New unabated coal is not compatible with keeping global warming below 2°C Statement by leading climate and energy scientists

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In response to the recent attempts to qualify "high-efficiency low-emissions coal combustion technologies" as a climate solution, the undersigned scientists make the following statement:

1 "Unabated coal" is coal burning without carbon capture and storage (CCS). All forms of "high-efficiency coal technologies" are counted as unabated coal, unless equipped with CCS.

1. UNABATED COAL IS NOT A "LOW CARBON" TECHNOLOGY

Even the most efficient coal-fired power plants emit more than about 15 times the amount of CO_2 per unit of electricity compared to renewable energy systems, and more than twice the amount of efficient gas fired plants. It is misleading to speak about "high-efficiency low-emissions coal combustion technologies" unless equipped with CO_2 capture and storage.

The most efficient coal-fired power plants emit about 750 gCO_2e/kWh, while efficient gas-fired plants typically emit around 350 gCO_2e/kWh. Renewable energy technologies are emissions-free in operation, and even over their full lifecycle result in much lower emissions. Typical values for lifecycle emissions for renewable energy sources are in the range of 5–50 gCO_2e/kWh (for wind energy: 10–20, solar PV: 35–50, concentrated solar: 15–30 gCO_2e/kWh (IPCC, 2011). See Figure 1.

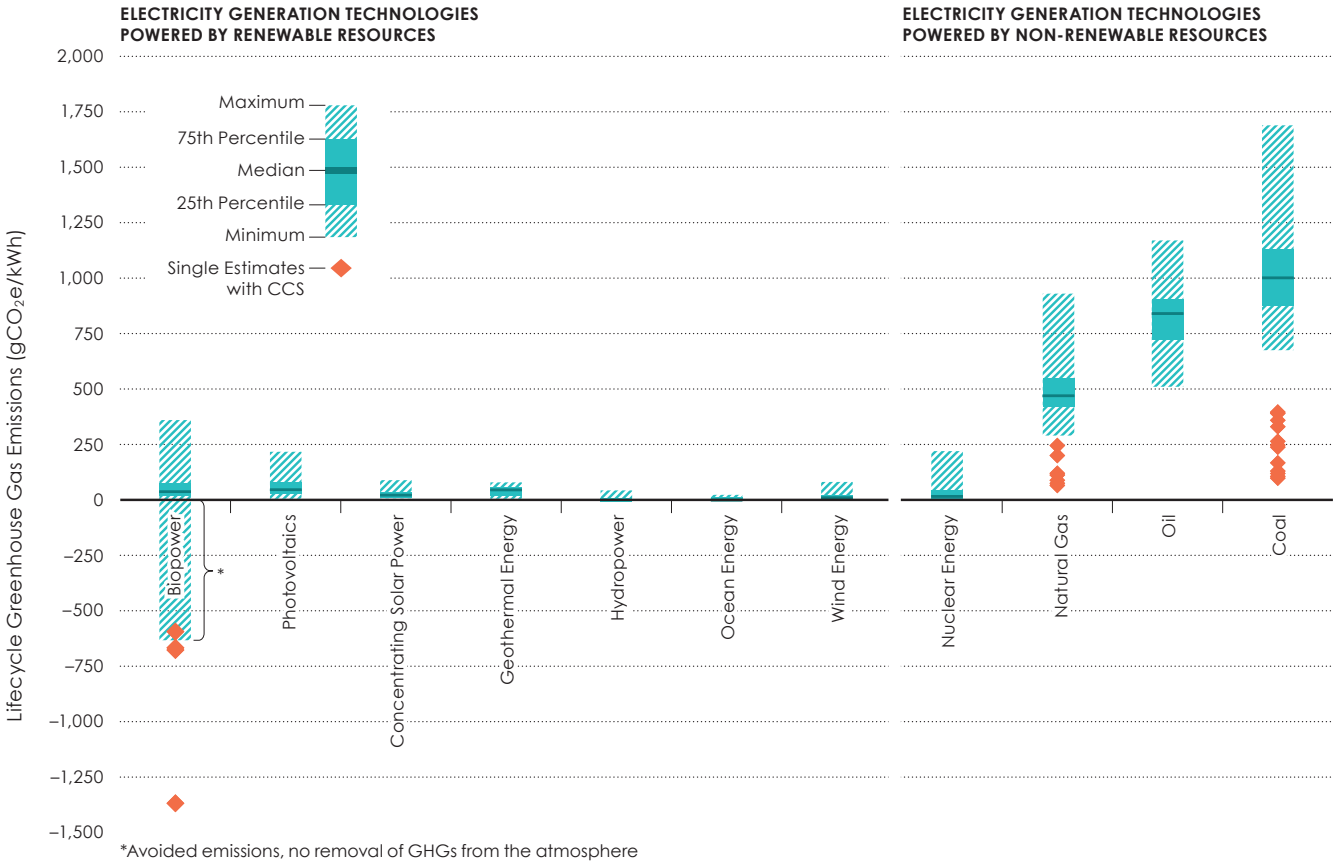

Figure 1. Emissions per unit of electricity produced for different energy technologies. Source: IPCC, 2011, adapted.

Only coal-fired power plants that are equipped with carbon capture and storage (CCS) systems can incur emissions levels below those of unabated gas plants, and therefore be considered a low carbon technology[2]. The only way that coal plants can be part of a low carbon future is for all new coal plants to include CCS from the outset.

2 However, natural gas power plants can also be equipped with CCS with a potential advantage that only about half of the CO_2 needs to be stored compared with coal and the cost per unit energy would be proportionally more attractive. Given that there are many technical and financial issues associated with CCS, managing only half the CO_2 could be a distinct advantage.

2. Avoiding dangerous climate change requires that the majority of fossil fuel reserves need to stay underground[3]

This is particularly true regarding coal for power generation. Coal is the fossil fuel that can most easily be replaced by near zero carbon alternatives, whereas the liquid fossil fuels used in transport are much harder to substitute.

In Cancun, in December 2010, all countries agreed to keep global mean temperature increase from pre-industrial levels below 2°C, and to aim to lower that limit even further to 1.5°C. To have a more than 66% chance of remaining on this 2°C pathway, the world can only emit a further 1050[4] $GtCO_2$ (IPCC, 2013a and b). This is approximately one-quarter of all known global fossil fuel reserves (IPCC, 2011). See Figure 2.

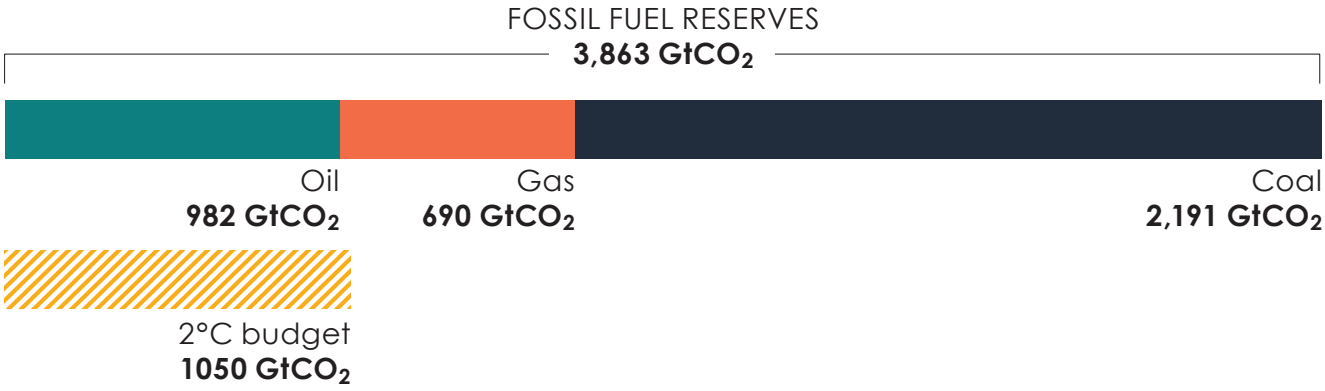

Figure 2: Conventional and unconventional fossil fuel reserves of coal, oil and gas, and the remaining global carbon budget compatible with scenarios limiting global mean warming to 2°C above pre-industrial temperatures. Source of Fossil Fuel Reserves: IPCC, 2011, Figure 1.7; Source of Carbon Budget: IPCC, 2013a and IPCC erratum, 2013b, adapted.

The largest portion of this very small carbon budget will be needed in sectors where there are no readily available alternatives, such as the liquid fossil fuels required for transport by air, sea and heavy vehicles. This means that unabated coal for power generation needs to be substituted as quickly as possible by technologies with near zero emissions.

Building new unabated coal plants will extend the period during which coal continues to be converted into atmospheric CO_2 as each coal plant is expected to operate for 40 to 50 years. Improvements in plant efficiency are not significant in the face of clear scientific evidence that CO_2 persists in the atmosphere for many hundreds of years.

3 If CCS is being used, a certain part of the reserves might be extracted and the CO_2 from burning it captured and stored. Quantitatively this is limited and changes only incrementally the bigger picture that the majority of fossil fuel reserves need to stay underground (Carbontracker Initiative, 2013).

4 The carbon budget for a 2°C pathway for the period 1860/1881 till 2100 according to IPCC, 2013a is 800 GtC (=2940 $GtCO_2$) and the amount already released till today is 515 GtC (corrected number as per IPCC 2013b; = 1890 $GtCO_2$). The remaining budget thus is about 1050 $GtCO_2$.

3. Current trends in coal use are harbouring catastrophic climate change

The current global trend of coal use is consistent with an emissions pathway above the IEA's 6°C scenario. That risks an outcome that can only be described as catastrophic, beyond anything that mankind has experienced during its entire existence on earth.

The IEA's medium-term coal market report (IEA, 2012) projects a further expansion of coal use that is even higher than IEA's own 6DS emissions scenario for 6°C warming in the long term (see Figure 3). The 6DS scenario assumes around 4°C warming by 2100 (Schaeffer and Van Vuuren, 2012). As the Secretary General of OECD warns: "Without CCS, continued reliance on coal-fired power is a road to disaster" (OECD, 2013).

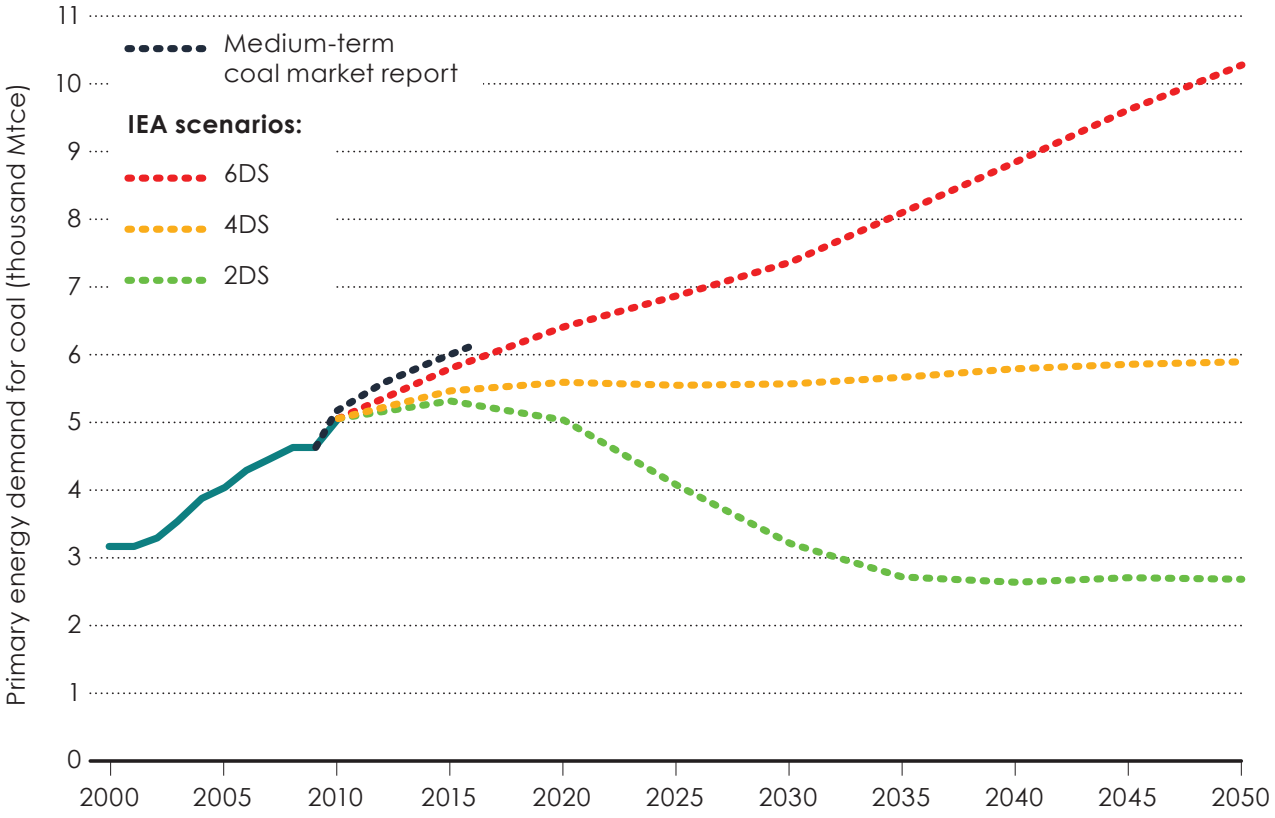

Figure 3: Primary energy demand for coal under IEA's medium-term coal market report and IEA Scenarios 2DS, 4DS and 6DS consistent with 2, 4 and 6 degrees warming above pre-industrial levels in the long term. Source: IEA/Gagné, 2012, adapted.

According to a recent World Bank report (World Bank, 2012), the consequences of a mean surface temperature rise of 4°C by 2100 could include "triggering a cascade of cataclysmic changes that include extreme heat waves, declining global food stocks and a sea-level rise affecting hundreds of millions of people (...). 4°C scenarios are potentially devastating: the inundation of coastal cities; increasing risks for food production potentially leading to higher under and malnutrition rates; many dry regions becoming dryer, wet regions wetter; unprecedented heat waves in many regions, especially in the tropics; substantially exacerbated water scarcity in many regions; increased intensity of tropical cyclones; and irreversible loss of biodiversity"[5].

5 World Bank press release: New Report Examines Risks of 4 Degree Hotter World by End of Century. November 18, 2012. http://www.worldbank.org/en/news/press-release/2012/11/18/new-report-examines-risks-of-degree-hotter-world-by-end-of-century.

4. To keep global warming to less than 2°C above pre-industrial, use of unabated coal has to go down in absolute terms from now on

There is no room in the remaining carbon budget for building new unabated coal power plants, even highly efficient ones, given their long lifetimes. Nor is there much room for upgrading existing coal plants with high-efficiency technologies, since they will consequently have even longer lifetimes.

The Global Energy Assessment, a scientific exercise involving hundreds of scientists, investigated more than 40 scenarios for a transition to a sustainable energy system, which would limit global temperature increase to less than 2°C above pre-industrial levels. All of these scenarios support the need to reduce the global capacity of coal-fired power plants that are not equipped with CCS. Without strong reductions in energy demand and early closure of existing coal plants there will be no room for building any high-efficiency coal plants at all. See Figure 4.

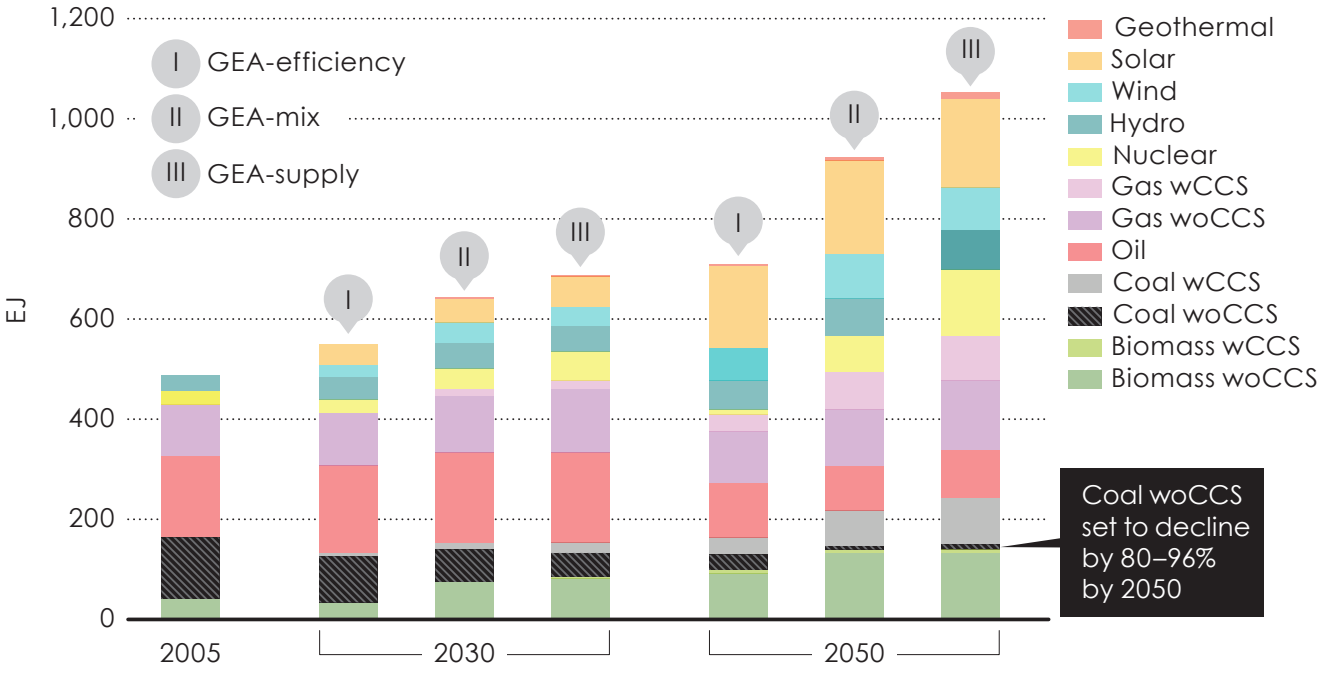

Figure 4: Declining share of coal without CCS in the fuel mix in a range of scenarios that lead to a sustainable energy system. This includes keeping global mean temperature below 2°C above pre-industrial, universal access to electricity, limiting health impacts from air pollution and improving energy security. Source: Riahi et al., 2012, adapted.

Building high-efficiency unabated coal plants is only compatible with a 2°C scenario, and the corresponding need to rapidly reduce coal use, if large numbers of existing coal-fired power plants are simultaneously shut down before the end of their economic lifetime. For instance, the IEA "4 for 2 degrees" scenario (IEA, 2013) is able to leave some room for new efficient[6] coal plants due to an assumed three times faster than usual closure rate of existing inefficient coal plants by 2020. Essentially, this scenario assumes the early closure of more than two subcritical plants for each efficient plant built[7]. This requires interference with property rights, which we do not consider realistic.

Upgrading existing coal plants to high-efficiency without adding CCS, and thereby extending their economic life by another 40–50 years, is also directly at odds with the need to reduce the capacity of unabated coal.

6 In this scenario meaning ultrasupercritical plants.

7 The IEA scenario assumes the building of about 160 GW of new ultrasupercritical coal plants (IEA/Gagné, 2012) and closure/scrapping of 340 GW subcritical coal plants (IEA, 2013).

5. Alternatives are available and affordable

Electricity from renewable energy sources has become cost competitive in most parts of the world. When the external costs of health and climate damage are taken into account, electricity from renewable sources is cheaper than fossil fuel-based electricity, including coal.

The cost of electricity from renewable energy sources has decreased dramatically. In many places it is now competitive with fossil fuel-based electricity (see Figure 5) and the trend is that cost of fossil fuel electricity will increase and that of renewable electricity will decrease further in the future (Frankfurt School UNEP Collaborating Centre and Bloomberg, 2013).

As a result, investments in new renewable energy-based electricity systems have increased enormously: of all the new electric power capacity that came on stream in 2012, 42% was from renewable sources (excluding large hydro) (Frankfurt School UNEP Collaborating Centre and Bloomberg, 2013). When the external costs due to climate change and the health impacts of air pollution are considered, electricity from renewable energy sources is almost always cheaper (see Figure 6).

Figure 5: Typical levelised costs of renewable energy sources 2012 and 2020, compared to fossil fuel power costs in OECD. Source: IRENA, 2013, adapted.

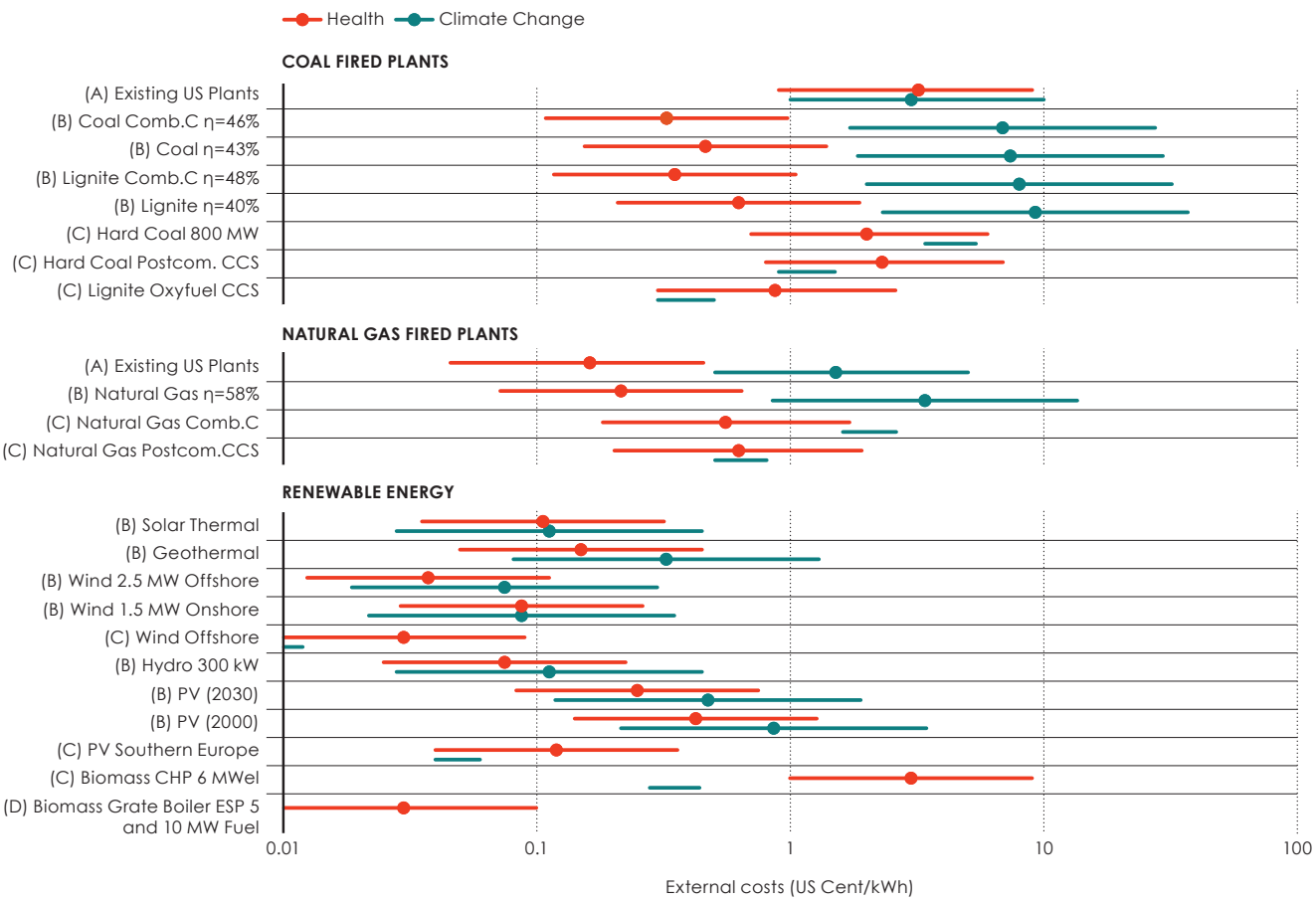

Figure 6: External costs from health impacts and climate damage for electricity production from different energy sources (note the logarithmic scale). Unabated coal external costs are typically in the range of 5–10 US$c/kWh. Source: IPCC, 2011, adapted.

6. Public financing institutions and regulatory agencies are reining in unabated coal, but more is needed

A number of bilateral and multilateral finance institutions (World Bank, EIB, US Ex-Im Bank) have recently introduced policies that restrict the financing of unabated coal-fired power plants to exceptional circumstances. The EIB has introduced emissions performance standards that rule out financing unabated coal, and the US EPA has announced a similar regulatory standard for new plants. In its air pollution action plan, China is prohibiting new coal capacity in three coastal provinces, and reducing the proportion of coal in the energy mix. Such policies are good examples of what is required to achieve the 2°C pathway.

Governments and both public and private financial institutions can help the transition to a low-carbon economy by significantly scaling up their support for zero carbon technologies, while stopping finance for the further expansion of unabated coal. This should be applied across the board for all publicly influenced finance, from R&D to subsidies, risk guarantees and credit lines, and last but not least carbon finance through the Clean Development Mechanism (CDM). As the Secretary General of OECD says: “This should be something every government considers for itself in terms of domestic developments and (for those countries that are donors) in respect of development assistance” (OECD, 2013). In the absence of reliable strong carbon pricing signals that are credible in the long term, regulatory action banning the construction of unabated coal plants is also warranted to prevent further lock-in of future emissions. This would avoid large amounts of capital being invested in assets that will need to be abandoned to achieve a 2°C pathway.

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