Projection of Atmospheric Mercury Emission in China

Shuxiao WANG
Tsinghua University
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Calculating mercury emissions in China

A technology-based emission factor method

\[ E = c \times R \times \prod (1 - \eta) \times \theta \times A \]

Activity levels

Hg concentration in fuel/raw materials

release  removal  speciation

1995

Wu et al., Environmental Science & Technology, 2016, 50: 13428-13435; Zhang et al., ACP, 2016, 16(4): 2417~2433
China’s climate goal: to have the CO₂ emissions peak before 2030 and achieve carbon neutrality before 2060.

To achieve carbon neutrality by 2060, China will strive to achieve a long-term deep decarbonization oriented towards the 1.5°C target.

- By 2050, the total energy demand is 5 billion tce.
- The proportion of non-fossil energy is more than 85%.
- The proportion of non-fossil power in the electricity generation is over 90%.
- The proportion of coal in total energy is below 5%.

Primary energy consumption and composition of carbon dioxide net emission scenarios under the target of 1.5°C.

ICCSD, Tsinghua University, 2020
The goal of carbon neutrality before 2060 will synergistically reduce the Hg emissions from energy sector (not limited to MC regulated sources).
## Future activity levels: impact of Minamata Convention

<table>
<thead>
<tr>
<th>Fuel consumption</th>
<th>Incineration and interment</th>
<th>Waste incineration</th>
<th>Biomass combustion</th>
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<td>Coal-fired power plants</td>
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<td>Coal-fired industrial boilers</td>
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<td>Residential coal combustion</td>
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<td>Other coal combustion</td>
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<td>Natural gas combustion</td>
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<td>Oil refining</td>
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<td>Oil combustion</td>
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<td>Building materials production</td>
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<td>Mercuric chloride catalyst production</td>
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<tr>
<td>Iron and steel smelting</td>
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<td>Vinyl chloride monomer (VCM) production</td>
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<td>Cement production</td>
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<td>Nonferrous metal smelting</td>
<td>Production activities using Hg</td>
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<td>Copper smelting</td>
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<td>Lead smelting</td>
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<td>Fluorescent lamp production</td>
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<td>Zinc smelting</td>
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<td>Battery production</td>
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<td>Industrial gold smelting</td>
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<td>Dental amalgam production</td>
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<tr>
<td>Aluminum smelting</td>
<td>Use of Hg-added products</td>
<td>Use of thermometer</td>
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<tr>
<td>Hg recovery</td>
<td>Hg production from recyclable resources</td>
<td>Use of sphygmomanometer</td>
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<td></td>
<td>Primary Hg ore mining</td>
<td>Use of fluorescent lamp</td>
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</tr>
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<td></td>
<td>Primary Hg ore mining</td>
<td>Use of battery</td>
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</tr>
</tbody>
</table>

Future activity levels: impact of other policies

Notice on the comprehensive implementation of domestic waste classification in cities at prefecture-level and above across the country.

Before the end of 2019, all cities should prepare and complete the implementation plan for domestic waste classification. Clarify the standards for domestic waste classification, and promote the target tasks, key projects, supporting policies, and specific measures for promoting domestic waste classification.

Figure source:

Figure source:
m.hxnews.com/news/gn/shxw/201907/10/1775402.shtml
Work plan to implement the ultra-low emission and energy-saving transformation for coal-fired power plants: By 2020, all coal-fired power plants complete the ultra-low emission transformation.

Wen et al., Journal of Hazardous Materials, 2020, 396: 122729
End-of-pipe control: waste incineration

Boiler  Stove ash  
\[ \text{AC Injection} \]
\[ \text{Neutralization Reactor} \]
\[ \text{Fabric Filter} \]
\[ \text{Stack gas} \]

Optimization of Carbon Injection Rate

AC injection rate
\[ 170 \text{ mg} \cdot \text{Nm}^{-3} \]
\[ 100 \text{ mg} \cdot \text{Nm}^{-3} \]

Hg removal
\[ 90\% - 95\% \]
\[ 66\% - 78\% \]

Li et al., Environmental Science & Technology, 2018, 52(4): 1940~1945
End-of-pipe control: cement clinker production

- The mercury cycling significantly increases the Hg emissions.
- BAT/BEP technologies shall be applied to control Hg emission from cement.

Thanks for your attention!

Contact me:
shxwang@tsinghua.edu.cn