

The long and winding road to a global coal phase-out: Overseas financing and future lock-in trends

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Summary of Doctoral Dissertation

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Many countries are phasing out or expediting retirements of coal-fired power plants (CFPPs) to mitigate climate change. However, some 6,500 units totalling 2,000 GW of capacity remain installed globally. In addition, 450 GW of new construction will prolong the lifetime of this fleet. Because of high costs and technological hurdles, construction in developing countries is primarily assisted by public finance from wealthier nations. Troublingly, financing has provided more support to coal-fired electricity than to renewables in recent years. There is thus a need to determine the reasons that explain why funds go to coal more than renewables.

Funding to coal has largely slowed down, with many bans on CPFF financing in place. But the global CFPP fleet has expanded, and there is a need to understand how long it will operate for, what the emissions will be, when retirements will occur, and what factors will drive or prevent this. Predicting the remaining operational lifetime of existing CFPPs is, therefore, a vital step to understand what countries will suffer most from coal lock-in.

In this way, this research aims to elucidate the factors that hamper coal phase-out in the global power sector from two perspectives: international financing and the early retirement of CFPPs. Specifically, it fixes two objectives:

1. Determine the factors that push international public financing towards coal more than renewables.
2. Systematically identify factors that influenced historical CFPP retirements and predict the future retirement ages, estimate carbon emissions based on predicted retirement ages, and quantify how particular countries are locked into coal power.

Data for the first objective was obtained from the Natural Resources Defense Council database (NRDC, 2017), which covers the international investments in coal and renewables from government-affiliated institutions from January 2013 to August 2017. Data for the second objective was collected from Global Energy Monitor to build a sample of retired, operating and under construction units of CFPP. Both quantitative and qualitative approaches are employed to address the research objectives. This dissertation conducts a systematic review to build the analytical framework and identify the influential factors. The identified factors were then applied in the Coincidence Analysis and Supervised Machine Learning.

For the first objective, by applying Coincidence Analysis to 10 factors, two combinations of influencing factors affecting international financing to the power sector are identified in this

dissertation: countries with: (i) a bilateral agreement to promote coal industry development and weak or absent carbon pricing; or (ii) weak policy support for renewable energy and weak or absent carbon pricing, will receive more financing to coal than renewables.

For the second objective, the historical analysis revealed that in all country groups, plant-level annual CO₂ emissions are the most important factor influencing the retirement age over the period 2010-2020. This dissertation additionally found that the penetration of renewables in the electricity mix exerts a strong influence on early plant retirement. Based on the retirement prediction analysis, this dissertation found that the future CO₂ emissions based on the remaining lifetime of the operating unit in this dissertation are 38% less than the reference scenario. Despite the lower future emissions from coal power, the challenges of some countries being locked in to coal will not disappear. Shown by the analysis on coal lock-in, this dissertation predicts considerable difficulties in achieving early retirements in many countries, especially those characterized by a high dependence on coal power, a large capacity or number of units, and with young fleet ages.

This analysis leads to important policy implications to overcome the lock-in situation by promoting an international financing shift to renewables. First, rather than merely trying to curb the flow of international financing to coal power, recipient countries could focus efforts on improving their investment environment to be more friendly to renewable energy. This dissertation suggests that negotiating bilateral or multilateral agreements that affect infrastructure and energy resource development is a crucial instrument where commitments to decarbonized electricity generation need to occur. In parallel, the importance of carbon pricing regulation should be accounted for. As suggested by the prevalence of carbon pricing schemes in the sampled countries receiving more financing for renewables, the political and socio-economic feasibility to introduce such regulations in the many countries still building CFPPs may be a crucial determinant of the carbon intensity of future financing in the power sector.

Second, this dissertation highlights the need to further strategies to mitigate the effect of coal lock-in. The global climate policy discourse tends to put a heavier weight on pushing retirement of CFPPs when it comes to addressing climate change, without considering the challenges that individual countries face. Nevertheless, this dissertation provides evidence that there is a potential of massive reduction of CO₂ emission from coal power in the future due to the early retirement. However, the risk for being locked-in in the future is still high

among developing economies. The implication of this is that to reach the target of climate stability in the future, the focus should not only be limited to achieving the coal phase-out globally. Therefore, the discussion should start from addressing the coal lock-in problem in countries with high lock-in, large capacity or number of units, and with young fleet ages, which represent more than 68% of coal power operations globally.