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## **Uncertainty, Risk and Ecosystem Management**

*Fabian Schuppert, URPP Ethics, University of Zurich, Switzerland*

Ronald Sandler argues that rapid anthropogenic climate change (CC) undermines traditional ecosystem management goals. According to Sandler this implies that ecological restoration should play a decreased role in future ecosystem management, while reserve oriented strategies might remain viable as long as we change the goals for ecosystem management in the light of CC. While I am overall sympathetic to Sandler's argument and agree with his analysis of CC's impact on existing ecosystem management strategies and goals, I want to critically highlight some shortcomings of Sandler's argument. In particular, Sandler seems to deal in his own positive proposal inadequately with the issues of risk and uncertainty, which play a crucial role in his argument against existing management strategies and goals.

1) Sandler's paper implicitly raises but fails to answer the question of how uncertainty affects the validity of our value-ordering and hence which weight we should attribute to relative certainty in choosing the goals we have for ecosystem management, as well as in making necessary value trade-offs in our policy-choices. This question is of particular interest considering the fact that Sandler treats uncertainty as a reason to abandon existing ecosystem management goals, while using unspecified probabilities to justify his own account of alternative management goals. If uncertainty is such a problem though, shouldn't we favour policies with (relatively) certain outcomes?

Needless to say, it seems obvious that we can never fully eliminate uncertainty as a variable in our decision-making. However, if Sandler's argument that uncertainty significantly affects the validity of our management goals and the efficiency of our management strategies is correct, then the question arises of how we can deal with uncertainty in choosing alternative management goals and strategies and whether we should aim for those policies which gives us a higher degree of certainty.

Sandler (p. 21) argues for three new ecosystem management goals, namely, 'adaptive capacity', 'maintaining ecosystem services' and 'allowing for ecosystem reconfigurations'. According to Sandler (p. 20) reserve oriented strategies can efficiently serve these goals as they 'provide some adaptive space (and so more adaptive possibilities) for populations and systems'. Moreover, since reserves are often more biodiverse places they 'are likely to have more species with sufficient behavioural and

evolutionary adaptive potentials to meet the adaptation challenge' (p. 20). Also, reserves are 'often' (p. 20) conducive to 'protecting ecosystem services and providing instrumental value' (p. 21). While all of this is true for the present, how do we know that in the future this will hold true, too, and how do we know that reserves are indeed an effective and *relatively certain* strategy to meet these goals long term?

Here it is important to stress that it is Sandler himself who introduces (p. 12) the idea of effectiveness as a criterion for choosing and assessing management strategies, and that it is the large uncertainty of future developments which carries significant argumentative weight in Sandler's case against existing ecosystem management practices and the viability of possible alternative strategies such as assisted colonization. If Sandler's initial argument that the magnitude, rate and uncertainty of CC renders traditional reserve oriented strategies untenable is correct, which I think it is, then why should we assume that leaving nature to itself is the best way to *secure* adaptive capacity and the availability of ecosystem services? Phrased differently, if we agree – as Sandler wants us to – that in times of rapid and uncertain CC all we can hope for is to promote adaptive capacities and maintain valuable ecosystem services, it seems on some level *sensible that we strongly value relative certainty with respect to reaching these goals*.

Thus, if it turned out that proactively interfering with natural habitats and ecosystems would with higher probability lead to preserving adaptive capacities and maintaining ecosystem services, according to Sandler's argument we would have to drop the idea of reserve oriented strategies. The problem with the way Sandler's argument currently stands is that it offers us too little evidence that adopting reserve oriented strategies would indeed be in the best interest of achieving our management goals. Moreover, Sandler gives us no hint as to how we should weigh relative certainty with respect to policy-outcomes, when it comes to settling on a set of management strategies.

This is a crucial point which seems particularly relevant in conjunction with another point Sandler only very briefly touches upon, namely, the need to reassess value-orderings and make trade-offs among different values in the context of CC. Sandler mentions 'protecting ecosystem services and providing instrumental value' (p. 21), as possible reasons for adopting reserve oriented strategies. If we were to treat these rather anthropocentric instrumental reasons on a par with more ecological reasons, the probabilities attached to different policy outcomes might matter significantly. In other words, instead of promoting uncertain value-gains through 'free' reserve areas, policy-makers could opt for securing (with relative certainty) basic ecosystem services through

heavily controlling ecosystem development, hence leading to a state in which a trade-off between different values is made (in part) due to the weight we give to relative certainty. After all, uncertainty certainly can work both ways, either in favour of taking a step back and sticking to a reserve oriented strategy, or in favour of securing at least basic values by adopting a human-interference focused strategy. It is this dilemma of uncertainty as a double-edged sword which we as ecologically conscious theorists and activists face whenever we try to base our argument on uncertainty to start with. Hence, it seems that Sandler needs to address this issue in greater detail, in order to make the case for reserve oriented strategies under conditions of CC more convincing.

2.) The second issue is directly related to the first, since Sandler's treatment of risk similarly seems somewhat incomplete. Sandler uses the idea of risk in two instances as an argument against adopting a particular strategy: on page six and seven Sandler argues that the risk of extinction which many species face in the context of CC make both species preservation and ecosystem preservation simply impossible; on page seventeen Sandler argues that assisted colonization should be treated with caution because of the risk of translocated species becoming problematically invasive.

While I think that for the reasons Sandler mentions in this and other publications of his one indeed should be sceptical about assisted colonization, Sandler's treatment of risk of extinction seems problematic.

In his initial argument Sandler claims that the risk of extinction is mainly a problem for strategies focusing on species preservation for species preservation's sake. However, this is not entirely true since the risk of extinction also says a lot about the lack of adaptive capacity among many species, which in turn seems problematic for Sandler's preferred strategy since the reason why Sandler holds reserve oriented strategies to be useful is precisely because they supposedly promote adaptive capacity. However, it is quite unclear why that should be indeed the case (or if it is the case quickly enough to make a difference), since Sandler himself claims in the beginning that the very features of current CC are of such a kind that many species cannot adapt in time.

While I fully agree with Sandler's argument (p. 18) against valuing species ahistorically, since the value of species 'is dependent upon evolutionary and ecological situatedness', the problem with the risk of extinction and reserve oriented strategies is that even if we value species in this way we might face a huge loss of value by adopting a reserve oriented strategy, namely if it turns out that species and systems in protected areas fail

to adapt as quickly and effectively as necessary. When it comes to choosing our preferred set of ecosystem management strategies then we also have to deal with the issue of risk and its associated losses of value. Is the small risk of a possibly catastrophic loss of value due to mass-species-extinction a reason to aim for strategies with higher but less catastrophic risks attached? And how shall we handle and weigh risk more generally? Unfortunately, Sandler does not engage with this point in depth, which means that Sandler cannot offer us a convincing argument for why his strategy is able to deal better with risk and uncertainty than the strategies he criticizes in his article.

It seems that the problem we touch upon here is of a more general nature when it comes to arguing about uncertainty and risk in the context of environmental ethics. The major challenge we face as theorists is to explain why risk and uncertainty seem to act as knock-down arguments in some cases while being less dominant in other cases. Moreover, if we were to value certainty and risk-avoidance to a significant degree this would influence the policy-choices we make and it might lead to tread-offs many of us are not prepared to make, since it is almost always easier to identify relatively certain low-risk options for less ambitious goals (e.g. securing basic ecosystem services for a limited number of humans) than to identify relatively certain low-risk options for more ambitious projects (e.g. promoting the well-being and functioning of diverse systems). How we deal with this dilemma though is crucial for determining adequate ecosystem management goals and strategies in the context of climate change.