Scenario modeling for emission pathway and the related synergies in China's steel and cement sectors

Shaohui Zhang[1]

[1] *School of Economics & Management, Beihang University, Beijing 100191, China.*

Background

A better understanding of sustainable climate solutions is crucial because the COP24 sets out each country should provide their national action plans, including GHGs mitigation and related adaptation measures. Most of energy models tends to focus on assess global and regional solutions and thereby miss linkages across countries and sub demand sectors, which leads to GHGs mitigation are often not very realistic and cannot be used to design specific policies.

Motivation

The objective of this study is to assess the cost-effective synergies in terms of energy & resource saving, emission reduction of CO_2 and environmental pollution in China's steel and cement sectors.

Methodology

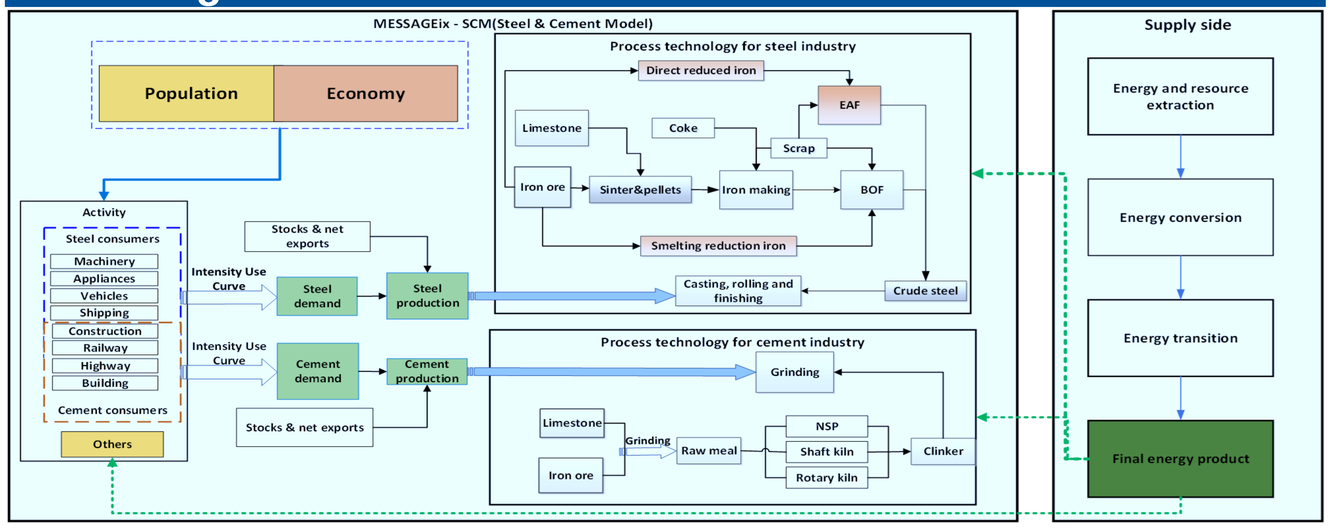
The MESSAGEix – SCM (Steel & cement Model) through integrate the cement and steel sectors into the IIASA's MESSAGEix framework to identify cost benefit potential for energy & resource saving and emission reductions. We select China as a case study, because China responsible for over 50% of the global cement and steel production and together consumes one quarter of China's total energy.

MESSAGEix – SCM is a technology-based model, which provides a complete description of the process and the related retrofitting measures for steel and cement sectors. Of overall 15 process technologies and 90 energy efficiency measures are include in MESSAGEix – SCM.

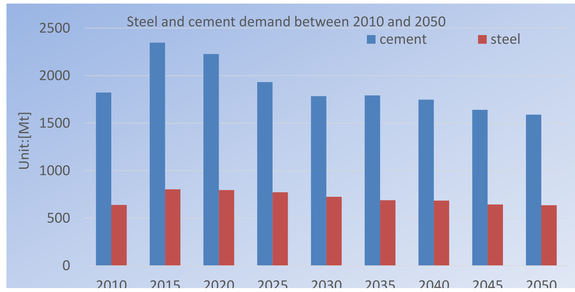
Scenario Design

Scenarios	Scenario Description	
	Common features	Different features
Baseline (BL)	The future production of cement and steel is assumed unchanged; Discount rate is 10% The imports share of raw material consumption remains unchanged in the future	The BOF share of total steel production will decrease by 2% The clinker to cement rate is assumed unchanged
Energy efficiency (EE)		54 energy efficiency measures in steel industry and 36 energy efficiency measures in cement industry will be introduced

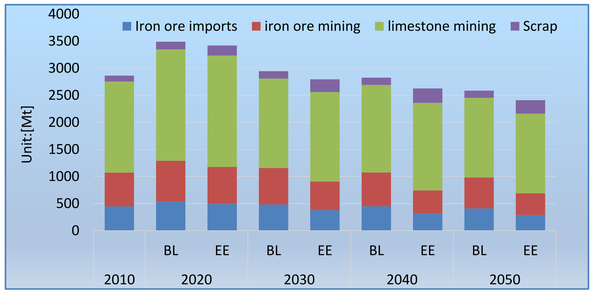
Modelling framework for MESSAGEix – SCM



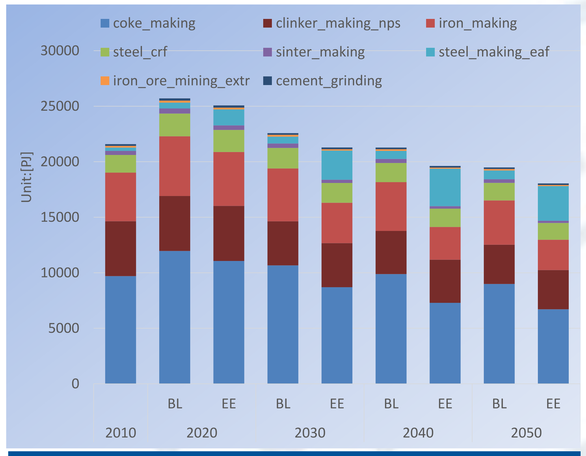
Steel & cement demand



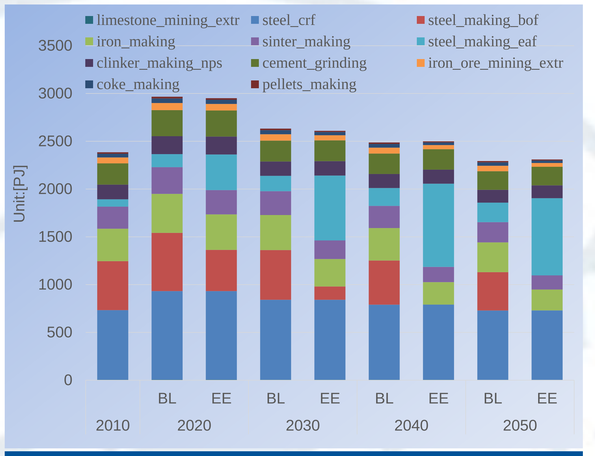
Raw material consumption



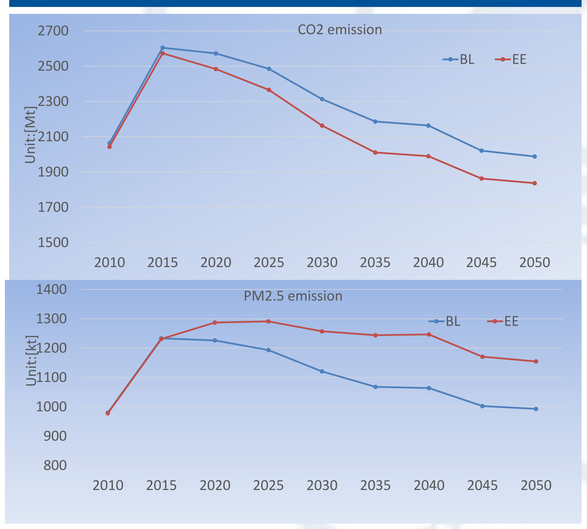
Coal consumption



Electricity consumption



Emissions for CO2 and PM2.5



Conclusions

- The peaks of energy & resource consumption and emissions appeared in 2015, then will be decline up to 2050.
- There are large potentials to decrease energy consumption and emissions without considering mitigation technologies.
- Cost-effective energy efficiency technologies would lead to 7% and 5% of energy saved in steel and cement industries, respectively.
- Process of EAF and NSP technology will be cost-effective in the future to improve energy and resource efficiency, and decline emissions.

Contact information: s_zhang@buaa.edu.cn(Shaohui Zhang)