

Forecasting China's Carbon Intensity

-- Is China on Track to Comply with Its Copenhagen Commitment?

Yuan Yang¹, Junjie Zhang², and Can Wang³

Executive summary

In the 2009 Copenhagen Accord, China agreed to slash its carbon intensity (carbon dioxide emissions/GDP) by 40% to 45% from the 2005 level by 2020. In November 2014, under the joint commitment between China and the United States to combat climate change, China has further announced to peak its carbon emissions by around 2030. However, the level of China's peak emissions as well as the effort needed to tame China's surging emissions to peak beyond 2020 firstly depends on how well China could do in the following years till 2020, or to be specific depends on whether the 2020 carbon intensity target can be overshoot or only underachieved.

This study assesses whether China can achieve the 2020 carbon intensity target under the business-as-usual scenario by forecasting its emissions from energy consumption. We use provincial data to forecast China's CO₂ emissions because using disaggregated data can increase forecasting efficiency. Moreover, by exploiting a large set of spatial econometric models to explicitly account for spatial-temporal dynamics of CO₂ emissions, our model accounts for spatial spillover effects which significantly improve forecasting performance especially for a long horizon. The data used for model estimation is a balanced panel data set of provincial CO₂ emissions from 1985 to 2011, which is calculated from detailed provincial energy consumption data.

We forecast China's carbon intensity in 2020 to be 32.8% below the 2005 level. It implies that China would be short of the 40%-45% Copenhagen target under the BAU scenario. Most provinces are unlikely to achieve the intensity targets without additional mitigation efforts. Only five provinces are likely to meet their targets in the 12th FYPs and only nine provinces are likely to accomplish the Copenhagen commitment. In particular, the less developed central and western provinces will miss the targets significantly, partly reflecting their fast paced industrialization. Furthermore, we forecast China's baseline CO₂ emissions to increase by 56.2% from 2011 to 2020. The emission increase is about 3 to 3.7 times of the total committed emission reductions from the European Union and the United States in the same period.

Keywords: climate change; carbon dioxide emissions; China; spatial econometrics.

1 State Key Joint Laboratory of Environment Simulation and Pollution Control (SKLESPC) and School of Environment, Tsinghua University

2 Co-lead author, Environmental Research Center, Duke Kunshan University and Nicholas School of the Environment, Duke University

3 Corresponding author: State Key Joint Laboratory of Environment Simulation and Pollution Control (SKLESPC) and School of School, Tsinghua University. Beijing 100084, China. E-mail: canwang@tsinghua.edu.cn