

A Hubbert Analysis on Natural Gas Production of the Top Producers. How the Carbon Budget Is Affected Under Unconstrained Extraction

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Abstract - The Hubbert curve was first introduced seventy years ago, to estimate oil reserves and production in the US. In this paper, Hubbert's logistic function is used to estimate the peak production of natural gas of the top producers worldwide. The aim is to manage and fit the historic data with the minimum error and eventually project the CO₂ emissions that result if the estimated reserves are extracted. Finally, we try to answer how the carbon budget is affected if production continues unconstrained. To that extend, historic data of the major producers were fitted and both production and expected emissions, were estimated. For several countries, the logistic function presented an adequate fit, while for others, it did not. The countries that didn't fall under the bell-shaped (Hubbert) curve, have made political decisions to constrain their production. Continuing with the other countries (so called reference countries) we estimate that their cumulative emissions from natural gas production, will account for 59% of worldwide emissions by 2050, with China and the US dominating. Most importantly, in the case of no action for mitigating the emissions, total CO₂ emitted, from natural gas production only, will consume 85% of the available carbon budget by 2050 to limit expected temperature increases to 1.5 °C and 31% of the budget in the case of a 2 °C temperature increase.

Keywords: Hubbert curve, logistic function, natural gas production, CO₂ emissions, carbon budget