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ABSTRACT: Einstein discovered a deep connection between energy and mass and represented it by the now famous equation $E=MC^2$. In this equation, the final variable is a very large number, the square of the speed of light. Moving beyond the physics, can we use the same intuitive approach when we look at the Environment where the final variable in this equation is the square of the climate or in other words, natural climate times human-induced climate. As we know, climate exerts a large influence on the environment, especially biodiversity, and we need to analyze the multiplier effects of the changing climate, not just the simple additive impacts. In this context, we know that biodiversity thresholds change radically when the impact of the multiplier climate is further accelerated by the lack of management actions. We have made significant progress in our understanding of the current and future changes in the climate system, but have we implemented biodiversity actions at the same magnitude and rate to maintain a sustainable environment?

Keywords: human-induced climate variability, multiplier climate, adaptive biodiversity management

1. Introduction

Human-induced climate variability and change is no longer a theoretical concept. It is a real driver of change that affects all human, biological and socio-economic activities. None are immune.

There are two real questions that now become apparent. First, are the cumulative effects of natural and human-induced changes in the climate an additive or a multiplier process? Second, can biodiversity management actions off-set this multiplier climate in order to maintain a sustainable environment?

In 2005, our article (MacIver and Wheaton, 2005) raised the overarching question if climate change were the “third outrage” on humanity. The first two were described by Freud when he observed that “humanity has in the course of time had to endure from science two great outrages upon its naive self love” – the first outrage when science discovered that the earth was not the centre of the universe and the second when biological science relegated humans to that of a descendent from the animal world (Gould, 1977). The Intergovernmental Panel on Climate Change has increasingly produced stronger language warning humanity that warming of the climate system is “unequivocal”. In other words, science has already defined this “third outrage” on humanity, but has management heard the message.

2. The Multiplier Climate and Biodiversity Management

The debates have raged for years on the subject of natural versus human-induced climates. In reality, the environment cares very little about the word “versus” and is much more affected by the combined effects of both climates. So how do we deal with this changing climate? In keeping with the brevity of Einstein’s equation, the following points bear consideration.

In the additive world of statistics, we could simply define the historical climate, its variabilities and extremes and add to it the projections of future climate change, making the assumption that the biological world will react in a similar linear and additive manner. By now, we know that this is not the case, and that the biological responses will be non-linear in space and time, hence the need for incrementally greater biodiversity management actions to off-set the multiplier effects of the changing climate.

But how do we illustrate this multiplier effect in a language that policy-makers and decision-makers can translate into adaptive management actions? We clearly understand the multiplier effects of a natural climate combined with an urban climate by defining pockets of urban heat islands and the increased adaptive responses that are required to protect human health in these sub-regions. Our experiences have demonstrated this same non-linearity at sub-regional and local scales in rural landscapes, demonstrating once again the multiplier effects of the combined natural and human-induced climate. Paleo-climate evidence also substantiates that atmospheric changes will be abrupt and step-wise and the need to re-define critical biological thresholds is urgent.

Have current biodiversity management practices kept pace and served as off-sets to this multiplier climate? Our experiences demonstrate that management is slow to respond to changes; reactive in its adaptation actions; incorrect in its assumptions that the biological community is a robust and resilient environment; and overall, management has difficulty custom-fitting adaptation actions to the appropriate scale. Instead, future adaptation actions need to recognize the urgency to adapt now; adopt a pro-active, anticipatory adaptation strategy; accelerate the planning and science solutions at the appropriate scales and engage communities, partners and the education sector. In other words, think much bigger in terms of planning; catastrophic in terms of threats; and implement solutions sooner, not later. The phrase “I told you so” brings little comfort to anyone after the event.

References:

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