Risk Regulation and the Future: On the Need for Helping Vulnerable Societies to Adapt to the Consequences of Climate Change

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I. Climate change is taking place now

Climate change – and its causes – is old news. As early as 1896, the Swedish scientist Svante Arrhenius showed that, in principle, changes in the levels of carbon dioxide in the atmosphere could alter the Earth's surface temperature through the so-called "greenhouse effect". Subsequently it was shown that the Earth is experiencing increased average temperatures as compared to pre-industrial temperatures. And this temperature increase produces a wide variety of climatic impacts, including, among others, rising sea levels, ocean acidification, droughts, and heat waves. These increases affect the patterns and amounts of precipitation, increase the frequency, intensity, and duration of extreme events such as hurricanes, and induce a myriad of other climatic consequences as well.

Much of the public debate surrounding the topic has focused on how we might avoid climate change by curbing greenhouse gas emissions. This debate, however, considerably overlooks the fact that climate change is not something that only belongs to the future; on the contrary, climate change has already begun, and even if we could stop all greenhouse gas emissions today, this would merely curtail what is in store for us – it would not bring climate change to a halt. Indeed, the acknowledgement that some climate change is unavoidable is reflected in the United Nations' Framework Convention for Climate Change (UNFCCC),[1] which was adopted in 1992.[2] At the time of its adoption, the UNFCCC clearly focused upon "*mitigation*", the process of curbing the emission of greenhouse gasses in order to stop climate change. However, over time it became widely accepted that mitigation would not suffice, that some adverse climate change is unavoidable and that, in the words of the World Bank, we have a "*new climate normal*".[3] Therefore, in 2001, the UNFCCC also included provisions concerning "*adaptation*" to climate change.[4] Indeed, more recently it has been acknowledged that in

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[1] For information on the UNFCCC, see <www.unfccc.int>.

[2] The UNFCCC entered into force on 21 March 1994.

[3] World Bank, *Turn Down the Heat: Confronting the New Climate Normal* (Washington, DC: World Bank, 2014).

[4] The question of climate change adaptation arises irrespective of the cause of the climate change. In other words, whether one accepts climate change as (wholly or partly) caused by humans or simply to be due to "natural variations", the need to adapt to the actual changes is the same.

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some situations even adaptation is inadequate, for example if an island is going to be permanently flooded, and so in 2013 (and, in particular, 2015) "*remediation*" (or "loss and damage") was included as well.[5]

When we consider climate change adaptation, it soon becomes clear that the challenges associated with such adaptation vary widely between different parts of the world. Whereas all parts of the world will be affected in one way or the other, the adverse changes are not evenly distributed and some regions will be affected more severely than others. For example, as a rule it is the case that as we get closer to the equator, the adverse effects of climate change become more profound. To make things worse, this is also where we find the majority of the world's most vulnerable countries.[6] In essence, this means that there is a particularly urgent need to prepare the developing countries of the Global South for the societal risks caused by climate change.

Preparing for the risks caused by climate change impacts essentially requires us to go through the following three steps:

- *Firstly*, we must find a method for identifying the most pertinent risks and we must develop a model for prioritising, or ranking, these different risks, such that we can focus resources on the most important ones.
- *Secondly*, we must identify and/or develop solutions to those risks that are considered the most important. Some solutions will be science-based; others will not. For example, the rising sea level means that saltwater will flow into many freshwater deltas and rivers, adversely affecting both fishing and farming. One solution could be to develop new crop varieties that can withstand the saltwater. However, other solutions will be found in the social sciences as well. For example, one way of coping with the consequences of droughts or typhoons may be to set up regional risk pools (i.e. regional climate-related disaster risk insurance).
- *Thirdly*, when we have either identified or developed workable solutions, we also need to find ways of implementing these in the affected societies. And, as anthropologists and others working in the field have often pointed out, this is where many otherwise excellent solutions run aground.

If, at least to a fair extent, we are capable of doing as suggested here, we may be able to cushion some of the adverse consequences of the new climate normal.

II. Identifying the most pertinent risks

In order to determine what are the most pertinent risks to societies caused by climate change, we must be able to quantify the immediate risks caused by a specific climate change impact, such as how the warming of the sea affects the power of typhoons. But, when we consider societal developments, climate change impacts are only one factor

[5] "Mitigation", "adaptation" and "remediation" are sometimes referred to as the "three pillars" of the UNFCCC.

[6] For example, The World Bank's first Turn Down the Heat report from 2012 (which offered a global overview of climate change and its impacts in a world that is 4°C warmer) concluded that impacts are expected to be felt disproportionately in developing countries around the equatorial regions, cf. World Bank, *Turn Down the Heat: Why a 4°C Warmer World Must be Avoided* (Washington DC: World Bank 2012).

amongst many, and there may therefore be cases where we will find it extremely difficult, or even impossible, to adequately establish the probability of how different climate change impacts may affect different societies.[7]

The natural sciences have made impressive progress when it comes to determining the extent to which climate change impacts on different natural phenomena; phenomena like heatwaves in the Middle East, hurricanes in the Caribbean, droughts in the Sahel, or precipitation in Northern Europe. For example, the Max Planck Institute for Chemistry in Mainz, Germany, and the Cyprus Institute have found that if the Earth's temperature were to increase by two degrees Celsius on average compared to pre-industrial times, the temperature in the Middle East and North Africa over the course of the 21st century in summer will increase more than twofold. They have also found that by mid-century, during the warmest periods of the year, temperatures will not fall below 30°C at night, and could rise as high as 46°C during daytime. Moreover, heatwaves could occur ten times more often than they do today and the duration of these heatwaves will be prolonged dramatically.[8]

The challenge is, however, to link the natural sciences and the social sciences so as to understand where we may expect particularly adverse societal impacts caused by climate change. Until now, though, the attempts at linking the two have not been particularly successful, at least not within the climate change field itself. Thus, those attempts that have been made have either first of all considered how human behavior may influence the climate – and much less how climate change may affect human society – or they have considered how climate change may affect human society, but only at a very general level.

What seems to be needed, then, is a much better understanding of how climate change impacts affect specific societies and communities. Thus, when determining which climate change impacts to target, we must consider whether the interaction between the impact and other societal factors will have a *multiplier effect* (i.e. it constitutes a leverage point where a small climatic impact can produce major changes to the society as such),[9] a *synergistic effect* (i.e. two or more factors interact directly or indirectly to create adverse effects to levels above the sum of their individual adverse effects),[10] or neither of these characteristics (in which case the impacts will likely have an *additive effect,* meaning that the full adverse effect of the climate change impact "merely" is equal to the sum of its individual adverse effect).[11]

To the extent that it is possible to determine in this way the likely consequences of different climate change impacts, we will thereupon have to establish a system for ranking their "harmfulness" in these different contexts. Part of such a ranking system would be to determine whether it is possible to prevent a given adverse development

[7] Where we are unable to establish the "probability" we may have to, instead, think more in terms of "uncertainty".

[8] J Lelieveld, Y Proestos, P Hadjinicolaou et al., "Strongly increasing heat extremes in the Middle East and North Africa (MENA) in the 21st century" (2016) *Climatic Change* 137, 245. doi:10.1007/s10584-016-1665-6.

[9] Today, in the field of climate change, the term "multiplier effect" is frequently used to denote a situation where a small climatic impact can produce big changes to the society as such. However, traditionally the term "leverage point" has been used with the same meaning.

[10] The term "synergistic effect" has been borrowed from the sciences. See, for example, A Hougaard Laustsen, "Toxin synergism in snake venoms" (2016) *Toxin Reviews,* DOI: 10.1080/15569543.2016.1220397.

[11] What is suggested here essentially is the development of complexity theory to allow us to understand how different climate change impacts may affect societies – broadly speaking.

from reaching a "tipping point", wherein it switches over from one state to another in a way that is abrupt and irreversible. Obviously, if we have a choice between investing our resources to avoid a tipping point and not doing so because it will simply not be possible to prevent such a tipping point, then priority should be given to the former. Still, in most cases ranking the different climate change impacts is bound to be a highly contentious and difficult task, but nevertheless one that seems unavoidable.

Irrespective of the above observations, when it comes to addressing climate change impacts the real challenge appears to be that in several cases we will be unable to give any useful indication as to the probability that a climate change impact may cause a given adverse effect, not to mention those situations where we will not even be capable of adequately determining what likely negative effects may flow from the impact.[12]

Even if we succeed in establishing a workable method for identifying some of the most pertinent societal risks caused by climate change, our method will still only provide some rough indicators of where precisely to act. To allow us to concentrate our efforts even further, it would seem useful to select a few broad areas where we may expect the risk to be particularly critical, such as: (1) access to food and water; (2) migration; and (3) diseases and public health.

IIII. Developing solutions

When the specific societal risks have been identified, the next step is then to identify or develop workable solutions to address these risks. In this respect, the above distinction between *additive*, *synergistic* and *multiplier* effects is important.

If the specific climate change impact produces either additive or multiplier effects, we must address this impact alone. For example, if the sea level rise causes saltwater to enter freshwater deltas and rivers and thereby affects crops that are not salt resistant, we will probably need to consider ways of either keeping the saltwater out or of finding salt resistant crops.[13]

By contrast, if the specific climate change impact produces synergistic effects, we must consider whether it will be most efficient to address the climate change impact as such or whether we would be better advised by addressing one or more of those factors that, in combination with the climate change impact, produce the societal challenge. For example, if climate change induced drought and population growth together threaten a community, it may well be more efficient to target population growth than target the drought.[14]

IV. Implementing solutions

When we have established what we consider to be the most pertinent climate change risks to societies and have identified and developed workable solutions to help the

[12] As observed in note 7 above, in these situations, it might be useful to think more in terms of "uncertainty" than in terms of "probability".

[13] E Held, *Biotech Benefits: Drought- and Salinity-Resistant Crops* (Food Insight 2016) available at <http://www.foodinsight.org/blogs/biotech-benefits-drought-salinity-resistant-crops-global-warming>.

[14] Similarly, it seems that the most climate change resilient societies are those that have a high level of good governance. Thus, if for example a development aid donor wants to help a developing country build climate change resilience, it may well be that part of the aid should be targeted on assisting the country in establishing good governance systems.

affected societies adapt to these risks, the last step is to implement those solutions. This may prove challenging in its own right.

Firstly, we are concerned with societies and communities in developing countries where the populations are generally poorly resourced and are also under pressure from the impacts of climate change. They simply may not themselves have the necessary resources to adapt, even if they are provided with a solution that will work if duly implemented.

Secondly, the solutions may be financially costly and/or may lead to a power rebalancing amongst those affected. Both costs may constitute important barriers, especially the power rebalancing, which may generate resistance from those in the affected communities who fear that they will be losing out.

Thirdly, it is important to take into full account local and cultural contexts in order to ensure that a proposed solution will be capable of achieving its intended effects. For example, if a salt-resistant crop is introduced in order to replace centuries old salt-sensitive crops, issues such as cultivation of the crop as well as its post-harvest processing may turn out to be decisive for the success of this "solution".

V. Rounding off

The world is faced with enormous societal risks that are difficult to both predict and quantify. To some extent, this may be likened to a country being at war and having to focus its resources in order to ultimately win the war. However, whereas we may expect a war to end and the country to return to a time of peace, climate change does not end. Instead, we are heading towards a "*new normal*" where human societies must learn to adapt to a number of climate change impacts that will affect us all. Choosing not to address these risks is not an option.