HOW CAN WE MEET THE PARIS AGREEMENT TARGET? - AN INTEGRATED MODELLING APPROACH

Koji Tokimatsu, Tokyo Tech & AIST, Phone +81 45 924 5533, E-mail: tokimatsu.k.ac@m.titech.ac.jp
Rieko Yasuoka, SRC, Phone +81 3 3434 1744, E-mail: r.yasuoka@src-i.co.jp
Masahiro Nishio, AIST, Phone +81 29 861 7241, E-mail: m.nishio@aist.go.jp

Overview

We investigate following three zero emissions scenarios to address target of 2 degree Celsius (DC) or below with Business As Usual (BAU) without any climate policy intervention. First one is keeping the emissions level zero after 2100 till 2150, denoted as “2100 zero”. Second one is “350ppm zero”, whose emissions trajectories are zero in the latter half of this century, which can be achieved by giving cumulative emissions of the Wigley-Richels-Edmonds (WRE) 350 from 2010 to 2150 as emissions constraint. Third one is denoted as “net zero”, whose cumulative emissions from 2010 to 2150 is zero. This does not mean keep the emissions level zero over the time horizon; allowing positive emissions in the coming several decades while negative emissions in the latter half of this century. Results indicate the 2 DC target can be achieved in the “net zero” scenario, while “350ppm zero” scenario leached 2.4 DC. The “2100 zero” scenario leached 4.1 DC while BAU about 5.2 DC. Even though “net zero” cannot attain 1.5 DC target, meaning something radical technologies are required to meet the target. Shadow price of carbon indicated dramatical increase under the “net zero” scenario, arriving around some hundred USD/tonCO2eq in 2100.

The paper is organised as follows: After the introduction the second section gives a brief overview about the integrated assessment model. The third section addresses the results briefly outlined in the above overview. In section four we describe some climate policy discussios to meet the 2DC target agreed in COP21. In the final section some concluding remarks are derived.

Methods

Integrated assessment model

Results

First, balances on carbon emissions and reductions by various technological measure are illustrated.

Second, trajectories on global mean temperature rise are shown under various climate policy scenarios.

Third, in addition to the above, paths of shadow price of carbon are shown to assess the scenarios.

Conclusions

Our findings have strong policy implications. The “net zero” emissions constraint is required to meet the 2DC, “350 ppm zero” scenario is insufficient when including Non Carbon GHG. However, even though “net zero” cannot attain 1.5 DC target, meaning something radical technologies are required to meet the target. On the contrary, if climate target of 4DC is taken, “2100 zero” scenario that allows us to emit GHGs without constraint till the end of this century to prepare zero emissions thereafter.

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