



Using a Pareto-optimal solution set to characterize trade-offs between a broad range of values and preferences in climate risk management

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Integrated assessment models (IAMs) are often used to inform the design of climate risk management strategies. Previous IAM studies have broken important new ground on analyzing the effects of parametric uncertainties, but they are often silent on the implications of uncertainties regarding the problem formulation. Here we use the Dynamic Integrated model of Climate and the Economy (DICE) to analyze the effects of uncertainty surrounding the definition of the objective(s). The standard DICE model adopts a single objective to maximize a weighted sum of utilities of per-capita consumption. Decision makers, however, are often concerned with a broader range of values and preferences that may be poorly captured by this a priori definition of utility. We reformulate the problem by introducing three additional objectives that represent values such as (i) reliably limiting global average warming to two degrees Celsius and minimizing (ii) the costs of abatement and (iii) the climate change damages. We use advanced multi-objective optimization methods to derive a set of Pareto-optimal solutions over which decision makers can trade-off and assess performance criteria a posteriori. We illustrate the potential for myopia in the traditional problem formulation and discuss the capability of this multiobjective formulation to provide decision support.