

1 **The future of coal in a carbon constrained climate**

2 *Michael Jakob<sup>a,\*</sup>, Jan Christoph Steckel<sup>a,b,#</sup>, Frank Jotzo<sup>c</sup>, Benjamin K. Sovacool<sup>d</sup>, Laura Cornelisen<sup>e</sup>, Rohit*  
3 *Chandra<sup>f</sup>, Ottmar Edenhofer<sup>a,b,g</sup>, Chris Holden<sup>h</sup>, Andreas Löschel<sup>i,j</sup>, Ted Nace<sup>k</sup>, Nick Robins<sup>l</sup>, Jens*  
4 *Suedekum<sup>m,n</sup>, Johannes Urpelainen<sup>o</sup>*

5 <sup>a</sup>: Mercator Research Institute on Global Commons and Climate Change, Berlin, Germany

6 <sup>b</sup>: Potsdam Institute for Climate Change Impact Research, Germany

7 <sup>c</sup>: Crawford School of Public Policy, Australian National University, Canberra, Australia

8 <sup>d</sup>: Science Policy Research Unit, University of Sussex, UK

9 <sup>e</sup>: Faculty of Public Health and Policy, London School of Hygiene & Tropical Medicine, UK

10 <sup>f</sup>: Center for Policy Research, New Delhi, India

11 <sup>g</sup>: Department Economics of Climate Change, Technische Universität Berlin, Germany

12 <sup>h</sup>: Department of Social Policy and Social Work, University of York, UK

13 <sup>i</sup>: School of Business and Economics, University of Münster, Germany

14 <sup>j</sup>: Fraunhofer Center for Economics of Materials, Halle, Germany

15 <sup>k</sup>: Global Energy Monitor, San Francisco, USA

16 <sup>l</sup>: London School of Economics and Political Science (LSE), Houghton Street, London, UK

17 <sup>m</sup>: Düsseldorf Institute for Competition Economics (DICE), Germany

18 <sup>n</sup>: Heinrich-Heine-University Düsseldorf, Germany

19 <sup>o</sup>: Johns Hopkins School of Advanced International Studies, Washington D.C., USA

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21 <sup>\*</sup>: Corresponding author: [jakob@mcc-berlin.net](mailto:jakob@mcc-berlin.net)

22 <sup>#</sup>: Corresponding author: [steckel@mcc-berlin.net](mailto:steckel@mcc-berlin.net)

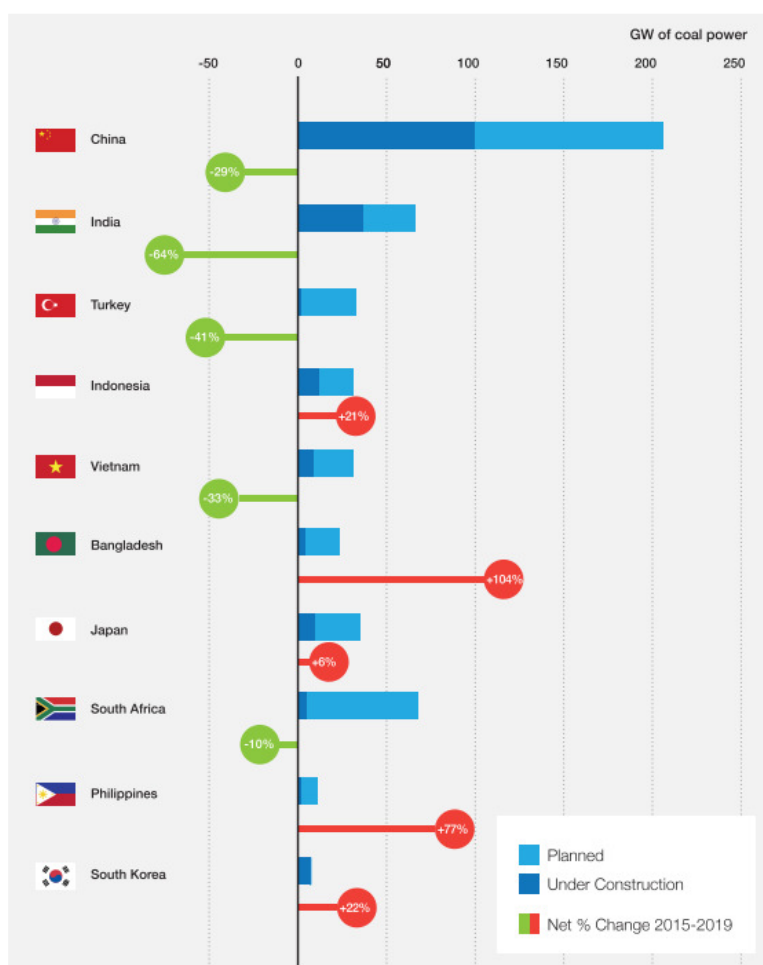
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25 **Phasing out coal requires expanding the notion of a ‘just transition’ and a roadmap which specifies**  
26 **the sequence of coal plant retirement, the appropriate policy instruments as well as ways to include**  
27 **key stakeholders in the process.**

28 Despite decades of knowledge about its contribution to climate change, coal combustion accounts for  
29 40% of global CO<sub>2</sub> emissions from energy use. The power sector must stop using coal without carbon  
30 capture-and-storage by about 2050, if the Paris Agreement climate goals are to be achieved.<sup>1</sup> This will  
31 not come easy. Globally, the coal mining industry alone employs about 8 million people and creates  
32 revenues of more than USD 900 billion a year.<sup>2</sup> While growth in coal investments is slowing and COVID-  
33 19 induced electricity demand reductions have cut coal fired electricity output in 2020, coal use is  
34 unlikely to decline substantially in the medium term. Reductions in the United States and Europe are  
35 offset by growth in China, India and other Asian countries<sup>3,4</sup>, thus locking in future demand. African  
36 countries might follow next.<sup>5</sup>

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41 Figure 1: Coal-fired power plants in the pipeline (planned, announced or under construction) as well as changes relative to  
42 2015 (ref 19). Percentage changes denote changes in the total pipeline between 2015 and 2019.

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44 Still, the urgency of climate change action demands the world to reduce coal use without carbon  
45 capture and storage quickly, and cease it over coming decades<sup>7</sup>. Yet, focusing on the environmental  
46 and health related externalities<sup>8,9</sup> of coal combustion will likely not be sufficient to phase out coal.

47 Rather, it will be crucial that the coal phase out is seen as fair and that the process corresponds to  
48 political realities. Policy makers need to understand in more detail who will be affected by a transition  
49 away from coal, how these societal groups can be effectively compensated and how powerful vested  
50 interests can be counterbalanced.

## 51 **Expanding the notion of just transition**

52 It is understood that a coal phase out can only succeed if it takes into account social objectives and  
53 priorities. The necessity of a ‘just transition’ is widely acknowledged (Box 1). Such dialogue typically  
54 emphasizes employment creation, but often fails to include considerations related to i) regional  
55 economic development, ii) effects of higher energy prices for consumers and energy-intensive  
56 industries, or iii) how just transitions dynamics may cascade beyond individual countries<sup>10</sup>. Hence,  
57 what is needed is a just and feasible transition providing decent work and quality jobs as well as  
58 regional economic futures, while at the same time limiting adverse impacts on consumers and energy-  
59 intensive industries.

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### 61 **Box 1: The just transition to date**

The concept of ‘just transition’ goes back to the 1990s. It was coined by trade unions to support social assistance programs for workers who lost their jobs as a result of environmental policies.<sup>20</sup> In the climate policy discussion, its importance has been recognized in the preamble of the Paris Agreement, which calls for “[t]aking into account the imperatives of a just transition of the workforce and the creation of decent work and quality jobs”<sup>21</sup> (p.2), and the ‘Solidarity and Just Transition Silesia Declaration’<sup>22</sup> adopted in 2018 at the 24<sup>th</sup> UN climate conference in Katowice, Poland. To date, there are a multitude of national commissions, policies, or task forces in place, including Canada, China, Czech Republic, Germany, Ghana, Indonesia, New Zealand, South Africa, Spain, the United States and Vietnam. A just transition is also backed by powerful coalitions and groups such as the International Trade Union Confederation (ITUC) and the International Labour Organization (ILO). We agree with calls to expand the notion of just transitions, to also reflect the potential negative effects of energy transitions on households and consumers, industry and regional development<sup>23, 24</sup>.

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### 63 *Regional economic futures*

64 While the environmental and health effects of coal are well understood, policy makers in newly  
65 industrializing countries often highlight the importance of coal for industrial development in specific  
66 regions<sup>16</sup>. Planning for alternative regional economic futures to substitute for coal requires a clearer  
67 understanding of the upstream and downstream links of coal mining and coal-fired power generation  
68 to the broader economy. Such plans could include the provision of transport and communication  
69 infrastructure, investment in higher education to attract human capital and new business  
70 opportunities, as well as the relocation of government services.

### 71 *Impacts on consumers and energy-intensive industries*

72 Renewing energy supply systems can increase electricity system cost, for example where depreciated  
73 coal plants produce at lower costs than new alternative power generation assets. It is then a question  
74 of social equity to shield the poor from electricity price increases. This can be achieved by adjusting

75 electricity tariffs, raising social spending or subsidizing energy efficiency, depending on the given  
76 institutional and political context.

77 Foregoing coal could also affect the competitiveness of industries such as steel, aluminum, chemicals,  
78 and other important components of industrial strategy. This might raise the risk of ‘carbon leakage’,  
79 i.e. the migration of energy-intensive industries to regions with laxer climate measures, thus  
80 undermining the benefits for the climate and make coal phase-outs politically more difficult. More  
81 fine-grained projections of leakage risks in different sectors under a wide range of scenarios are  
82 required to explore which policy instruments can effectively reduce leakage. Options include  
83 coordinated implementation of emission reductions among different countries, the free allocation of  
84 permits within emissions trading schemes, border carbon adjustments, carbon contracts for  
85 difference, and mechanisms of technology transfer.<sup>17</sup>

#### 86 *Expanding the feasibility space for phasing out coal*

87 The coal industry typically is a powerful stakeholder with vested interests in delaying coal phase-out.  
88 Strategies to overcome the influence of vested interests might include government payments for coal  
89 power plants that are being closed. In Germany, for example, the government agreed in early 2020 on  
90 a set of measures to phase out coal by 2038 with additional costs of € 70 to 90 billion, including € 4.35  
91 billion to operators of (lignite) coal-fired power plants that in turn shut down their plants early, i.e.  
92 before 2030. More cost-efficient alternatives that could be assessed include accelerated carbon pricing  
93 or industry-internal schemes whereby remaining power stations pay out plants that are retiring ahead  
94 of their end of economic life.<sup>18</sup> In addition, the interests of alternative energy producers can be  
95 leveraged to help build coalitions that create support for coal phase-out that partially offsets the  
96 opposition of those losing out<sup>19,20</sup>.

### 97 **A roadmap to phase out coal in practice**

98 A viable coal phase-out strategy will need to avoid that new coal-fired power plants are built. This  
99 prevents locking in long-lived assets and is usually politically easier to achieve than closing existing  
100 plants early. In many cases expanding power supply through sources other than coal, i.e. renewables  
101 or natural gas, is cost effective, even before considering the environmental and health costs of coal  
102 use. This will increasingly be the case as the cost of renewable energy technologies continues to fall.  
103 Nevertheless, there are factors that tend to favor continued investment in coal assets, including the  
104 security of supply in regions with abundant coal resources, the desire to protect jobs in the coal sector  
105 and in regional areas of coal production, dependence of public budgets on royalties from coal mining,  
106 as well as political influence of owners of coal mines and power producers.

107 Coal phase-outs therefore require roadmaps based on a clear understanding of which plants are to be  
108 phased out when, which policies can be applied and how affected stakeholders can be included in the  
109 process.

#### 110 *Sequence phase-outs*

111 The age profile of coal power plants differs greatly between countries. Industrialized countries typically  
112 built up a large part of their power infrastructure before 1990, whereas India, China and many other  
113 industrializing countries ramped up coal use in the last 15 to 30 years<sup>1</sup> (Economic logic suggests that  
114 relatively old, and typically less efficient, plants often found in developed countries should be  
115 decommissioned first. Other factors to consider are the public health impacts of associated air

116 pollution and water use in densely populated areas. A realistic sequence of power plant closure will  
117 also need to take into account political and institutional constraints.

118 A nuanced understanding of the associated political barriers as well as feasible no-lose options can  
119 help to identify countries and regions where policy action in the near term is more likely than in.

#### 120 *Choosing the right instruments*

121 Coal producers and consumers need to understand the real costs of coal, including local health  
122 damages and climate consequences for the climate. Removing any existing coal subsidies would be a  
123 step to creating a level playing field for clean energy sources to compete. Some jurisdictions may want  
124 to impose an additional carbon cost on coal plants to accelerate coal phase-out. To be socially  
125 equitable and politically acceptable, a carbon price could raise funds in support of affected workers,  
126 communities and consumers. It may be usefully embedded within a broader reform to the tax system  
127 geared to assist low-income households.<sup>21</sup>

128 In addition, central banks and financial regulators need to include the climate and financial risks  
129 associated with coal assets in the prudential management of banks, insurers and institutional  
130 investors.<sup>22</sup> Transparent disclosure of exposure to financial risks of climate policy could provide an  
131 important motivation for investors to reallocate assets away from coal.<sup>23</sup> Financial investors  
132 increasingly decline to invest in coal-based assets already, because they are seen as high risk.<sup>24</sup>

#### 133 *Stakeholder involvement and communication*

134 Efforts to phase out coal will only succeed if stakeholders are involved early on in the decision process  
135 to ensure democratic legitimacy. This is particularly important in times in which populist parties  
136 increasingly depict climate change mitigation as project undertaken by the political elite against the  
137 interests of the broader population, and where well founded concerns about economic prosperity  
138 dominate public discourses.

139 Different forms of public deliberation, such as stakeholder dialogues, just transition commissions, and  
140 citizen assemblies, reflect public opinion and could be apt to further agreement between different  
141 interests. This raises the question of how participants are selected, in which form and frequency  
142 discussions take place, how scientific knowledge is used as an input and how the results of public  
143 deliberation are used by policy-makers. Policy makers could adapt their communication strategies on  
144 coal phase-out for different audiences that highlight the key benefits that align with individual  
145 concerns, , for instance emphasizing the importance of coal phase-out for climate change mitigation  
146 for one social group, and the more localized benefits of reduced air pollution for others.

#### 147 **How to phase out coal**

148 To achieve internationally agreed climate targets, the world will need to phase out coal rapidly and  
149 immediately. This may be politically even more difficult in the altered political and economic landscape  
150 after the coronavirus pandemic. Roadmaps for coal phase out, smart use of a combination of policy  
151 instruments and effective integration of powerful stakeholders into the process are key to success.

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