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Empirical Measures for Climate Change Mitigation

As UNFCCC Parties prepare and submit their INDCs, third party analysts will attempt to compare dissimilar plans to establish comparability of mitigation effort. Such analyses vary widely depending on the relative importance given to equity, national capacity, historical responsibility, and cost effectiveness (Höhne et al., 2014). A major weakness of these analyses is the question of baseline emissions. In order to quantify a country's mitigation, its proposed plan of emissions must be deducted from a baseline – generally considered to be a "no policy," business-as-usual prediction of emissions (Søbygaard & Larsen, 2013). However, such predictions vary widely and the choice of baseline strongly influences the resulting estimation of mitigation effort (Figure 1).

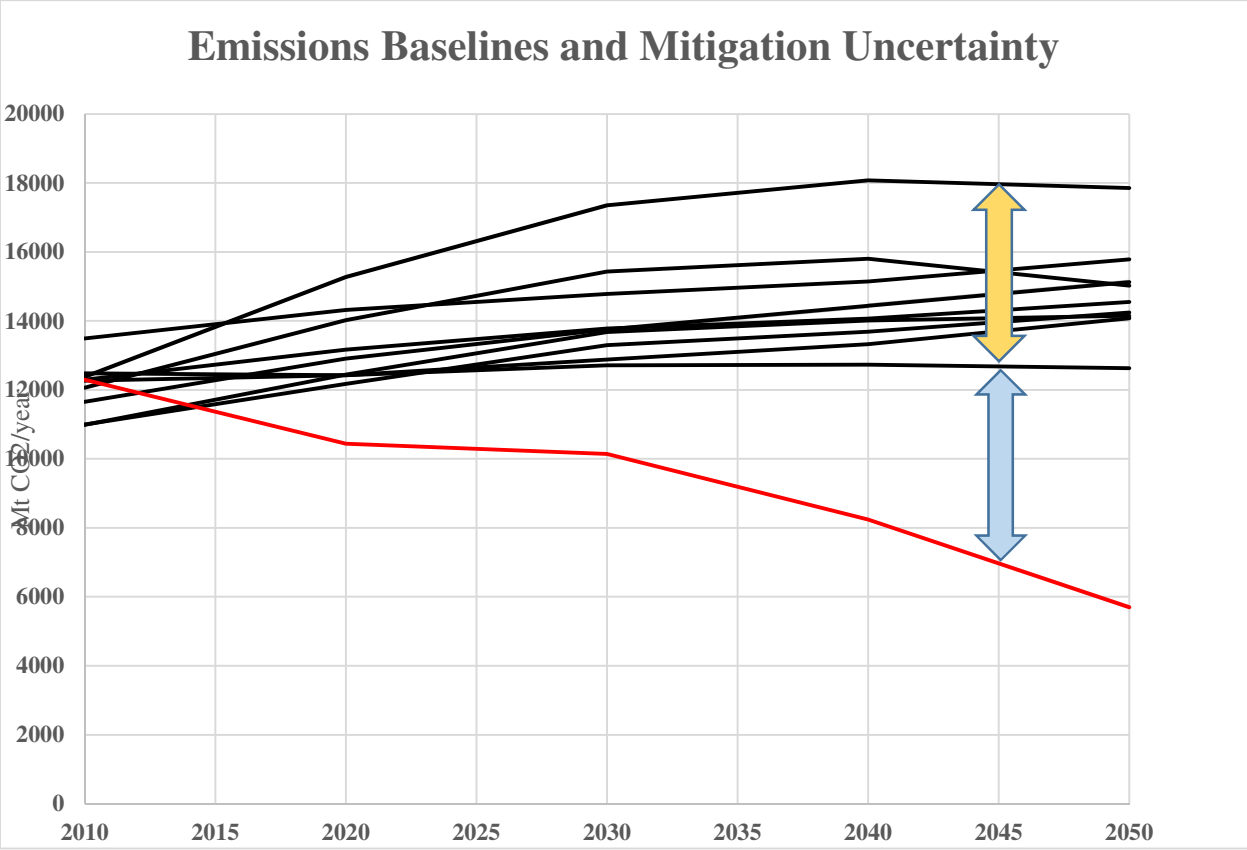

Figure 1: Select baseline emissions trajectories from Integrated Assessment Models (black lines) and a mitigation pathway representative of INDCs (red line) for OECD 1990 countries. The blue arrow represents mitigation measured against the most conservative baseline and the yellow arrow uncertainty in mitigation due to model spread. Data source: AR5 Scenario Database (Version 1.0.1) https://secure.iiasa.ac.at/web-apps/ene/AR5DB

Integrated assessment models (IAMs) are the usual tool of choice to predict emissions trajectories over time as well as the economic consequences of those pathways (Søbygaard & Larsen, 2013). However, IAMs suffer from several weaknesses, ranging from technical to epistemological (Stern 2013). As a result, the numbers derived may be off by an order of magnitude or more (Moore & Diaz, 2015). IAMs have been criticized as creating "a perception of knowledge and precision, but that perception is illusory and misleading." (Pindyck 2013). The resulting baselines are highly dependent on input parameters and thus subjective, diminishing their usefulness in negotiations. Moreover, IAM results, while available for major emitters, are often not available for many smaller and less developed countries. Nevertheless, IAMs continue to be widely used as no ready or superior substitute is available.

I propose to address this issue by empirically deriving national baselines. For example, population growth is a major driver of GHG emissions and changes slowly on a multidecadal timescale. It can therefore be used as an objective predictor of a nation's baseline emissions path. I will test various predictors for each country and expect to find a tailored set of predictors for each country which both significantly constrains emissions growth and can be predicted into the future under a variety of climate conditions with high confidence. This will allow proposed INDC mitigation paths to be compared against "apples-to-apples" baselines.