



Korea's Coal Finance: POLLUTING THE WORLD

Executive Summary

Air pollution is an important and growing concern around the world, particularly in many Asian countries. In May 2018, the World Health Organization released an analysis showing that 9 out of 10 people around the world are breathing air that contains high levels of pollutants and that 7 million deaths per year are caused by air pollution,¹ with the most polluted cities concentrated in Asia. One of the main drivers of air pollution and the associated damage to health is the burning of fossil fuels.

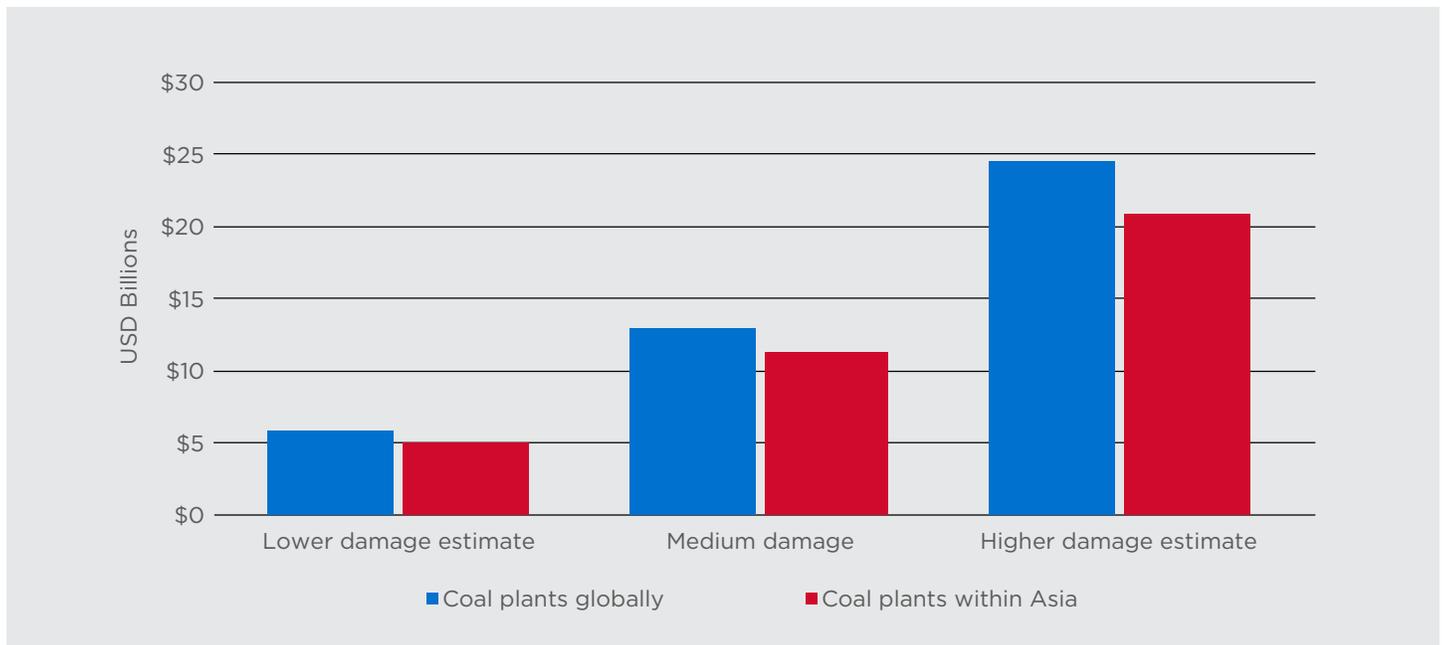
Burning of fossil fuels is also contributing to climate change, the impacts of which are already being felt around the world. Recent research indicates that to limit global warming to below 1.5°C - which could avert the worst effects of climate change in line with the aims of the Paris Agreement - at least 85 percent of global fossil fuel reserves will need to stay in the ground.

The twin challenges of air pollution and climate change demand a rapid transition away from fossil fuels, and a particularly rapid phase-out of coal-fired power plants.

Despite this, the Korean government continues to be among the biggest backers of coal-fired power plants around the world. Korea consistently ranks in the top three providers of public finance for coal-fired power plants and the current government has continued the previous government's approach of continuing to provide government-backed finance for coal-fired power plants across Asia and around the world.

This briefing analyzes some of the economic costs of the overseas coal plants financed by Korean government-controlled institutions, including the Export-Import Bank of Korea (KEXIM), the Korea Trade Insurance Corporate (K-Sure), and Korea Development Bank (KDB). The analysis assesses the costs of air pollution and global climate change impacts associated with fifteen Korean-backed coal projects overseas, most of which are located in Asia (including in Vietnam, Indonesia, and India). Of these fifteen plants, nine are already operating (since 2011 or later), and

Figure ES-1: Combined Damages from Overseas Coal Plants Receiving Korean Public Finance, including Air pollution and Greenhouse Gas Emissions



six are under construction and expected to commence operation by 2020.

Once all of these coal plants are operational, this analysis estimates the economic costs of emissions associated with these projects to be in the range of USD 5.7 billion to USD 24.6 billion annually, in 2017 dollars (Figure ES-1). Considering Korean-backed coal plants in Asian countries only, the range of combined air pollution and climate damages is USD 5.0 billion to USD 20.9 billion. The largest contributor to these air pollution damages is the damage caused by particulate matter that is 2.5 micrometers or smaller (PM 2.5), also commonly referred to as “fine dust.” Figure ES-2 shows the damages from local air pollution resulting from Korean-backed coal-fired power plants disaggregated by country.

The annual costs of local air pollution are estimated to be USD 1.8 billion under a lower scenario (assuming pollution controls are applied) and USD 13.4 billion under a higher scenario (assuming no pollution controls). These costs accrue to the local populations in the countries with the coal-fired plants.

The costs of emissions contributing to global climate change are estimated to be USD 3.9 billion under a lower scenario (USD 39/tCO₂e) and USD 11.2 billion under a higher scenario (USD 112/tCO₂e).

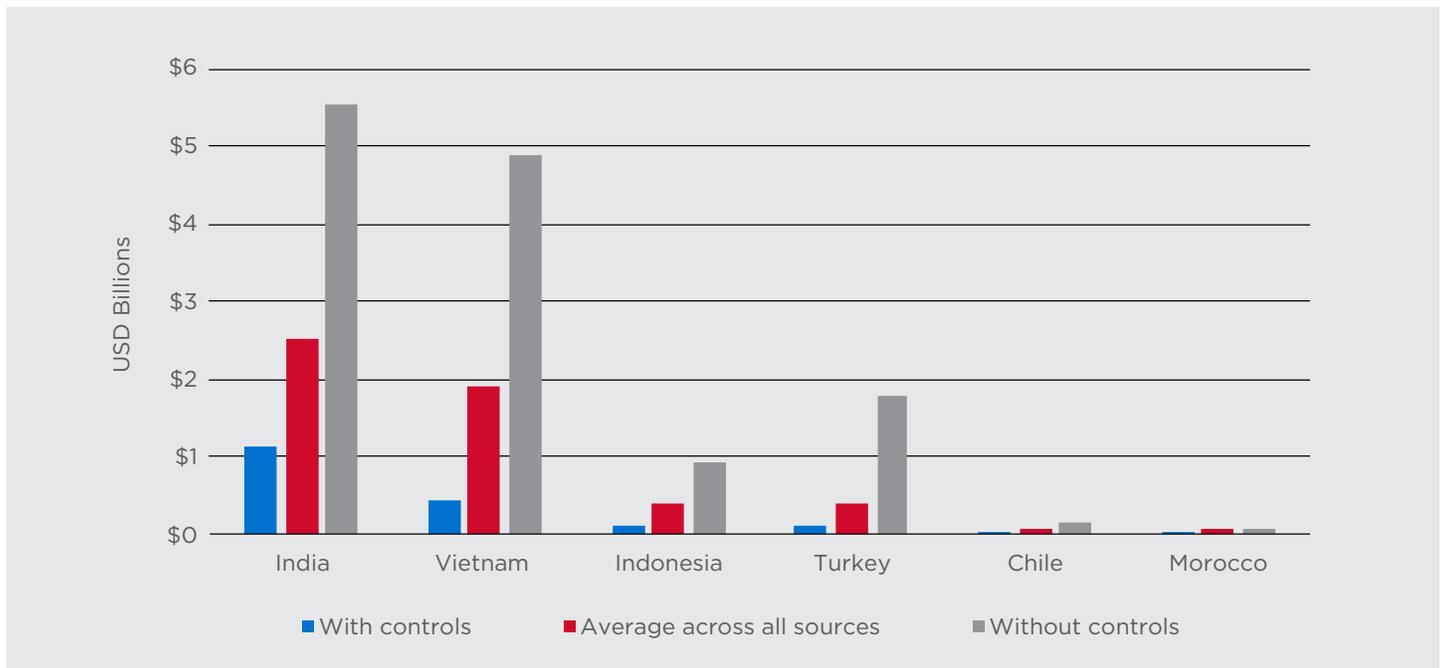
The high end of the total economic costs far exceeds the total Korean investment in these fifteen coal projects of USD 8.0 billion. The health damages from air pollution generated by these coal projects are extreme. On average, USD 1.00 in Korean public finance for these projects will generate local air pollution health damages as high as USD 1.67 annually (not discounted). And, these projects have lifetimes that can reach 50 years.

Korea’s continued public finance for coal is increasingly out of step with global trends, as the costs of renewable energy relative to new coal-fired power plants continues to drop precipitously. The cost of electricity from renewable energy has dropped below that of coal in much of the world, including in major emerging markets like India.²

Other world leaders are taking a stand against coal-fired power and public finance for such power plants: 28 national governments and 8 sub-national governments have already joined the Powering Past Coal Alliance, an effort led by the Canadian and UK governments to move away from coal, and which includes a provision prohibiting members from financing unabated coal-fired power plants.

The Korean government is falling behind and must take steps to align with the international community and protect its regional neighbors from air pollution by committing to end Korea’s public finance for coal in the near term.

Figure ES-2: By Country: Local Air Pollution Damages from Overseas Coal Plants Receiving Korean Public Finance (USD Billions)



Introduction and context

Korea continues to finance polluting coal plants in an era of energy transition

Despite the urgent imperative to transition away from fossil fuels and toward clean energy, the current Korean government has continued the previous government’s policy of financing coal-fired power plants across Asia and around the world.

The Export-Import Bank of Korea (KEXIM) signed its most recent deal to support the Nghi Son 2 coal-fired power plant in Vietnam in April of 2018, providing a guarantee to this coal plant that will produce twice as much CO₂ per every unit of power generated as the average coal power plant in Vietnam,³ and which will exacerbate air pollution concerns in Vietnam and across the region.

Air pollution is already a pressing concern in many Asian countries – including Korea – and the problem is growing. The Korean government has taken some steps to try and reduce air pollution from sources within Korea, including temporarily shutting down some of the country’s oldest and most polluting coal-fired power plants during the height of the air pollution season. But, while aiming to reduce air pollution at home, the Korean government continues to use Korean taxpayer money to finance coal plants around the world,⁴ causing significant damage to human health

in neighboring Asian countries, and further exacerbating global climate change.

On May 2, 2018, the World Health Organization released an analysis showing that 9 out of 10 people around the world are breathing air that contains high levels of pollutants and that 7 million deaths per year are caused by air pollution,⁵ with the most polluted cities concentrated in Asia. The 2018 Environmental Performance Index, a series of environmental indicators compiled by Yale and Columbia universities in collaboration with the World Economic Forum, ranks Korea a lowly 174th out of 178 countries in exposure to PM 2.5 (often referred to in Korea as ‘fine dust’).⁶

Financial risks of continued public finance for coal-fired power

It is also important to note that the coal power sector is in terminal decline around the world; not only are these investments in coal using Korean taxpayer money harming people’s health and exacerbating climate change, most are also extremely risky financially.

Around the world, new records were set in 2016 and 2017 for the unsubsidized price of clean energy, with utility-scale solar below USD .025 / kWh,⁷ and onshore wind at below USD .03 / kWh.⁸ These real-world examples of unsubsidized

renewable electricity prices demonstrate that renewable energy is fast outpacing coal in many markets, even without any consideration of the climate pollution and local air pollution from coal-fired power.

Global credit ratings agencies are seeing this trend clearly: late last year, Michael Wilkins of Standard and Poor's, said "the tide has turned" in the global energy transition and that regardless of political posturing from leaders like Donald Trump, the economic viability of coal mines and coal-fired power stations will be "vastly impaired."⁹

The World Economic Forum estimates that by 2020, worldwide the levelized cost of electricity from solar photovoltaics will be less than from coal-fired power.¹⁰

In late 2017, the newly-formed government in the Netherlands committed to ending coal-fired power by 2030, which will include shutting down three plants that were only completed in 2015.¹¹ This highlights the risk of stranded coal assets in jurisdictions where coal-fired power development continues without attention to the changing market and policy landscape.¹²

The risk of broken promises

In order to limit global warming to below 1.5 degrees Celsius, at least 85 percent of global fossil fuel reserves

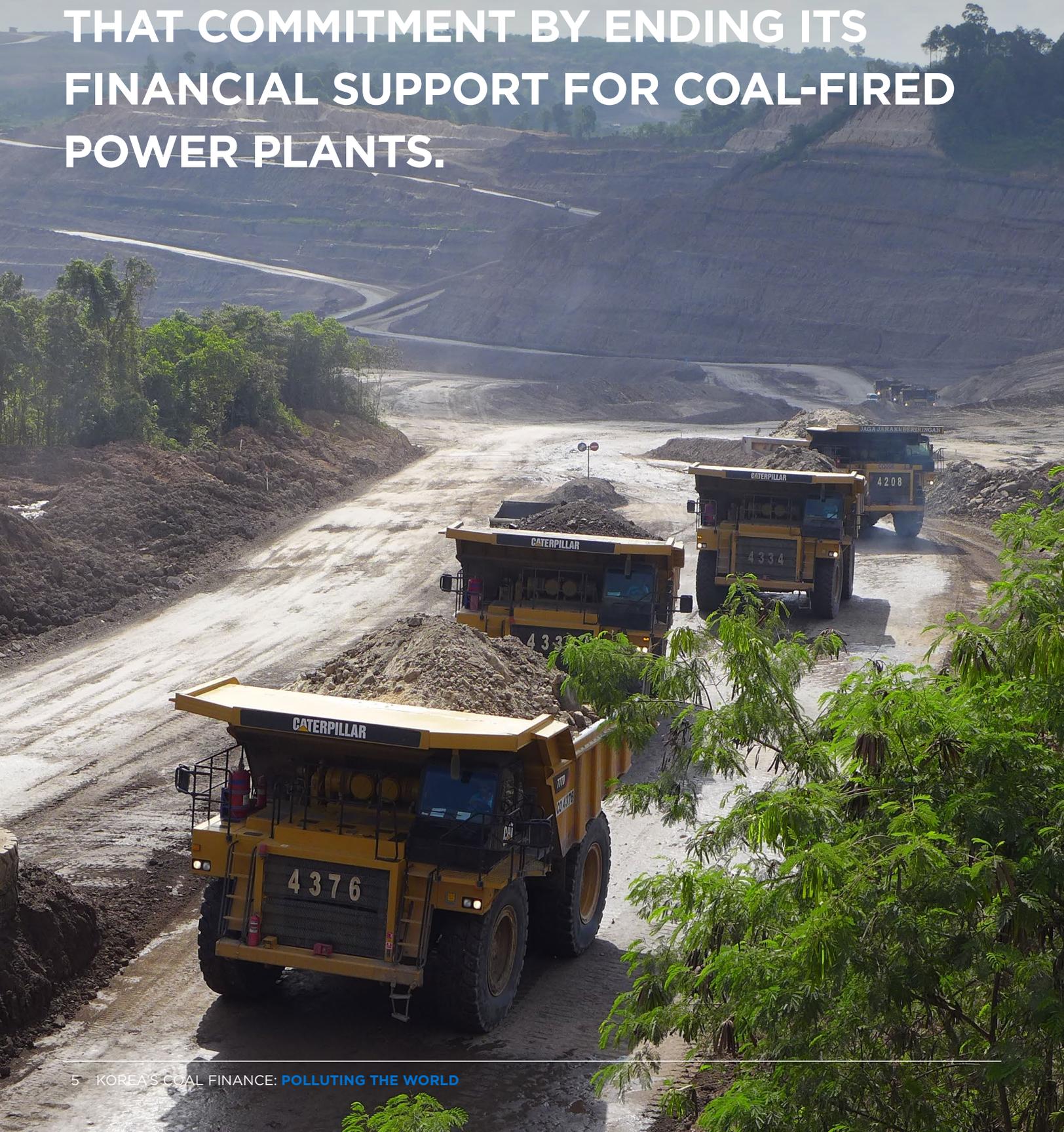
will need to stay in the ground.¹³ Korea has committed to the Paris Agreement on climate change and must align its public finance with that commitment by ending its financial support for coal-fired power plants. Dozens of governments have already committed to move rapidly away from coal under the Powering Past Coal Alliance, which also includes a commitment to end these governments' public finance for unabated coal-fired power plants.¹⁴ This movement is growing rapidly, and Korea risks being left behind if it does not aggressively move away from its international public finance for coal.

Korea committed to stop financing the dirtiest coal plants in 2015 under an agreement with other Organisation for Economic Co-operation and Development (OECD) countries. Yet in April 2018, by financing a new particularly polluting coal power plant in Vietnam,¹⁵ the Korean government violated the spirit of this promise, and many civil society organizations have raised objections to this transaction.¹⁶

The Korean government must weigh the true costs of ongoing public finance for coal. This analysis, applying a methodology developed by International Monetary Fund analysts, estimates the cost of damages from air pollution and greenhouse gas emissions caused by Korean-financed overseas coal plants.



KOREA HAS COMMITTED TO THE PARIS AGREEMENT ON CLIMATE CHANGE AND MUST ALIGN ITS PUBLIC FINANCE WITH THAT COMMITMENT BY ENDING ITS FINANCIAL SUPPORT FOR COAL-FIRED POWER PLANTS.



Methodology

The starting point for the analysis of the economic costs of overseas coal power plants supported by Korean public finance institutions is an earlier analysis that considered the pollution from all coal plants backed by export credit agencies of OECD countries. That 2015 analysis, “Hidden Costs: Pollution from coal power plants financed by OECD countries,”¹⁷ published by Oil Change International and the WWF European Policy Office, the primary author of which was Michael Westphal of the World Resources Institute.

This new analysis focuses only on overseas coal plants financed by Korean public finance institutions and is based on the list of coal-fired power plants contained in a database compiled by the Natural Resources Defense Council, Oil Change International, and World Wide Fund for Nature (NRDC-OCI-WWF)¹⁸, in addition to newly-financed plants identified in the “Financing Dirty Energy” report published in 2018 by Solutions for Our Climate.¹⁹

This analysis considers only overseas coal-fired power plants financed by the Korea Export-Import Bank (KEXIM), Korea Trade Insurance Corporation (K-Sure), and the Korea Development Bank (KDB).

In contrast to the methodology used in the “Hidden Costs” report, this analysis looks at both operational and soon-to-be-operational coal plants (i.e., those already under construction) that have benefited from Korean public finance. For coal plants that are not yet in operation but are under construction, this analysis applies air pollution and climate change costs as if those plants were already operating as of 2017 in order to provide a more complete picture of the health and climate change burden from overseas coal plants financed by Korean government institutions. This analysis therefore considers fifteen coal power projects, nine of which were operational at the time of publication and six of which are still under construction, located in six countries (Appendix I).

For the power plant data, the analysis relies on the Global Coal Plant Tracker for operational dates and on a variety of sources, including the Global Coal Plant Tracker, to verify the installed capacity of each plant.²⁰

We estimated the economic costs for local air pollution based on data from Parry, et al.²¹, who employed the following methodological steps, by:

- **Determining how much pollution is inhaled by exposed populations**, both due to emissions from domestic power plants as well as emissions that may have been transported from other countries;
- **Assessing how this pollution exposure increases mortality risks**, accounting for factors such as the age and health of the population, that affect vulnerability to pollution-related illness;
- **Monetizing the health effects**, using estimates from the OECD and corrections for national income;
- **Expressing the resulting damage per unit energy of coal.**

In order to calculate the costs of local air pollution per plant, we determined the energy output per plant in 2015 (PJ), using average regional capacity factors from the International Energy Agency²² and technology-specific heat rate estimates (Btu/kWh).²³ We multiplied this by the country-specific damage estimates per unit of energy to yield the total annual local air pollution costs per plant in each country.

The analysis posits two values for local air pollution costs: a higher scenario (uncontrolled emissions) and a lower scenario (average across plants within each country with some country-specific control technology), two scenarios employed by Parry, et al.,²⁴ derived from the Greenhouse Gas and Air Pollution Interactions and Synergies (GAINS) model.²⁵

The GAINS model includes country-specific emission factors based on: (1) an uncontrolled emission rate; (2) an average emission rate for plants that have some control technology (e.g., SO₂ scrubber); and (3) an average emission rate across all existing plants with and without emissions control technologies. This analysis uses these country-level averages, as emissions factors for the specific plants analyzed in this study are not available.

The procedure for calculating the costs of climate change impacts from coal-fired power plant emissions starts with the emission factors (kt CO₂/PJ) from Parry, et al., to obtain total annual CO₂ emissions. Using estimates of the social cost of carbon (USD/tCO₂e) – the present discounted value of global damage from the future climate change associated with an additional ton of CO₂ emissions – one can then calculate the costs in a given year.²⁶ The U.S. Government has calculated the social cost of carbon for CO₂ emitted from 2010 to 2050 for three different discount rates (2.5 percent, 3.0 percent, 5 percent).²⁷

Two values for the social cost of carbon are applied, both from previous U.S. Government official estimates. The former is a central estimate, while the latter value is supposed to represent a lower probability, but higher damages estimate. These two values represent (i) the average value for a metric ton of emissions in 2017 across model runs assuming a 3.0 percent discount rate, and (ii) the 95th percentile of model runs assuming a 3.0 percent discount rate. The resulting published values used in this analysis are USD 36/tCO_{2e} and USD 105/tCO_{2e}, respectively. These are not meant to represent upper and lower bounds for the social cost of carbon, but two reasonable values consistent with ranges used in other studies.

Key findings

The analysis finds that coal-fired power plants receiving public finance from Korean government institutions, once all of them are in operation, will be responsible for between USD 5.7 billion and USD 24.6 billion annually in damages resulting from air pollution and climate change (see Figure 1).

For Korean-financed plants only within Asia (including in Vietnam, Indonesia, and India), the range of damages is between USD 5.0 billion and USD 20.9 billion (Figure 1).

At the higher end of the damage estimates, air pollution is responsible for higher damages than climate pollution, though the reverse is true at the lowest end of the damage estimate. Figures 2 and 3 illustrate the damages from each pollution component for all Korean-financed overseas coal plants, and for those only in Asia, respectively. Within the air pollution component, the largest contributor to health damage in these figures is fine dust particulate matter (i.e., PM 2.5 or smaller).

The large jump in air pollution damages from the low estimate to the high estimate represents the difference between air pollution from plants with advanced pollution controls (at the lower end of the damage estimate) and those without such controls (at the higher end of the estimate). Since detailed information on the pollution controls at each plant was not available for this analysis, the range of damage estimates is provided.

A significant majority of the air pollution-related damages occur within Asian countries. These damages are separated out by country of incidence in Figure 4, which indicates that communities in India, Vietnam, Indonesia, and Turkey experience the most local air pollution damage as a result of coal-fired power plants receiving Korean public finance.

Figure 1: Combined Damages from Overseas Coal Plants Receiving Korean Public Finance, including Air Pollution and Greenhouse Gas Emissions

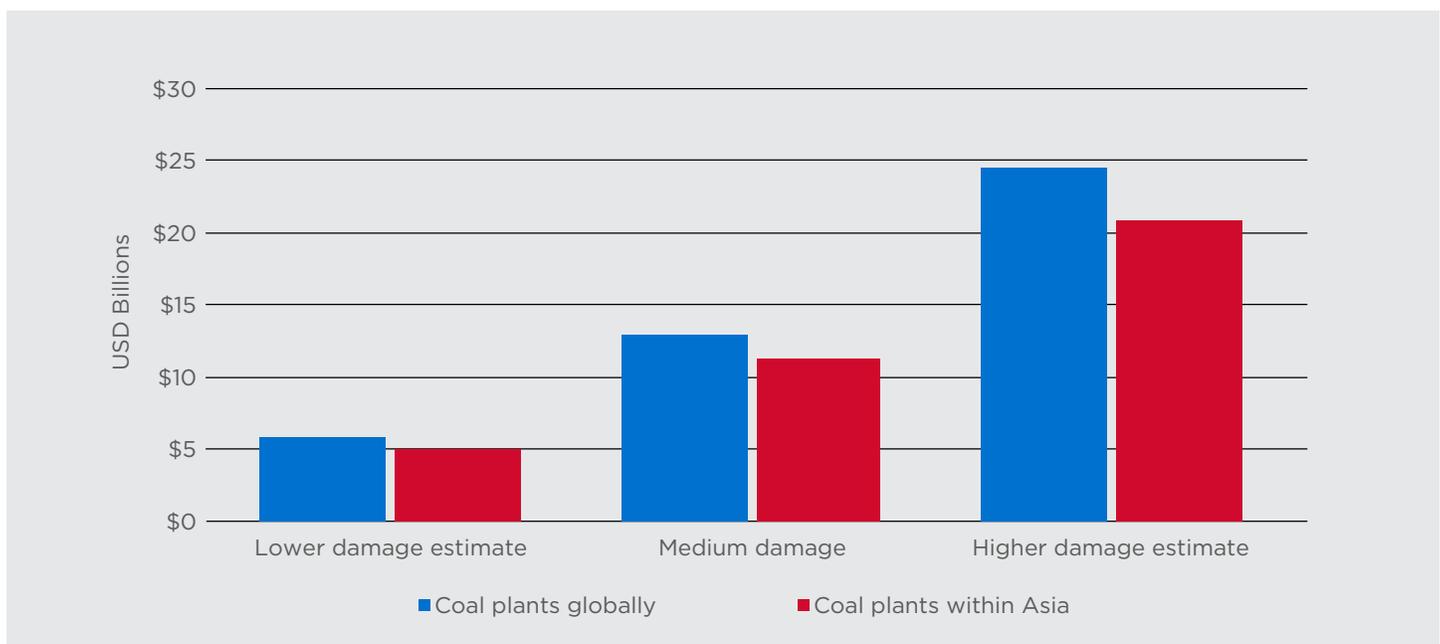


Figure 2: By Damage Component: Combined Damages (including air pollution and greenhouse gas emissions) from Overseas Coal Plants Receiving Korean Public Finance (USD billions)

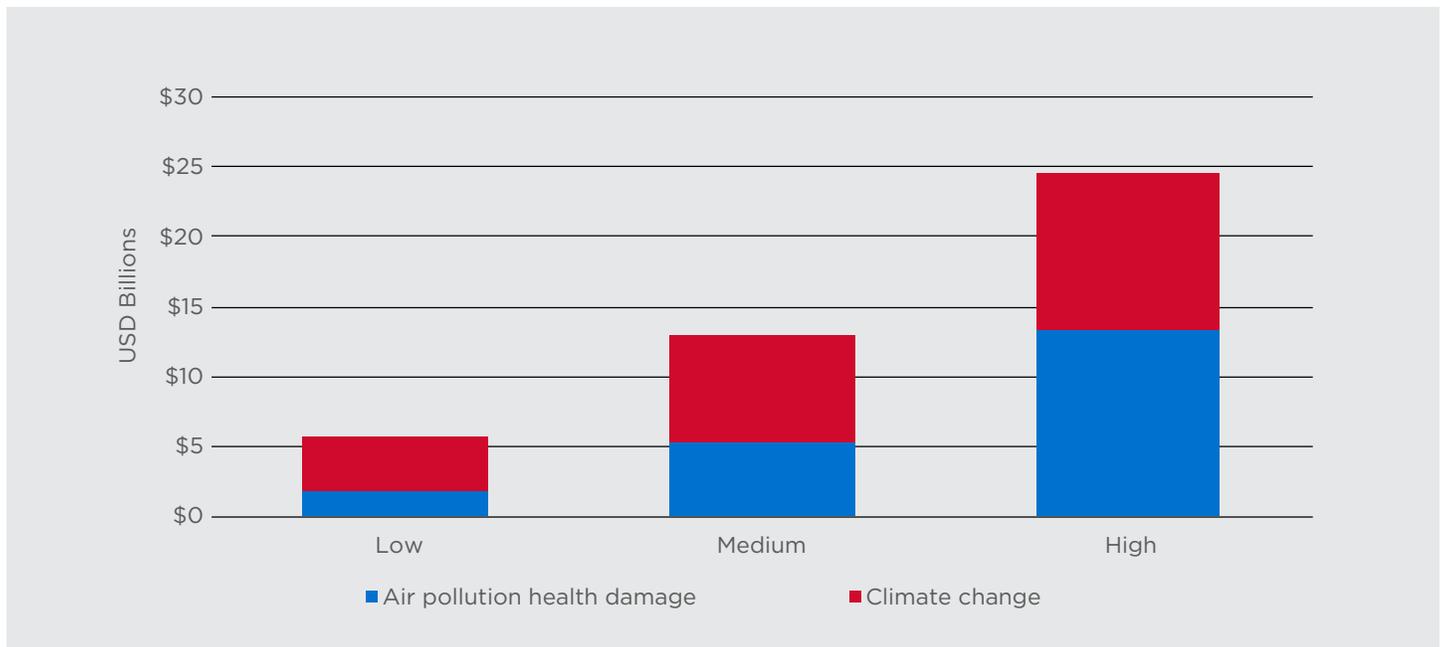


Figure 3: By Damage Component: Combined Damages (including air pollution and greenhouse gas emissions) from Overseas Coal Plants Receiving Korean Public Finance, In Asia Only (USD billions)

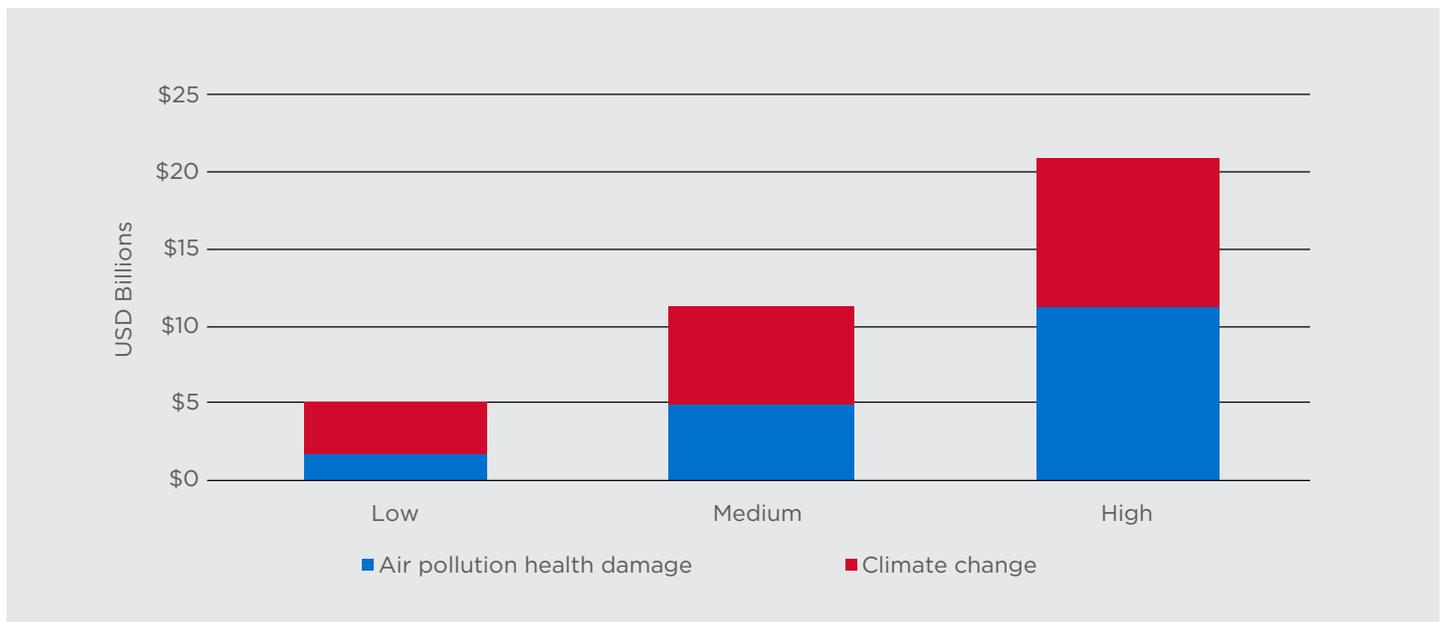
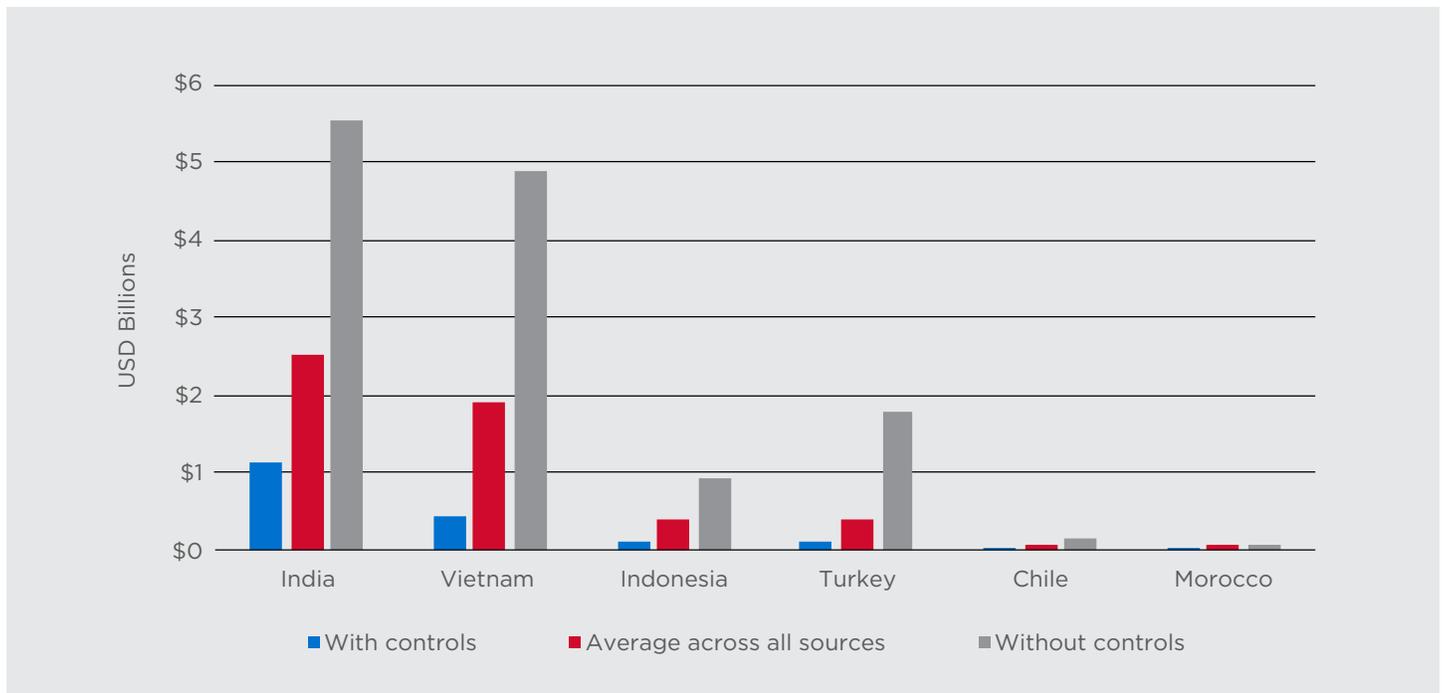


Figure 4: By Country: Local Air Pollution Damages from Overseas Coal Plants Receiving Korean Public Finance (USD Billions)



Conclusions and recommendations

Korea’s public finance for coal remains among the highest of any country in the world. With billions of dollars in potential coal projects still pending consideration by KEXIM and K-Sure, the Korean government should take a strong stand and commit to ending financing for coal-fired power plants overseas. Korea’s Ministry of Strategy and Finance should no longer allow Korea’s public finance institutions to finance coal-fired power plants and associated infrastructure, effective immediately.

This would help the Korean government live up to the spirit of its commitments under the OECD Arrangement on export credits, as well as the Paris Agreement on climate change. It would also reduce exposure of Korean taxpayers to financially risky and increasingly distressed coal projects.

And, as this analysis indicates, coal plants that Korea has already provided public finance to are responsible for as much as USD 24.6 billion per year in damages to people’s health and to the climate; ending new public finance for coal could prevent billions of dollars per year in additional damage to the health of people in countries like Vietnam and Indonesia.

Korea’s government should approach its desire to act as a climate leader seriously. It can demonstrate this leadership regionally by showing other governments that the era of government backing for overseas coal plants is over, while prioritizing Korea’s role in the rapidly accelerating global transition to clean energy.

Appendix 1

List of overseas coal power plants receiving Korean public finance considered in this analysis

Project	Country	Year in operation	Capacity (MW)	Technology	Sources
Cirebon 1	Indonesia	2012	660	Supercritical	https://www.sourcewatch.org/index.php/Cirebon_power_station
Cirebon 2	Indonesia	2020	1000	Ultra-supercritical	https://www.sourcewatch.org/index.php/Cirebon_power_station
Mong Duong 1	Vietnam	2015	1000	Subcritical	https://www.sourcewatch.org/index.php/Mong_Duong_power_station
Mong Duong 2	Vietnam	2015	1200	Subcritical	http://www.doosanheavy.com/download/pdf/products/energy/turbine_generators.pdf
Thai Binh 2	Vietnam	2019	1200	Subcritical	https://www.sourcewatch.org/index.php/Thai_Binh_Power_Center
Vinh Tan 4	Vietnam	2018	1200	Supercritical	https://www.ksure.or.kr/FileDown.do?t_idx=221740
Song Hau 1	Vietnam	2019	1200	Supercritical	https://www.sourcewatch.org/index.php/Song_Hau_Thermal_Power_Plant
Cochrane	Chile	2016	531	Subcritical	https://www.sourcewatch.org/index.php/Cochrane_power_station
Mundra UMPP	India	2013	4000	Supercritical	https://www.sourcewatch.org/index.php/Tata_Mundra_Ultra_Mega_Power_Project
Jorf Lasfar 5+6	Morocco	2014	700	Subcritical	https://www.sourcewatch.org/index.php/Jorf_Lasfar_power_station
Nghi Son 2	Vietnam	2020	1200	Supercritical	https://www.banktrack.org/project/nghi_son_2_coal_power_plant
Song Hau 1	Vietnam	2019	1200	Supercritical	https://www.sourcewatch.org/index.php/Song_Hau_Thermal_Power_Plant#S.C3.B4ng_H.El.BA.ADu-1
Angamos	Chile	2011	545	Subcritical	https://www.sourcewatch.org/index.php/Angamos_power_station http://s2.q4cdn.com/825052743/files/doc_downloads/sustainability/2012PlantOfTheYear.pdf
Tufanbeyli	Turkey	2016	450	Subcritical	https://www.sourcewatch.org/index.php/Tufanbeyli_power_station
Kalsel-1	Indonesia	2019	200	Subcritical	https://www.sourcewatch.org/index.php/Tabalong_power_station

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Oil Change International is a research, communications, and advocacy organization focused on exposing the true costs of fossil fuels and facilitating the coming transition towards clean energy.

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June 2018

This briefing was written by Alex Doukas, with Oil Change International, with research by Ken Bossong with the SUN DAY Campaign. It builds on a prior report, which was authored by Michael Westphal of the World Resources Institute, Sebastien Godinot of the WWF European Policy Office, and Alex Doukas.

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