan attempts to rule out this fourth scenario with an *a priori* argument, in which he shows that the assumption of such sorites sequences leads to a contradiction.[55] He claims that at least one of the intermediate steps must trigger a perceptible difference when compared to the step preceding it.[56] Nefsky, however, counters that although some perceptible difference in the underlying

dimension must exist, it need not make a difference in *value*[57] – and only the question of whether or not my emission makes the world a worse place is morally interesting.

The tolerance thesis that Kagan contests[58] is especially plausible for the so-called "phenomenal sorites cases."[59] These cases are formulated with perceptual predicates such as "to feel like", "to smell like", "to look like", etc. For example, selecting the relation "feels just like" between intermediate steps S1 and S2 is about providing a basis for such phenomenal sorites cases. In everyday situations, it is often the case that we think two distant points diverge significantly, e.g., with regard to pain, but all of the individual intermediate steps feel the same in pairwise comparison. Kagan, who does not think that such phenomenal sorites cases are possible, has to claim that these must be based on *misperception*.[60] But must one then suppose that in the case of pain, there is an imperceptible "true" pain lying behind the supposedly misperceived pain that goes unnoticed by the subject? Does this supposition of an "objective" pain make sense for a state defined subjectively? Of course, it could turn out that careful observation or, as Kagan suggests, a comparison of steps S1 and S2 with "zero" = "no pain"[61], could lead to a revision of the subject's perceptual judgment (S1 feels like 0, S2 doesn't). But even so, must that be the case? Does such a comparison necessarily lead to a determination of differences between the intermediate steps and the zero point, or to a determination of differences between S1 and S2, as Kagan expects? Should there turn out to be phenomenal sorites cases in which subjects actually persist in their judgments, even after a Kagan-type examination, then Kagan is refuted. I submit that there are many such cases. For example, if I put a crystal of sugar in my tea after every sip, will two consecutive sips ever really taste different?

If we describe our problem in this way and apply the lesson learned from phenomenal sorites cases, it might follow that contributions to global warming resulting from a specific drive of 100 kilometers might be too small to make a difference regarding (harmful) climate changes.

Now, the sorites arguments are often understood as semantic, whereas the theses regarding the climate problem are of a *causal* nature. Are we committing a "fallacy of verbalism" since "vagueness … can only belong to a representation", as Bertrand Russell thinks?[62] Rosanna Keefe does not think so and discusses "ontic vagueness" as a meaningful notion.[63] Nefsky tries to close this gap by hinting at instruments of measurement:

> Imagine that you are working with this machine that registers charges only in whole kilovolts, increasing the current applied to it nanovolt by nanovolt. … So, the machine could change from registering 0 kV to registering 1 kV at any moment. But, given that you are within the margin of error of 1 kV for that device, it would be a mistake to think that, at the moment when it actually does register 1 kV, this is due to the last minuscule increase in voltage that you made. It *is* due to the fact that many increases were made, such that the current is in some rough, very close vicinity of 1 kV. … But that it registered 1 kV at the precise point in your adding nanovolts that it did is most likely due to mechanical or environmental factors and not to the addition of some single nanovolt.[64]

However, this argument requires a complete theory of instrumental measurement and thus creates further problems that take us deep into the territory of the philosophy of science. Another way to deal with the matter would be to understand sorites in a strongly semantic fashion and to apply Nefsky's thesis to nature in general: that is, to defend the claim that there are processes in nature that are analogous to sorites in the sense that tiny differences do not accumulate in a linear fashion until they lead to larger differences. I mentioned this causal mechanism – call it "causal

elasticity" – above. Nefsky's description of measuring instruments at the limits of their measuring accuracy would correspond to such a model. The phenomena investigated in chaos theory, emergence theory,[65] and quantum theory[66] might provide further examples. The application to the climate is especially convincing since climate is suggested to be a system that allows for emergence: "In the climate system, abrupt climate change is a likely example of unpredictable emergent behavior."[67]

Therefore, if we speak about a version of ontic sorites or even only about causal elasticity, *we can answer Q by saying that small individual actions are not relevant, and one should not, pro tanto, change one's emissions-behavior in the fourth scenario.*

VI. Answer to question Q: A duty to avoid emissions

So do we have such a duty even if we live in the fifth scenario? Sometimes our acts *can* cross thresholds, sometimes not. I think the answer depends on how we evaluate scenarios three and four in comparison because it is a combination of both. So let us address the final answer to our question Q: How to decide in which scenario we are living? Seemingly, the answer would be to assign subjective probabilities to each scenario. Let's try. One is very unlikely, so is four (b) – in light of the International Panel on Climate Change (IPCC) reports, let us assign a probability of five percent to each. Two is a subtype of three. So the question is three, four, or five? Science gives no evidence. Perhaps we want to evaluate all three scenarios as equally likely because we lack further information. Since one and four (b) have ten percent, ninety percent remain; so each of the three scenarios has a probability of thirty percent.

So far, an estimation of probability seems to be possible, but it seems to be useless because you have at best a negative expected utility analysis for car driving in scenario three and a positive

one in scenario four. A further decision seems to afford a kind of exactness that is not given, especially in scenario three, where you cannot calculate without the symmetry thesis. You do not know how great the dangers are; nor how small the probability of crossing thresholds is. You know only a little about the relation of dangers and probabilities at best. So you can formulate an estimation that the result will be negative but you can only guess *how* negative it will be. But you need this information about the amount for a comparison of three and four.

Perhaps someone will be able to show how the comparison works, but that has to be analyzed if and when it happens. Contrary to the Morgan-Knapp and Goodman thesis, I believe that expected utility is of no value in answering *Q* and that is the main result of this paper. This conclusion is not only the case because of Nefsky's arguments, which apply only in one scenario, but it is also true for the whole question.

I think the risk aversive Responsibility Argument (RA) gives the best answer to *Q*. It is reasonable to look at RA if uncertainty is too great. So the best answer for *Q* is that if it is possible that we are in scenario three or five, so that premise (2) of RA[68] is true. In other words, you should avoid the risk of damage and leave your car parked because the price of doing so is manageable.

What is needed is further discussion about what to do when uncertainty is too great for an expected utility analysis. Such arguments as the Responsibility Argument are important when used with common sense and they should be applied and justified in a utilitarian way if it is possible.[69] But this remark is only an outlook. In every model of normative ethics we need an ethics of risk assessment that is not formal and exact where exactness is impossible, but that is substantial.

[1] This represents the starting point for a similar debate: see Jonathan Glover and M. J. Scott-Taggart, "It Makes No Difference Whether or Not I Do It," *Aristotelian Society Supplementary* 49 (1975): 171-210.
[2] As Julia Nefsky emphasizes, it is not only a problem for utilitarians: "The problem for non-consequentialists is that, even though they do not think that all that matters morally is the difference you make in outcome, it's not clear how there could be any reason to X, which connects appropriately to outcome Y, if X-ing cannot make any difference with respect to Y." Julia Nefsky, "Fairness, Participation, and the Real Problem of Collective Harm" (Oxford University Press, 2015). Similarly Morgan-Knapp and Goodman write: "A constraint against harming can't prohibit doing something harmless." Christopher Morgan-Knapp and Charles Goodman "Consequentialism, Climate Harm and Individual Obligations," *Ethical Theory and Moral Practice* 18 (2015): 177-90.
Marion Hourdequin denies this conclusion and attempts to provide a non-consequentialist way out of the problem. Marion Hourdequin, "Climate, Collective Action and Individual Ethical Obligations," *Environmental Values* 19, no. 4 (2010): 443-64. To see why I choose utilitarianism, see Bernward Gesang, „Utilitarianism with a Human Face," *The Journal of Value Inquiry* 39 (2005): 169-81.
[3] See Brad Hooker, *Ideal Code, Real World: A Rule-Consequentialist Theory of Morality* (New York: Oxford University Press, 2000), p. 5.
[4] Strictly speaking, I am concerned with all trace gases we emit.
[5] The Hadley Center has put forward this kind of model. Peter Cox et al., "Acceleration of Global Warming Due to Carbon-Cycle Feedbacks in a Coupled Climate Model," *Nature* 408 (2000): 184-87. See also James Hansen and Peter Cox, "Dangerous Human-Made Interference with Climate: A GISS model E Study," *Atmospheric Chemistry and Physics* 7 (2007): 2287-2312.
[6] Mark Lynas, *Six Degrees* (New York: Harper Perennial, 2008), pp. 215-40.
[7] So we have the following construction schema for our scenarios: Alternative one, single emission actions may have influence on harm (scenarios 1-3, and 5) or not (scenario 4). Alternative two, if they have influence, every action can either have the same influence (scenario 2) or not (scenario 1, 3, and 5). Alternative three, if they do not have the same influence, there may be just one influential action (scenario 1), or there may be multiple (scenario 3 and 5).
[8] Walter Sinnott-Armstrong, "It's Not My Fault: Global Warming and Individual Moral Obligations," *Perspectives on Climate Change: Science, Economics, Politics and Ethics, Advances in the Economics of Environmental Research* 5 (2005): 285-307.
[9] Morgan-Knapp and Goodman, "Individual Obligations," pp. 185-86. They identify the methods of Kagan and Singer (p. 182).
[10] I choose Kagan's account because it is the most developed. Shelly Kagan, "Do I Make a Difference?" *Philosophy and Public Affairs* 39 (2011): 105-41. Kagan does not speak about climate change but about consumer ethics. Similarly (regarding climate change), see Avram Hiller, "Climate Change and Individual Responsibility," *The Monist* 94 (2011): 349-68; Christoph Lumer, *The Greenhouse: A Welfare Assessment and Some Morals* (Oxford: University Press of America, 2002). Morgan-Knapp and Goodman, "Individual Obligations," pp. 177-90.
[11] Kagan, "Do I Make a Difference?" p. 129; see Derek Parfit, *Reasons and Persons* (New York: Oxford University Press, 1987), sec. 27; see Peter Singer, "Utilitarianism and Vegetarianism,"

Philosophy and Public Affairs 9 (1980): 325–37; see Gaverick Matheny, "Expected Utility, Contributory Causation, and Vegetarianism," *Journal of Applied Philosophy* 19 (2002): 293–97. Recently, Pinkert agreed that Kagan is successful with regard to cases where agents do not know if their contribution will make a difference, but that cases in which agents know that they cannot make a difference are neither rare not unrealistic. Felix Pinkert, "What if I Cannot Make a Difference (and Know It)" *Ethics* 125 (2015): 971-98.

[12] Using Glover's terminology, voting is an example of a case with an absolute threshold whereas the climate system is an example of a case with discrimination thresholds. I ignore this difference for reasons of simplicity and discuss the climate system as a case of absolute thresholds. See Glover and Scott-Taggart, "It Makes No Difference," p. 173.

[13] "Thus, we know that there is some triggering number, *T* (more or less), such that every *Tth* purchase (more or less) triggers the order of another *T* chickens (more or less)." Kagan, "Do I Make a Difference?" p. 124.

[14] Morgan-Knapp and Goodman, "Individual Obligations," p. 182.

[15] Kagan, "Do I Make a Difference?" p. 127. Imagine a large dam. If it breaks, as much water as was contained by the dam will flood over the land, but this picture is misleading when it comes to damage. I owe this point to Julius Schälike.

[16] Whereby *A* is part of a collectively bad practice with at least bad effects and a triggered harm that does not become randomly small. That is the premise. Kagan, "Do I Make a Difference?" p. 120.

[17] Matheny, "Expected Utility," p. 295.

[18] Some people might have doubts as to whether Kagan's "thresholds" are applicable to climate change. But if they are right, we have to deal with scenario two or four.

[19] Frank Jackson, "Which Effects?" *Reading Parfit* (Oxford: Blackwell, 1997): pp. 42-53. He shows very clearly that if an immoral action, viewed in isolation, is overdetermined, it can no longer be condemned by consequentialists.

[20] The International Energy Agency says "+ 50% until 2030." IEA, *Electricity Information 2013 Edition*, http://wds.iea.org/wds/pdf/Documentation%20for%20Electricity%20Information%20%282013%20edition%29.pdf (28.12.2013).

[21] In detail, see Aaron Maltais, "Radically Non-Ideal Climate Politics and the Obligation to at Least Vote Green," *Environmental Values* 22 (2013): 589-608; and Elizabeth Cripps, *Climate Change and the Moral Agent: Individual Duties in an Interdependent World* (New York: Oxford University Press, 2013), pp. 123-24. The Paris Agreement is also based on voluntary commitment only, which will at most limit global warming to 2.7 degrees Celsius. Model country Germany will probably miss its aims for 2020, which shows how shaky such aims are.

[22] See Hansen, "Human-Made Interferences," p. 2306. For a similar result, see John Harris and Richard Calvin, "'Pass the Cocoamone, Please': Causal Impotence, Opportunistic Vegetarianism, and Act-Utilitarianism," *Ethics, Policy and Environment* 15, no. 3 (2012): 374.

[23] Kagan, "Do I Make a Difference?" p. 119.

[24] And also Matheny, "Expected Utility," p. 295.

[25] Kagan, "Do I Make a Difference?" pp. 127-28.

[26] See Simon Gaus, „Folgt aus dem Unwert der Tierhaltung ein Verbot des Fleischkonsums?" *Grazer Philosophische Studien* 88 (2013): 257-67.

[27] For further criticism, Cripps, "Climate Change and the Moral Agent," p. 122.

[28] Mark Lynas holds it and justifies it with methanhydrate explosions but it is easier to justify it with social consequences of extreme heat: Lynas, *Six Degrees,* p. 226-34.
[29] Pierre Friedlingstein et al., "Climate-Carbon Cycle Feedback Analysis: Results from the C^4MIP Model Intercomparison," *Journal of Climate* 19 (2006): 3337-53; Cox et al., "Acceleration of Global Warming"; Martin L. Weitzman, "On Modeling and Interpreting the Economics of Catastrophic Climate Change," *Review of Economics and Statistics* 91 (2009): 1–19.
[30] This is often discussed, e.g.,Parfit, *Reasons and Persons*, p. 78; Donald H. Regan, *Utilitarianism and Co-operation* (New York: Oxford University Press, 1980), p. 60; Kagan, "Do I Make a Difference?" p. 132; and applied to climate change, Morgan-Knapp and Goodman, "Individual Obligations," pp. 186.
[31] This "worse than" can thereby be perceived or perhaps only inferred. One can describe the tiny steps between the endpoints as perceptible or imperceptible, as directly harmful or as increasing the likelihood of future harm. See also Kristin Shrader-Frechette, who claims that every small (not yet morally relevant) difference between the state pairs in question creates a physiologically measurable difference in subjects, which raises the probability of perceived future harm. Kristin Shrader-Frechette, "Parfit and Mistakes in Moral Mathematics," *Ethics* 98 (1987): 50-60.
[32] See Sabine Hohl and Dominic Roser, "Stepping in for the Polluters? Climate Justice under Partial Compliance," *Analyse und Kritik* 33 (2011): 477-500.
[33] John Nolt, "The Individual's Obligation to Relinquish Unnecessary Greenhouse-Gas-Emitting Devices," *Philosophy and Public Issues* 3 (2013): 139-65.
[34] Kagan, "Do I Make a Difference?" p. 116.
[35] Sumner draws this conclusion from the contemporary debate: Leonard W. Sumner, *Welfare, Happiness, and Ethics* (New York: Oxford University Press, 1996), p. 112. Parfit's solution to operate with imperceptible harm is not accepted here by Kagan and Nefsky and for good reason: see Kagan, "Do I Make a Difference?" p. 129; Julia Nefsky, "Consequentialism and the Problem of Collective Harm: A Reply to Kagan," *Philosophy and Public Affairs* 39 (2011): 364-95. Kai Spiekermann, "Small Impacts and Imperceptible Effects: Causing Harm with Others," *Midwest Studies in Philosophy* 38 (2014): 84, defends "Experienced Harm": "A moral theory that departs from Experienced Harm must explain what makes an action wrong if no one experiences any consequences caused by this action."
[36] It is possible to assume a further scenario: one may cross a series of small thresholds before something truly catastrophic happens (of the kind presented in scenario one). But even if this is an empirical possibility, the same arguments will apply that were already presented with regard to scenarios one and three.
[37] And the time is important: See Alastair Norcross, "Torturing Puppies and Eating Meat: It's All in Good Taste," *Southwest Philosophy Review* 20 (2004): 117-23.
[38] Kagan, "Do I make a Difference?" p. 124.
[39] Matheny, "Expected Utility," p. 295.
[40] Nefsky, "Consequentialism," p. 369; see Hams and Galvin, "Causal Impotence," p. 79.
[41] See Morgan-Knapp and Goodman, "Individual Obligations," pp. 188-89.
[42] Further illustrated by Morgan-Knapp and Goodman with the possibility of a "butterfly effect." Morgan-Knapp and Goodman, "Individual Obligations," p. 184.
[43] Nolt, "Individual´s Obligation," p. 154.

[44] Morgan-Knapp and Goodman look at the thesis that individual contributions make no difference in two ways. But the thesis that miniscule contributions make no difference at all is not discussed. Morgan-Knapp and Goodman, "Individual Obligations," p. 184.
[45] In 2012, two leading researchers at the PIK (Potsdam Institute for Climate Impact Research) were unable to answer the question of whether the climate is sensitive to an emission of ten tons.
[46] Sinnott-Armstrong, "It's Not My Fault"; Mark Bryant Budolfson, "Collective Action, Climate Change, and the Ethical Significance of Futility," January 2013 (http://www.budolfson.com/papers).
[47] As opposed to voting, where one vote is an entity to which the result is sensitive.
[48] Crispin Wright, "On the Coherence of Vague Predicates," *Synthese* 30 (1975): 325-65.
[49] Rolf Bertil, "Sorites," *Synthese* 58, (1984): 219-250.
[50] Dominic Hyde, "Sorites Paradox," in *Stanford Encyclopedia of Philosophy* (Winter 2014), ed. Edward N. Zalta (https://plato.stanford.edu/archives/win2014/entries/sorites-paradox).
[51] Nefsky, "Consequentialism," p. 375.
[52] Ibid., pp. 377-78.
[53] Nefsky, "Consequentialism," p. 378; cf. also her "fairness example" p. 374.
[54] Shrader-Frechette, "Parfit and Mistakes in Moral Mathematics," p. 222.
[55] Kagan, "Do I Make a Difference?" p. 132. But perhaps even the greatness of the intermediate steps plays a role so that only great steps make a difference because of laws of perception or laws of causality.
[56] Ibid., p. 133. How the contradiction depends on transitivity and the whole paradox might be avoided: Spiekermann, "Causing Harm," p. 86 But if nature doesn't accumulate in a linear way (s.b.), the single action may be as harmless as that of the last toturer, after 999 torturers have already pressed the button.
[57] Nefsky, "Consequentialism," p. 383.
[58] Ibid., p. 384.
[59] Ibid., p. 373; Spiekermann, "Causing Harm " p. 80.
[60] Kagan, "Do I Make a Difference?" pp. 136-37; Spiekermann "Causing Harm," p. 83.
[61] Ibid., p. 136.
[62] Bertrand Russell, "Vagueness," *The Australasian Journal of Psychology and Philosophy* 1 (1923): 84-92.
[63] Rosanna Keefe, *Theories of Vagueness* (Cambridge: Cambridge University Press, 2000), p. 15.
[64] Nefsky, "Consequentialism," p. 391.
[65] Philip Clayton and Paul Davies, eds. *The Re-Emergence of Emergence: The Emergentist Hypothesis from Science to Religion* (New York: Oxford University Press, 2006).
[66] With regard to abrupt changes of measurements that lay the foundation for "objective chance" in the "Copenhagen Interpretation," see Erwin Schrödinger, "Die gegenwärtige Situation in der Quantenmechanik," in *Die Deutungen der Quantentheorie* (Braunschweig and Wiesbaden: Vieweg, 1987), pp. 111 and 117; or see works of Pascual Jordan, etc.
[67] José A. Rial et al., "Nonlinearities, Feedbacks and Critical Thresholds within the Earth's Climate System," *Climatic Change* 65 (2004): 11-38.
[68] "(2) Your small contributions to climate change might result in very great damages" (p.14, above).
[69] If people are risk aversive, they are comforted when you decide to use risk aversion in cases of uncertainty. If you have no information with which to decide a case, perhaps you should take people's preferences into consideration. Your decision brings either harm or joy to the world

because people either agree or disagree with your choice. If you have no other data about harm and joy, it might be reasonable to look at any harm that would result from the decision itself and then work to minimize it.