# Revised Emissions Growth Projections for China: Why Post-Kyoto Climate Policy Must Look East

by Geoffrey J. Blanford, Richard G. Richels, and Thomas F. Rutherford

## Overview

Carbon dioxide ($CO_2$) emissions from China's energy sector have recently grown much faster than most analysts expected. This paper presents updated global emissions projections after taking into account recent trends in China. The results suggest that even the most up-to-date international forecasts may still underestimate potential emissions growth, especially among developing countries.

## Discussion

Since 2000, China's energy-related $CO_2$ emissions have grown at an average rate of more than 10% per year. Global forecasts have been slow to reflect this trend, in part because it follows two decades in which the energy intensity of the Chinese economy declined with privatization and the introduction of market reforms. But rapid growth in industrial demand and a heavy reliance on coal have since combined to reverse that decline. In 2006, China surpassed the United States as the world leader in carbon emissions.

More broadly, it now appears that emissions from developing countries as a group will exceed those of developed countries before 2010, much earlier than previously expected. To explore the implications of these trends, the authors recalibrate MERGE, a general equilibrium model of the economy and energy use, to incorporate more recent data from China. Comparing the results to historic emissions and development patterns in similar Asian countries, the authors find that their new projections for China are largely consistent with past experience.

Higher baseline or "business-as-usual" (BAU) emissions make any given target for stabilizing atmospheric $CO_2$ concentrations more difficult and expensive to achieve. Comparing their updated emissions projections to different stabilization pathways and considering three distinct scenarios for developing-country participation in future mitigation efforts, the authors reach sobering conclusions about the attainability of commonly discussed $CO_2$ stabilization targets.

## Key Findings & Recommendations

➢ *Updated projections for China suggest that continued growth in developing-country emissions could put stabilization targets effectively out of reach within the next 10 to 20 years, regardless of what wealthier countries do.* By as early as 2020 or 2030, depending on the stabilization target chosen, BAU emissions from developing countries alone—even with zero contribution from developed (so-called "Annex B") countries—could exceed the maximum consistent with a reasonable trajectory for achieving $CO_2$ stabilization.

➢ *A $CO_2$ stabilization target of 450 parts per million by volume ( ppmv) is probably no longer realistic and a target of 550 ppmv now appears as challenging as 450 ppmv appeared just a few years ago.* To achieve the 450 ppmv target, even with all nations participating under optimal conditions, abatement must begin immediately such that global emissions by 2020 are 35% below BAU levels. This implies a carbon price on the order of $2,000 per ton, carbon in 2020 (roughly equivalent to a gasoline tax of $6 per gallon) and is unlikely to be tenable.

➢ *Stabilization at 550 ppmv may still be feasible if developed countries undertake immediate reductions and developing countries follow a "graduated accession" scenario in which China and other mid-income countries (e.g., Korea, Brazil, Mexico, and South Africa) join global mitigation efforts in 2020, India joins in 2040, and poorer countries delay participation until 2050.* However, this requires that (a) developed countries achieve 60% reductions (below 2005 emissions) by 2050 and (b) developing countries, when they join, join at the same level of stringency as developed countries, which translates to adopting a carbon price trajectory that rises from $65 per ton in 2020 to $280 per ton in 2050.

➢ *If developing countries enter into a global regime more gradually—for example, by adopting progressively more stringent targets only as incomes rise—global emissions continue to grow through 2050 and even the 550 ppmv target begins to look doubtful.* To explore this option, the authors use a simple correlation between country-level income and targets adopted during the first Kyoto commitment period. This produces substantially better results than the no-participation case, but global emissions are still higher than in the graduated accession scenario and well above the optimal trajectory for stabilization at 550 ppmv.

➢ *The longer developing countries continue on a BAU path, the more globally costly it becomes to achieve a given stabilization target. At the same time, participation in a global regime can impose disproportionate costs on developing economies.* The authors find that rapidly growing countries like China and India experience a higher percent reduction in GDP for the same percent reduction in emissions under an optimal 550 ppmv stabilization scenario where all countries participate at the same level of stringency. Thus, equity-based adjustments may be needed to motivate developing-country participation in the timeframe needed to achieve stabilization objectives.

## CONCLUSION

The recent acceleration of energy-related emissions in the developing world, particularly China, has taken many analysts by surprise. An updated view of global trends suggests that stabilization at the 450 ppmv level is no longer an option, while achieving a 550 ppmv target will be much more difficult than previously anticipated. In this context, no issue is more urgent for international climate negotiations than that of establishing incentives for timely and meaningful participation by developing countries, especially China.

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