How Green Transition of Energy System Impacts China’s Mercury Emissions

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Abstract China has long been committing to green transition of energy system to alleviate the heavy pollution; however, a quantitative analysis for its impact on air pollution has been lacking. To fill the knowledge gap, this study makes an initial attempt to reveal how green transition of energy system influences China’s energy-related mercury emissions from both individual sector and supply chain perspectives, by using input-output (IO)-structural decomposition analysis and structural path analysis. Moreover, the aggregated power sector in the original IO tables are further disaggregated into seven types of power sectors to avoid the inherent huge uncertainty related to the aggregation. The results show that green transition in terms of emission factor control and energy mix adjustment has substantially benefited mercury reduction, while energy efficiency improvement has a much weaker effect. The largest consumption-based mercury reduction brought about by energy green transition happens in sector Construction, with an amount of 49.6 t. This study also finds that the green transition generally makes the production layers less mercury intensive, and the energy-related mercury emissions are more concentrated in the production layers. Policy suggestions for further enhancing energy green transition’s mitigation effects for mercury emissions are comprehensively discussed.

Plain Language Summary China is undergoing an unprecedented green transition towards a more renewable, more efficient, and less polluted energy system. An important question arises on how to quantify the impact of green transition on mercury emissions, a toxic global pollutant to both human health and ecosystem. To this end, an environment-economy integrated model is developed to link the mercury emissions with the production chain network in China. We find that green transition in terms of “less polluted” and “more renewable” has substantially benefited mercury reduction, while the effect of “more efficient” is much weaker. The green transition brings the largest mercury emission reduction along the upstream supply chains in sector Construction. This study also finds that the green transition generally makes the production layers less mercury intensive. By understanding the green transition’s mitigation effects for mercury emissions, more targeted policies could be adopted for China to fulfill the commitment under Minamata Convention.

1. Introduction

China is the largest emitter of anthropogenic mercury globally, a highly toxic pollutant to human health and the ecosystem (Chen et al., 2019; Mergler et al., 2007; Zhang & Wong, 2007). Fossil energy, coal especially, is one of the main sources for mercury emissions. A recent research shows that 37.92% of China’s air-borne mercury emissions can be attributed to coal combustion (Wu et al., 2016). To cope with the threats posed by mercury, China officially ratified the legally bind Minamata Convention aiming at global mercury control in 2016. Since then, mercury emission reduction has been an international and domestic obligation for China. Accordingly, reducing mercury emissions from energy sources is considered to be one of the priorities in mercury control policies, regarding fossil energy’s dominant role in China’s enormous mercury emissions (Wu, Li, et al., 2018).

The dirty coal-dominated fossil energy issue in China is not only blamed for its serious mercury pollution but also responsible for carbon emissions as well as other severe air pollutions (Ma et al., 2017; Tong et al., 2018; Zhang, Jiang, et al., 2017). Consequently, China has made great determination to promote energy’s green
transition. Remarkable efforts have been made in different aspects such as issuing environmental mandates, improving energy efficiency, and restructuring energy system, especially in power sector (Ma & Zhao, 2015). For example, environmental mandates require power plants to install flue gas desulfurization devices that can lower the mercury emission factors. Supercritical and even ultracritical technologies with much higher power generation efficiency have gradually replaced the subcritical units for power generation (Zhao & Ma, 2013). At the meantime, China has long been committed to generating more power from renewable sources, such as solar and wind. China Electricity Council reports that electricity produced from renewable sources is growing from $5.79 \times 10^9$ to $1.48 \times 10^9$ GWh during 2008–2016 in China (CEC, 2009, 2012), mainly consisting of hydro and wind. And now, over a quarter of China’s power generation comes from renewable sources. Moreover, as China explores renewables not just only for the prevention and control of air pollution but also for ensuring its energy security, it is highly likely that renewables will takes more weights in the power mix in future (Kan et al., 2019).

In this context, a question arises, that is, how the green transition of energy impacts the energy-related mercury emissions? There has been several studies on how various driving factors (e.g., electricity generation mix change, final consumption level, and economic output) affect carbon emissions in electricity sector based on the index decomposition analysis (Goh et al., 2018; Liu et al., 2017; Zhang et al., 2019; Zhou et al., 2014) and structural decomposition analysis (SDA; Ma et al., 2019; Wang et al., 2019). However, a quantitative analysis for how China’s green transition of energy system changed the national mercury emissions, especially in electricity sector, is left unexplored. Moreover, most of the existing studies only focus on how the pollution control actions and policies affect end-of-pipe mercury emissions (Chen, Li, Chen, Wei, Yang, Yao, Shao, Zhou, Xia, & Dong, 2017a; Chen, Driscoll, et al., 2018; Liu et al., 2018; Wu, Li, et al., 2018; Wu et al., 2016; Wu, Wang, et al., 2018; Zhang et al., 2015; Zhang et al., 2018; Zhao et al., 2015), which fail to reveal how the green energy transition affects the sectoral and supply chain mercury emissions from a consumption perspective.

In order to answer the aforementioned question, this study first quantifies the contribution of various factors such as energy structure to mercury emissions changes in light of the environmentally extended input-output-based SDA (EEIO-SDA) approach and then tracks the changes in the key path for mercury transfer via supply chains by using structural path analysis (SPA). It should be noted that electricity sector plays the most important role in energy system’s green transition in China. Therefore, this study firstly disaggregates the power sector into power transmission & distribution as well as six different power generation sectors in the input-output (IO) table. The reason why the disaggregation is necessary has been well elaborated in numerous studies (Ma et al., 2019; Wei et al., 2018). Lenzen (2011) pointed out that the aggregation of environmentally intensive sectors in EEIO-based studies leads to not only information loss but also errors. More specifically, Lindner proved that the aggregation of power from different sources will lead to huge uncertainty when using EEIO to calculate embodied carbon emission (Lindner et al., 2013). For instance, if the emission-free hydropower sector and emission-intensive coal power are aggregated into the power sector, the emission intensity of coal-fired power will be grossly underestimated while that of hydropower will be overestimated.

To our knowledge, this is an initial attempt to measure green transition of energy’s contribution to energy-related mercury emission changes from the consumption perspective. Thus, this study is expected to not only figure out how the energy transition influence the mercury emissions induced by one of the world’s largest energy consumer but also provide valuable insights for mitigation strategies for the world’s largest mercury emitter.

2. Materials and Methods

2.1. Disaggregating the Power Sector in Chinese IO Tables

The first step is to disaggregate the original power sector into two subsectors, that is, power transmission & distribution and power generation sector. Inputs from all the other sectors into these two new subsectors are estimated according to their ratios of monetary investment, following (Lindner et al., 2013). Here, we use an example to elaborate the case. If agriculture’s inputs into the aggregated power sector are 1 million yuan, then agriculture’s inputs into power transmission & distribution and power generation are 0.3 million and 0.7 million yuan, respectively. These two subsectors’ initial inputs, outputs into the rest sectors, and their
The IO-SDA starts with the quantification of consumption-based mercury emissions by

\[ ME = f(I-A)^{-1}F, \]

where \( A \) is a reflection of the technical level of the IO coefficient matrix, \((I-A)^{-1}\) represents Leontief inverse matrix, which is referred to as the intersectoral matrix, which is referred as the intersectoral structure. \( F \) is the final demand. Mercury intensity is calculated by emission factor \( e \) multiplying by energy mix \( M \) and energy intensity \( E \); therefore, it can be further decomposed into these three factors.

\[ f = e^*M^*E. \]

Meanwhile, each sector's final demand can be further decomposed into these three factors: consumption structure \( S \), consumption per capita \( C \), and population \( P \).

\[ F = S^*C^*P. \]

Therefore, the changes in mercury emissions can be expressed as

\[ ME = e^*M^*E^*L^*S^*C^*P. \]

Thus, changes in energy-related mercury emissions between different years can be calculated by

\[ \Delta ME = ME_t - ME_0 = e_tM_tE_tL_tS_tC_tP_t - e_0M_0E_0L_0S_0C_0P_0. \]

where \( \Delta ME \) indicates the change of total mercury emissions. Theoretically, there will be \( 7! = 5,040 \) types of decompositions, which is very time-consuming. To address this problem, two polar decompositions are adopted (Feng et al., 2015; Mi et al., 2017). Thus, \( \Delta ME \) can be obtained as

\[
\begin{align*}
\Delta ME &= (\Delta e_tM_tE_tL_tS_tC_tP_t + \Delta e_0M_0E_0L_0S_0C_0P_0)/2 + \\
& e_tM_tE_tL_tS_tC_tP_t + e_0M_0E_0L_0S_0C_0P_0)/2 + \\
& e_tM_tE_tL_tS_tC_tP_t + e_0M_0E_0L_0S_0C_0P_0)/2 + \\
& e_tM_tE_tL_tS_tC_tP_t + e_0M_0E_0L_0S_0C_0P_0)/2 + \\
& e_tM{t}E_tL_tS_tC_tP_t + e_0M_0E_0L_0S_0C_0P_0)/2 + \\
& e_tM_tE_tL_tS_tC_tP_t + e_0M_0E_0L_0S_0C_0P_0)/2 + \\
& e_tM_tE_tL_tS_tC_tP_t + e_0M_0E_0L_0S_0C_0P_0)/2 + \\
& e_tM_tE_tL_tS_tC_tP_t + e_0M_0E_0L_0S_0C_0P_0)/2 + \\
& = ME(\Delta e) + ME(\Delta M) + ME(\Delta E) + ME(\Delta L) + ME(\Delta S) + ME(\Delta C) + ME(\Delta P).
\end{align*}
\]

Finally, the total change of mercury emissions will be decomposed into seven components according to their own changes: \( ME(\Delta e) \), \( ME(\Delta M) \), \( ME(\Delta E) \), \( ME(\Delta L) \), \( ME(\Delta S) \), \( ME(\Delta C) \), and \( ME(\Delta P) \), which denote changes of mercury emissions due to changes in emission factor, energy mix, energy efficiency, Leontief inverse matrix, consumption structure, consumption per capita, and population, respectively. The impact of green transition can be characterized by improving energy efficiency, decreasing mercury emission factors, and energy mix restructuring.
2.3. Structural Path Analysis

SPA is employed to identify the crucial paths for energy-related mercury emissions along the supply chains in China. In light of Taylor series approximation, the domestic Leontief inverse can be expanded as

\[
(I - A)^{-1} = I + A + A^2 + \cdots + A^t, \quad \lim_{t \to \infty} (A^t) = 0, \tag{7}
\]

Therefore, equation (7) can be expressed as

\[
ME = f(I-A)^{-1}y = fIy + fAy + fA^2y + \cdots + fA^ty \tag{8}
\]

where \(fA^ty\) stands for the energy-related mercury emissions caused by the \(t\)th production layer (PL\(t\)). More detailed explanation on SPA method can be resorted to Zhen, Qin, Qian, et al. (2018) and Zhen, Qin, Zhong, et al. (2018). As an open economics, China’s domestic produced inputs obviously distinct with those imported. For this study, we mainly focus on the sectoral energy-related mercury emissions for domestic production. Therefore, we remove the import inputs from the IO tables and assume the same proportion of imports for each sector’s final demand, following Zhang, Qu, et al. (2017).

2.4. Uncertainties

The identification of the critical uncertainty factors is vital to facilitate the robustness of the study. There are a few leading factors related to the uncertainties in this study, including but not limited to mercury emission inventory, disaggregation of the power sector, the inherited uncertainties from IO table compilation, and the choice of SDA method. For mercury emission inventory, this study uses Monte Carlo simulations to generate the probabilistic emissions by taking into account the probability distribution of key parameters, including activity level, mercury content in coal, and APCD combination removal efficiencies (Wu et al., 2010, 2016). A normal distribution with a coefficient of variation is set to be 5% for energy consumption data (Liu et al., 2019), while mercury content of consumed coal is assumed to fit a log-normal distribution curve (Wu et al., 2010; Zhang et al., 2012). In terms of APCD removal efficiencies, different types of APCD combinations are considered to fit normal distribution or Weibull distribution, and the average and coefficient of variation are collected from previous studies (Liu et al., 2018, 2019; Wu et al., 2016; Zhang et al., 2015). To acquire the reliable statistic distribution results, we set the sampling number as 10,000. P10 and P90 values are used to represent the uncertainty range with confidence degree of 80%. The overall degree of uncertainty is estimated to be −48.66% to 74.80% in 2012 and −45.21% to 69.49% in 2017 (Figure S1). Disaggregation of power sector is usually considered to reduce the uncertainties of IO modelling (Lindner et al., 2013). However, the current insufficient disaggregation method also leads to a certain degree of uncertainties (see details in Text S2). Moreover, the inherited uncertainties from IO table compilation will also lead to uncertainties, which has been comprehensively illustrated by previous studies (Chen, Han, et al., 2018; Lenzen et al., 2010; Rodrigues et al., 2018). In addition, as there is no unique solution for the SDA, polar decomposition is adopted as an approximation of the average of all \(7! = 5,040\) decompositions and therefore may introduce a certain amount of uncertainties (Dietzenbacher & Los, 1998; Meng et al., 2019).

2.5. Data Sources

The IO tables from 2012 and 2017 are derived from the National Bureau of Statistics of China (2014, 2019). Moreover, we convert these IO table into 2012 constant prices by the double deflation method. All the investment data required to disaggregate the power sector in Chinese IO tables are collected from Annual Compilation of Statistics for Power Industry (CEC, 2012, 2017).

The national energy-related mercury emissions are estimated by summing the provincial results, which are obtained via multiplying the provincial energy activity by region-specific emission factors. Provincial sectoral energy inventories come from China Emission Accounts and Datasets (Shan et al., 2016). The provincial emission factors of coal in 2012 are obtained by averaging the factors in 2010 and 2014 from Wu et al. (2016), as emission factors of 2012 are not directly given. The factors of other energy (i.e., coke, crude oil, gasoline, and kerosene) are derived from Chen, Li, Chen, Wei, Yang, Yao, Shao, Zhou, Xia, Dong, Xia, et al. (2017b). Under the implement of a series of rigorous control polices for air pollutions in coal-fired
power plant and industrial process, both the APCD types and installation rates changed annually in these sectors and regions. Therefore, we update the emission factor of coal-fired power plants and coal-fired industrial boiler at provincial level in 2017 by referring to China Atmospheric Mercury Emission model (Zhang et al., 2015; details in Text S3). The provincial APCD installation rate of different type in 2017 is derived from the latest study (Liu et al., 2019). Other parameters such as provincial mercury content in consumed coal, mercury release rate of a certain type of boiler, removal efficiency of coal washing, and removal efficiency of a certain type of APCD combination are obtained based on various previous studies (Liu et al., 2018; Wu et al., 2016; Zhang et al., 2015). The ultimate factors used for coal-fired power plants and coal-fired industrial boiler at provincial level are summarized in Table S4.

3. Results

3.1. The Contribution of Green Transition to National and Sectoral Mercury Emission Changes

The structural decomposition results prove that green transition of energy system in China has remarkably contributed to the reduction of consumption-based mercury emissions, which decrease from 342.5 t in 2012 to 216.8 t in 2017. The emission factor change leads to the largest amount of emission reduction (−52.1 t), followed by the effects of energy mix (−31.8 t) and energy efficiency improvement (−8.0 t). Even though green transition of energy system brought remarkable mercury reduction, the negative effect is largely offset by the growing per capita consumption (75.1 t) and population (7.4 t).

From the sectoral perspective, green transition of energy system also exhibits negative effects on embodied mercury emission of different economic sectors (Figure 1b). The largest consumption-based mercury emission reduction caused by emission factor/energy structure/energy efficiency change individually is sector Construction, followed by Manufacture of transport equipment and Manufacture of communication equipment, computers and other electronic equipment. It is worth noting that green energy transition brings remarkable consumption-based mercury reduction (−49.6 t) in Construction but partly neutralized by other factors’ positive effects, ultimately leading to a total of 24.3 t mercury reduction in the embodied sectoral total emissions. Manufacture of transport equipment has the second largest consumption-based mercury emissions mitigation (−11.3 t), followed by Manufacture of special purpose machinery (−9.3 t) and Manufacture of communication equipment, computers and other electronic equipment (−9.0 t).

3.2. Green Transition’s Impact on Mercury Emissions Along the Supply Chains

China's green energy transition also changed the supply chain mercury emissions (see Figure 2). From the PL perspective, the energy-related mercury emissions show a more obvious “long-tail” feature from 2012 to 2017. On the one hand, among all the PLs, the largest emissions always occur in PL1, accounting for 22.6% and 24.2% of the total emissions in 2012 and 2017, respectively. On the other hand, the first three PLs (i.e., PL3–PL5) dominate the overall emissions, with an increasing contribution from 56.7% in 2012 to 60.8% in 2017, indicating more concentrated mercury emissions in the production layers.

The critical paths are identified to reveal how the energy-related mercury emissions transformed from producers to consumers along the supply chains. The top 10 critical paths’ energy-related mercury emissions driven by the final demand in both 2012 and 2017 are summarized and ranked in Table 1, the sum of whose ratio to the total emissions increases from 15.5% in 2012 to 16.6% in 2017. The largest emissions occur along the path of Coal power in 2012, followed by the paths of Non-metallic minerals → Construction and Coal power → Construction. These top 3 ranking paths hold their positions in the period concerned, but their contributions decline slightly. Notably, the contribution of the Information transfer increases from 0.8% to 1.4%, making the path order increase from ninth in 2012 to fifth in 2017. In addition, from Table 1, it can be seen that half of these top 10 critical paths involve with Coal power or Construction, indicating the paths related to these two sectors are the most important transmission channels for energy-related mercury emissions along the supply chains. However, Coal power and Construction play different roles in the supply chains. Generally, Coal power appears more as a provider, which provides intermediate products for other sectors, while the Construction plays more as a consumer. This implies that rational control of construction and mitigation of on-site mercury emissions from coal burning in power plants will both greatly benefit mercury reduction. More details about the supply chain emissions can be found in Tables S5–S9.
4. Discussions and Policy Implications

SDA results clearly demonstrate that China's mercury mitigation has greatly benefited from its firm determination in boosting green energy transition. Notably, emission factor's effect makes significant contribution to energy-related mercury reduction in the period of 2012–2017. China issued mandatory regulations such as deploying air pollutant control devices that have co-benefits for mercury reduction in important air

Figure 1. (a) Total contributions of socioeconomic factors to China's consumption-based mercury emission changes during 2012–2017. (b) Contribution of seven factors to the changes of sectoral consumption-based energy-related mercury emissions during 2012–2017.

Figure 2. Energy-related mercury emissions induced by final demand at each production layer (The percentage presents the contribution of rth production layer PL_r to the total consumption-based mercury emissions. Take car industry as an example, mercury emissions in the zeroth layer are the emissions during the assembly phase of the final product. Mercury emissions in the first layer are the emissions associated with producing the intermediate parts needed by the final assembly. Mercury emissions in the second or higher layers are the emission to produce the inputs for the components in the supply chains.)
pollutant sources (e.g., SO$_2$, NO$_x$, and PM$_{2.5}$). These pollution control mandates (e.g., Emission Standard of Air Pollutants for Thermal Power Plants [GB13223-2011]) have brought administrative strong incentives to measures such as expanding APCDs installation in coal-fired power plants. For example, selective catalytic reduction is widely applied in pulverized coal boilers, and 65% of APCDs are equipped to meet the ultra-low emission standard (Liu et al., 2019), both of which are able to largely remove the atmospheric mercury emissions from per unit coal burned. Thanks to the growing number of installed air pollution control devices in coal-fired power plants, mercury emission factors of key coal-dominated industries experienced obvious decline in most provincial regions during 2012–2017 (Table S4). Considering that air pollution control will be China’s long-term strategy, it is expected that this factor will continue to benefit energy-related mercury reduction in China in the future.

In terms of energy mix, the share of mercury-intensive coal decreased from 68.5% in 2012 to 60.4% in 2017 (National Bureau of Statistics of China, 2018). In the future, energy restructuring characterized by replacing coal with more renewable energies is expected to play a critical role in energy-related mercury reduction, regarding China’s ambition for renewable energy development. According to Energy Consumption and Production Revolutionary Strategy (2016–2030), renewable energy will satisfy 20% of China’s total energy consumption in 2030; at the meantime, the percentage of coal will decline to about 50%. However, there is still a long way to go to achieve this goal. We should take that actions that make renewable energy are more widely accepted by end users.

Technology innovation is in urgent need to build a more reliable and stable renewable energy system. Besides, making the price of renewable energy more competitive in the energy market will also expand its utilization. Moreover, it is critical to find solutions to the large-scale curtailment of wind power, solar energy, and hydropower in recent years. The government need to reform power dispatching mechanism and build more transmission channels for interregional renewable energy absorption. Only in this way can renewable energy gradually fill the energy gap leaving by the retirement of coal, thus effectively help alleviate mercury pollution.

Compared with emission factor and energy mix change, the effect of energy efficiency made much less contribution to mercury reduction. In the aspect of energy efficiency improvement, the government has enacted a series of energy conservation laws and regulations such as Energy Conservation Law of the People’s Republic of China and 12th Five-Year Plan for Energy Conservation and Emission Reduction to vigorously promote energy efficiency. During the 12th Five-Year Plan, China sets clear targets for phasing out enterprises with high-energy consumption, massive pollution emissions, and excess capacity, focusing on industries such as electricity, steel, cement, nonferrous metals, coke, and paper making. Driven by these actions, China’s overall energy efficiency in electricity sector improved by around 3% during 2012–2017 (CEC, 2017). Therefore, more stringent standards and advanced technology could be promoted to further improve the energy efficiency in various industries, especially for coal-dominated industries.

The results of SPA also provide evidence that China’s green power transition has greatly benefited energy-related mercury reduction. According to the results, mercury emission intensity from all the power sectors has decreased by around 15%, showing that power in China turned to be less mercury intensive, thanks to China’s perseverance for air pollution control and substituting coal with renewable sources in power industry. Notably, opposite to the obvious mercury reduction in PL$^0$ of sector coal-fired power, PL$^3$ has a tiny emission growth during 2012–2017. The reason behind may be explained by more power intermediate inputs required by the operation and maintenance. For example, the APCDs also need to consume a certain amount of power generated by itself. As more APCDs are equipped, more power are used as intermediate inputs for power plant operation. Therefore, attention should also be paid to the power consumption by

| Year | Rank | PL | Contribution (%) | Paths |
|------|------|----|------------------|-------|
| 2012 | 1    | 0  | 3.81             | Coal power $\rightarrow$ Construction |
|      | 2    | 1  | 2.24             | Non-metallic minerals $\rightarrow$ Construction |
|      | 3    | 1  | 2.18             | Coal power $\rightarrow$ Construction |
|      | 4    | 2  | 1.83             | Coal power $\rightarrow$ Non-metallic minerals $\rightarrow$ Construction |
|      | 5    | 1  | 1.23             | Smelting & processing $\rightarrow$ Construction |
|      | 6    | 2  | 1.04             | Coal power $\rightarrow$ Smelting & processing $\rightarrow$ Construction |
|      | 7    | 0  | 0.85             | Transport & storage |
|      | 8    | 1  | 0.79             | Coal power $\rightarrow$ Chemical products |
|      | 9    | 0  | 0.76             | Information transfer |
|      | 10   | 0  | 0.73             | Wholesale |
| Total |     |    | 15.46            |         |

| Year | Rank | PL | Contribution (%) | Paths |
|------|------|----|------------------|-------|
| 2017 | 1    | 0  | 3.17             | Coal power |
|      | 2    | 1  | 2.52             | Coal power $\rightarrow$ Construction |
|      | 3    | 1  | 2.52             | Non-metallic minerals $\rightarrow$ Construction |
|      | 4    | 2  | 1.74             | Coal power $\rightarrow$ Non-metallic minerals $\rightarrow$ Construction |
|      | 5    | 0  | 1.40             | Information transfer |
|      | 6    | 0  | 1.38             | Transport & storage |
|      | 7    | 1  | 1.33             | Smelting & processing $\rightarrow$ Construction |
|      | 8    | 2  | 0.98             | Coal power $\rightarrow$ Smelting & processing $\rightarrow$ Construction |
|      | 9    | 0  | 0.87             | Construction |
|      | 10   | 0  | 0.74             | Wholesale |
| Total |     |    | 16.64            |         |
Power based on the aggregated table, while it turns out Power 141 is 10 (Supplement C), 931 as 10 LI ET AL. supporting information. cated in the data sources and in the analysis are openly available as indi-
71904128). All the data used in this China (71704060, 71904125, and National Natural Science Foundation of
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5. Conclusions
In 2016, China officially ratified the legally bind Minamata Convention, making mercury control a compulsory task. Meanwhile, China is undergoing a green transition in energy system, aiming to improve energy efficiency and reduce pollutant emissions. As energy combustion is the largest source of mercury emissions in China, understanding how green transition of energy system impacts mercury emissions in China is of significant importance to design proper mercury control strategies. Therefore, this study aims to reveal how green transition of energy system influences China’s energy-related mercury emissions from both individual sector and supply chain perspectives, by using environmentally extended IO based SDA and SPA. Prior to this, the power sector in the original IO table is disaggregated into power transmission & distribution as well as six different power generation sectors to avoid the inherent huge uncertainty related to the aggregation. The results show that green transition in terms of emission factor control and energy mix adjustment has substantially benefited mercury reduction, while energy efficiency improvement has a much weaker effect. From the sectoral perspective, the largest consumption-based mercury reduction brought about by energy green transition happens in sector Construction. From a supply chain perspective, the production layers become less mercury intensive, and mercury emissions are more evenly concentrated in the supply chains. Revealing the impact of green transition of energy system on mercury emissions in China provides more implications to further enhance green transition’s mitigation effects for mercury emissions.

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