Assessment of the Banskhali S. Alam coal power (SS Power I) project EIA

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About the publishers

This is a joint publication by Centre for Research on Energy and Clean Air (CREA), Bangladesh Environmental Lawyers Association (BELA) and Bangladesh Working Group on External Debt (BWGED), authored by Lauri Myllyvirta, CREA lead analyst.

Centre for Research on Energy and Clean Air (CREA) is an independent research organisation focused on revealing the trends, causes, and health impacts, as well as the solutions to air pollution. CREA uses scientific data, research and evidence to support the efforts of governments, companies and campaigning organizations worldwide in their efforts to move towards clean energy and clean air, believing that effective research and communication are the key to successful policies, investment decisions and advocacy efforts. CREA was founded in December 2019 in Helsinki and has staff in several Asian and European countries.

Bangladesh Environmental Lawyers Association (Bengali: বাংলাদেশ পরিবেশ আইনবিদ সমিতি), or BELA (বেলা) was established in 1992 by a group of lawyers with the broad objective of promoting environmental justice and contributing to the development of sound environmental jurisprudence.

BWGED (Bangladesh Working Group on External Debt) is a flexible forum of progressive activists and organizations from all over Bangladesh. The BWGED was primarily formed by NGO Forum on ADB in 2013 to ensure safeguards for affected communities and human rights defenders from adverse impacts of IFI financed projects, but it is not limited to the Forum members. Later, the Working Group was expanded to a broader community of civil society by including External Debt Issues in 2016.

Summary

SS Power I, also known as Banskhali S. Alam power project is a 1320 (2x660) MW coal power station under construction in Chattogram, Bangladesh. The plant is being built by Shandong Electric Power Construction Corporation (SEPCOIII), a subsidiary of PowerChina, a Chinese central government enterprise. 70% of the project's cost is financed through a $1.8 billion loan from a consortium of Chinese banks including the Bank of China (lead arranger), the Export-Import Bank of China (export credit agency), China construction bank, China Development Bank, among others[1].

CREA obtained the Environmental Impact Assessment of the unit 1 (660 MW) of the project and has evaluated the key air quality-related parts of the document, discovering several instances of erroneous or false information, as well as unlawful omissions.

- The assessment makes a false claim that baseline air quality in Banskhali is in compliance with Bangladeshi air quality standards. This is not true even in light of the measurement data presented in the EIA.
- There is absolutely no mention of the health impacts of air pollutant emissions under the impact assessment.
- The impacts of the plant's mercury emissions are completely omitted.
- The air quality modeling is flawed, resulting in predicted pollution levels multiple times lower than would be obtained with appropriate modeling.
- There are inconsistencies in emissions data used in the EIA, as well as a systematic failure to model worst-case, rather than average, emissions.
- The project plans to apply very weak emissions standards, which would not be legal in China, and the flaws and omissions in the EIA help justify this.

The EIA contains errors and omissions that would have been caught by the environmental regulator if appropriate oversight was in place. This is an alarming indication of lack of oversight by Bangladeshi authorities, and disregard for Environmental Impact Assessment guidelines and standards by the project proponents.

The EIA is not publicly available, which in itself is a major transparency issue.

A CREA assessment (Myllyvirta 2020a) of the air quality and health impacts of proposed coal power plant projects in Chattogram found that, collectively, their emissions would be

[1] Market Forces 2019; ICBC undated; S. Alam Group Bhd undated; PowerChina 2018

responsible for an estimated 30,000 air pollution-related deaths over an operating life of 30 years. Furthermore, mercury emissions from the plants would lead to potentially dangerous levels of mercury deposition in an area with an estimated 7.4 million inhabitants. The scale of these impacts shows the severity of the omissions made in the preparation of the EIA.

Details of the shortcomings

Legal requirements for an EIA

The legal requirement for an EIA is established in Environmental Conservation Rules (MoEF 1997a). These rules classify coal power plants as "Red list" projects (on a scale of Green-Orange-Red), requiring the most stringent permitting procedure due to their potential environmental impact.

The requirements for an EIA for an industrial project were laid down in the EIA Guidelines for Industries (MoEF 1997b). The EIA has to identify "the project's key impacts on the environment", and "predict the impacts using qualitative and, if possible, quantitative methods".

The Guidelines recognize that heavy industrial projects have "major" impacts on both air quality and public health and therefore these impacts should, following the guidelines, be assessed and described in detail.

The Guidelines list emission of dust and smoke, as well as emission of heavy metals, among "activities of major concern", with the principal effects including the effect on human health, the first item on the list.

Updated Guidelines were published in February 2021, but since the S. Alam EIA was prepared before that date, we referred to the 1997 Guidelines in our assessment.

False statement on air quality at the site

The assessment claims that air quality around the project site currently complies with the Bangladesh ambient air quality standards (p. 95). However, on the very next page, the assessment presents data on air quality monitoring carried out in the vicinity of the plant

which shows that every single measurement exceeded the Bangladesh standard for both annual average PM2.5 and PM10 (Table 1).

Sample Location ID		Pollutant concentration present in ambient air (µg/m^3)						
		$PM_{2.5}$	PM_{10}	SPM	SO_2	NO_x	CO	O_3
N- 21º 58´32.5´´	Wet	29	69	189	21	26	190	37
E- 91º 57´16.8´´	Dry	41	117	267	24	29	190	25
N- 21º 58´17.6´´	Wet	33	67	177	18	22	175	26
E- 91º 53´ 16.6´´	Dry	36	79	189	19	24	166	21
N- 21º55´21.2´´	Wet	22	56	148	14	18	90	12
E- 91º 52´40.0´	Dry	27	64	189	13	21	82	17
N- 22º0´31.23´´	Wet	27	59	156	13	17	80	13
E- 91º 53´9.95´´	Dry	25	56	176	12	18	76	14

Table 1. *Results of ambient air quality measurements at locations around the project site, as given in the EIA. Bangladesh standards for annual average PM2.5 and PM10 concentrations are 15µg/m^3 and 50µg/m^3, respectively — not a single one of the short-term measurements is within the prescribed standards.*

Air quality sampling carried out for the EIA was extremely patchy, apparently only consisting of one sample per sampling location collected during the wet and one during the dry season.

Establishing compliance with standards for 24-hour and annual pollutant concentrations, a full year of daily sampling would be required, to obtain annual average values and the number of days per year when the 24-hour standards are exceeded. Since far more limited sampling was carried out, the results should be interpreted conservatively, at the very least.

Furthermore, the sampling is poorly documented; the EIA states that the sampling period was 8 hours but yet the values are compared to 24-hour air quality standards. It's common for air pollution to peak during nighttime so if samples were only collected during daytime, the values are likely to underestimate concentrations even during the days when pollution was sampled.

Using results from two 8-hour samples to claim that air quality is in compliance with standards shows that the authors of the EIA either did not understand how ambient air quality standards work or knowingly presented false claims. Either possibility should have disqualified the EIA if proper oversight was applied.

The false claim about air quality allows the project proponent to further claim that the emissions limits adopted by the project are in compliance with the International Finance Corporation EHS Guidelines for Thermal Power Plants. This would only be true if air quality in the area could be characterized as “non-degraded”, i.e. in compliance with national standards. Since air pollution levels in the area are in excess of national standards, the more stringent emissions limits for “degraded” areas would have to be adopted to comply with the Guidelines.

Complete omission of public health impacts from air pollution

There is absolutely no mention of the health impacts of air pollutant emissions under the impact assessment part of the EIA (p. 228). This is not compatible with the regulation in Bangladesh that requires that significant impacts of the project have to be identified and assessed.

The proposed coal-fired power plant, once in operation, would release very large amounts of toxic air pollutants, making it one of the largest point sources of air pollution in the country.

Exposure to particulate matter increases the risk of death from diseases such as acute lower respiratory diseases in children, and lung cancer, stroke, heart diseases and respiratory diseases in adults. This results in premature deaths. These serious health impacts are not even mentioned let alone quantified in the ESIA.

Particulate matter pollution is a major environmental health risk globally and in Bangladesh, responsible for an estimated 200 premature deaths per day in the country (IHME 2020).

The EIA completely fails to even acknowledge, let alone assess, the impact of air pollutant emissions on human health, despite the fact that the tools and methods to do so are well established.

Compliance with discharge and ambient air quality standards cannot be used as a basis for not assessing the human health impact, as air pollutant concentrations in the area already exceed standards. More fundamentally, any increase in air pollution levels increases health risks, including at levels well below Bangladesh ambient standards.

CREA studies (Myllyvirta 2020a, 2020b) projecting the health impacts of planned coal power projects in Bangladesh have demonstrated that the public health impacts of the projects are likely to be very substantial, amounting to tens of thousands of deaths from air pollution during the operating life of the plants, as well as a range of other negative health outcomes (Table 1).

Table 1. Projected cumulative health impacts associated with the emissions from power plant cluster around Cox' Bazar, over 30 years of operation (Myllyvirta 2020a). 95% confidence intervals in parentheses.

Cause	Pollutant	Matarbari Phases 1&2		Kohelia Phases 1&2		All Chattogram projects	
deaths	All	6,689	(4,619 - 10,064)	4,043	(2,785 - 6,116)	30,139	(20,789 - 45,467)
of which due to:							
chronic obstructive pulmonary disease	PM2.5	921	(324 - 1,715)	548	(193 - 1,022)	4,076	(1,443 - 7,584)
diabetes	PM2.5	43	(14 - 96)	26	(9 - 58)	185	(64 - 393)
ischaemic heart disease	PM2.5	1,694	(1,330 - 2,115)	1,014	(795 - 1,269)	7,739	(6,081 - 9,654)
lower respiratory infections	PM2.5	634	(234 - 1,218)	377	(139 - 726)	2,694	(996 - 5,174)
lower respiratory infections in children	PM2.5	51	(33 - 74)	31	(20 - 44)	226	(144 - 326)
lung cancer	PM2.5	292	(134 - 518)	178	(82 - 315)	1,315	(604 - 2,331)
stroke	PM2.5	1,397	(573 - 2,432)	851	(349 - 1,483)	6,351	(2,604 - 11,055)
all causes	NO2	1,281	(662 - 2,991)	802	(415 - 1,873)	5,914	(3,059 - 13,801)
asthma emergency room visits, adults	PM2.5	5,803	(3,800 - 7,791)	3,497	(2,290 - 4,694)	26,787	(17,541 - 35,960)
asthma emergency room visits, children	PM2.5	3,103	(1,623 - 4,566)	1,867	(977 - 2,748)	14,230	(7,444 - 20,934)
new cases of asthma in children	NO2	7,389	(1,953 - 14,653)	4,593	(1,214 - 9,106)	32,409	(8,593 - 64,152)
preterm births	PM2.5	5,237	(2,536 - 5,562)	3,154	(1,527 - 3,349)	24,431	(11,840 - 25,941)
work absence (sick leave days, million)	PM2.5	3.70	(3.15 - 4.25)	2.22	(1.89 - 2.55)	17.04	(14.49 - 1..56)
years lived with disability, chronic obstructive pulmonary disease	PM2.5	6,787	(2,440 - 13,031)	4,047	(1,454 - 7,774)	30,244	(10,879 - 58,047)
years lived with disability, diabetes	PM2.5	937	(261 - 2,354)	564	(158 - 1,407)	4,007	(1,178 - 9,645)
years lived with disability, stroke	PM2.5	2,890	(964 - 5,788)	1,749	(584 - 3,504)	12,969	(4,326 - 25,992)

Flawed emissions calculations and air dispersion modeling

It's standard practice in Environmental Impact Assessments to use maximum design emissions rates for air quality modeling. This would yield an estimate of the maximum air quality impact when the plant is running as designed and as allowed by its permits.

However, the basis for the emissions estimates used in the EIA appears to be average, best estimate values. This means that about 50% of the time, emissions will be higher than modeled. The modeling should be based on guaranteed emissions limits that would not be exceeded even under unfavorable conditions.

There is also an inconsistency in the numbers on particle emissions: the EIA claims that particulate matter concentration in flue gas would be limited to 50mg/Nm3, but the reported emissions rate and flue gas flow rate indicate a value of approximately 60mg/Nm3[2]. This indicates both incompetence on behalf of the project proponents and their consultants, and lack of any government oversight that would detect even elementary errors.

The air dispersion modeling done for the EIA appears to completely ignore the formation of PM2.5 aerosols from SO2 and NOx emissions, which typically increases the contribution of the plant to PM2.5 pollution by a factor of 5 or more.

When emitted into the atmosphere, sulphur dioxide and nitrogen oxides form sulfate and nitrate particles – this is known as secondary particle formation (e.g. Mangia et al. 2015; Holland et al 2005). This pathway is the most important contribution of coal-fired power plants to PM2.5 pollution. Because of this flaw, the maximum ground-level concentrations of PM2.5 resulting from the emissions from the power plant are likely underestimated several times.

For example, a recent modeling study in Italy found that average PM2.5 concentrations predicted from a coal-fired power plant were 4–6 times higher when secondary particle formation was included (Mangia et al 2015). Another study on a coal-fired power plant in Poland found an up to 7-fold increase (Oleniacz 2016). There is no justifiable reason for excluding this effect in the modeling.

[2] PM10 emissions from the two boilers are given as 41.6g/s and the ratio of PM10 to total PM is assumed as 0.67 (pp 203–204), and flue gas flow rate is given as 1,950,000 Nm3/h (p 38) per boiler, which implies PM flue gas concentration of 41.6 g/s / 0.67 / (2 × 1.95 × 10^6 Nm3/h) = 57.3 mg/Nm3.

The CALPUFF settings also use a far too high flue gas temperature (110°C, p. 210) considering the plant has a wet flue gas desulfurization system which would typically reduce the temperature to around 40°C. This increases the plume rise predicted by the model and further reduces the modeled air quality impact.

A basic requirement of EIAs to use conservative values for modeling to establish the impacts under a worst-case scenario. This principle has been violated throughout.

Very weak air emissions standards

The flawed assessment of current air quality, and future impacts on air quality from the plant, help justify emissions limits for the plant that are multiple times higher than those allowed, for example, in China.

The EIA reports (p 209) “manufacturer guaranteed values” of 200, 510 and 50mg/Nm3 for SO2, NOx and particulate matter emissions. The values are extremely weak compared with what’s legally required in China, where the standard for new coal-fired power plants in 35, 50 and 10mg/Nm3. The European Union requires 75, 85, 5mg/Nm3.

In other words, the plant would emit 5 times as much SO2 and particulate matter as allowed in China, and 10 times as much NOx (Figure 1). Compared to the legal requirements in the EU, SO2 emissions would be 3 times as high, NOx emissions 6 times as high and particulate matter emissions 10-20 times as high. These weak emissions standards imply that air quality and public health impacts are correspondingly at least five times as high as if the plant was built to Chinese or European standards.

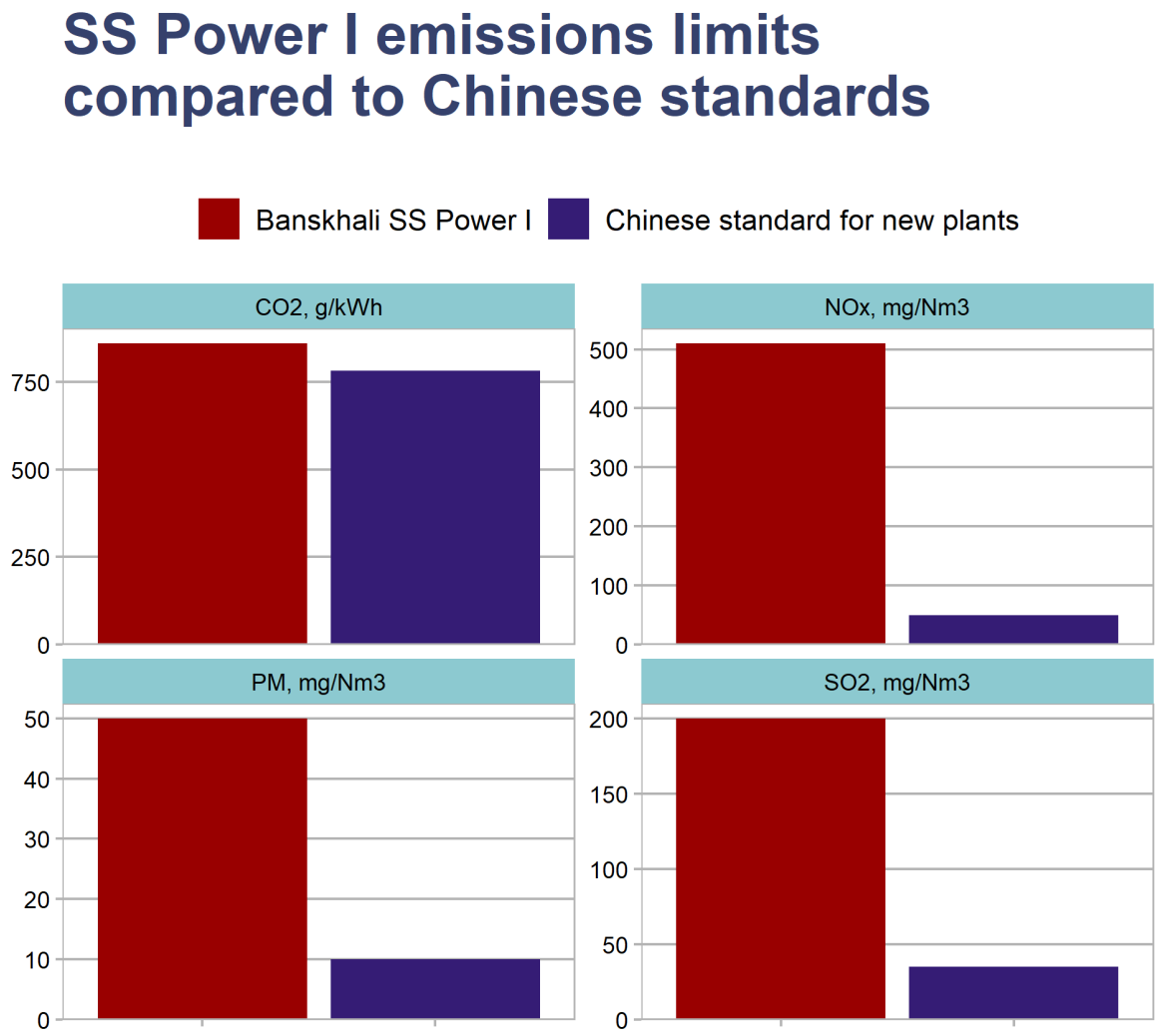

Figure 1. Emissions limits or target values adopted in the SS Power I project, compared with legal requirements in China.

Complete omission of heavy metals emissions and their impacts

Coal-fired power plants are the main source of mercury emissions into the air globally. Coal power plant emissions also contain a long list of other toxic heavy metals, many of which are carcinogenic (e.g. arsenic, cadmium, chromium, and nickel).

Yet the EIA has no data on the mercury and other heavy metals content of the coal planned to be burned, nor on the expected emissions of these toxic pollutants. Some of the emitted mercury gets deposited locally and can increase mercury levels in fish and crops (see e.g. Sullivan et al 2006). Exposure to mercury harms the cognitive and neurological development of children. The main route of exposure is through mercury deposition and take-up into fish and crops. (E.g. Spadaro & Rabl 2008.)

Two separate CREA studies evaluating and modeling the impacts of planned coal power clusters around Cox's Bazar, Chattogram (Myllyvirta 2020a), and Payra, Patuakhali (Myllyvirta 2020b), have demonstrated the risk of mercury deposition reaching dangerous levels in large areas around the power clusters, including in ecologically sensitive protected areas and important coastal fisheries (Figure 2).

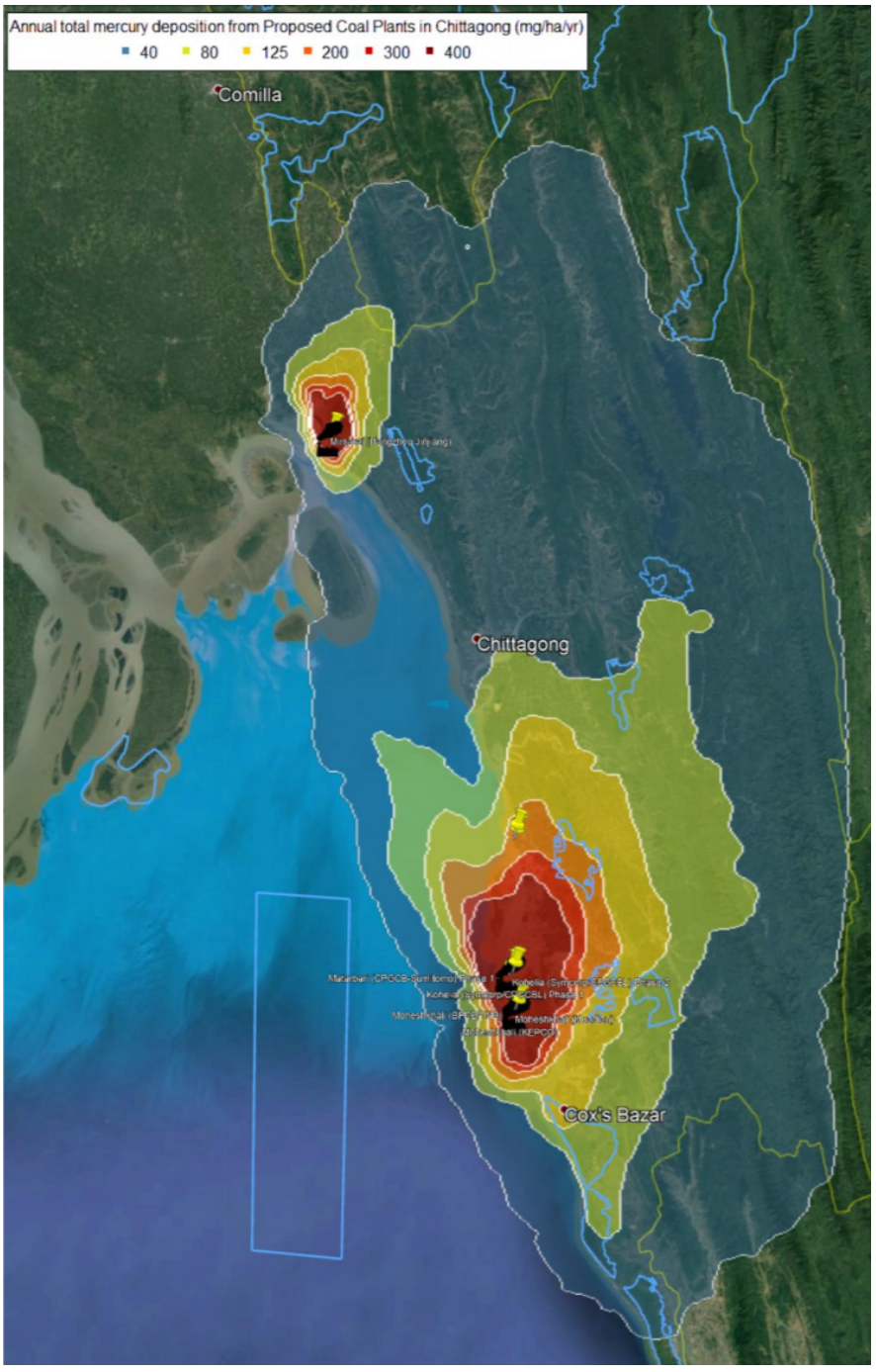

Figure 2. Predicted mercury deposition from planned coal-fired power plants around Cox's Bazar. Boundaries of protected areas are shown in light blue. Mercury deposition levels exceeding 125mg/ha/yr can lead to unsafe concentrations of mercury in fish. (Myllyvirta 2020a)

Recommendations

Bangladesh government

Strengthen the oversight and enforcement of Environmental Impact Assessments and environmental permits in Bangladesh. Relevant government agencies have a duty to check and ensure that any project's Environmental Impact Assessment is complete, consistent and fulfils the criteria laid out by the Bangladeshi law. Favorable assumptions made in the Environmental Impact Assessments e.g. about emission rates and environmental management measures must be adopted as legally binding and enforceable permit conditions.

Incorporate public health impact assessment in energy planning and permitting. CREA research has demonstrated the potential for substantial negative impacts on public health, fisheries and ecosystems from coal power projects in Bangladesh. However, these impacts have not been assessed as a part of the energy planning process or the project permitting processes. Such an assessment should be urgently carried out and used to inform decisions about future power generating capacity.

Chinese financiers and suppliers

Require compliance with local law and international best practices in overseas power projects. Financiers, in this case China Export Import Bank, and EPC companies, in this case SEPCOIII and its parent company PowerChina, also have a duty to check the veracity and legality of a project's EIA and environmental management plan before agreeing to participate in it via financing and construction services.

For companies and banks involved in such a project, an EIA is a key mechanism by which to assess and avoid environmental, social, political and, ultimately, investment risk. Good risk management entails following international best practice and not exploiting the loopholes afforded by weak regulation and regulatory oversight in Bangladesh. It is imperative that foreign backers of projects take environmental and social risks seriously and not consider the EIA process as a box-ticking exercise.

At a press conference on 13 May China's State Asset Supervisory and Administration Commission (SASAC), the highest supervisors of China's state owned companies, publicly stressed the importance of SOEs "following global rules and host country laws and regulations" and avoiding legal risk in Belt and Road countries.

Align financing portfolios and safeguards with the Chinese leadership's vision of a "green Belt&Road". Since the 2nd Belt and Road Forum in April 2019, China's top leadership have consistently emphasised that BRI infrastructure projects should be "high quality" and utilise best technologies. In his opening address to the Forum, President Xi Jinping stated, "[we should] align our cooperation with universally accepted rules, standards and best practices, and pursue economic growth, social progress and environmental protection in a balanced way." The message of a high quality and green Belt and Road was reiterated at the Leaders' Summit on Climate in April 2021.

In December 2020, China's Ministry of Ecology and Environment endorsed a study by the Belt and Road Initiative International Green Development Coalition, a coalition of Belt and Road advisors, which classified oversea project types green, yellow or red, based on their impacts on biodiversity, climate and local pollution. The classification mechanism labelled coal power projects "red", meaning that the negative impacts of the project cannot be mitigated and involvement in such projects should be avoided.

References

Holland M, Hunt A, Hurley F, Navrud S & Watkiss P 2005. Methodology for the Cost-Benefit analysis for CAFE [Clean Air for Europe]. AEA Technology Environment. http://ec.europa.eu/environment/archives/cafe/pdf/cba_methodology_vol1.pdf

ICBC undated. Supercritical Coal-fired Power Project in Chittagong Bangladesh. http://www.icbc.com.cn/ICBC/外部调用/一带一路最佳项目评选/07.htm

Institute for Health Metrics and Evaluation (IHME) 2020. Global Burden of Disease 2019 Results Tool. http://ghdx.healthdata.org/gbd-results-tool

Mangia C, Cervino M, Antonio E & Gianicolo L 2015. Secondary Particulate Matter Originating from an Industrial Source and Its Impact on Population Health. Int J Environ Res Public Health. 2015 Jul; 12(7):7667–7681. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4515683/

Market Forces 2019. Choked by Coal: The Carbon Catastrophe in Bangladesh. https://www.marketforces.org.au/wp-content/uploads/2019/11/Choked-by-Coal_The-Carbon-Catastrophe-in-Bangladesh-FULL.pdf

MoEF 1997a. Environmental Conservation Rules. http://www.doe.gov.bd/site/page/40711011-9fa2-45f1-bfee-512c27103284/- English translation: https://www.elaw.org/system/files/Bangladesh+--+Environmental+Conservation+Rules,+1997.pdf

MoEF 1997b. EIA Guidelines for Industries.

Myllyvirta 2020a. Air quality, health and toxics impacts of the proposed coal power cluster in Chattogram, Bangladesh. Centre for Research on Energy and Clean Air. https://energyandcleanair.org/publications/air-quality-health-and-toxics-impacts-of-the-proposed-coal-power-cluster-in-chattogram-bangladesh/

Myllyvirta 2020b. Air quality, health and toxics impacts of the proposed coal power cluster in Payra, Bangladesh. Centre for Research on Energy and Clean Air. https://energyandcleanair.org/publications/air-quality-health-and-toxics-impacts-of-the-proposed-coal-power-cluster-in-payra-bangladesh/

Oleniacz R, Rzeszutek M & Bogacki M 2016. Impact of Use of Chemical Transformation Modules in Calpuff on the Results of Air Dispersion Modelling. Ecological Chemistry and Engineering S 23(4). https://doi.org/10.1515/eces-2016-0043

PowerChina 2018. POWERCHINA's Bangladesh power plant makes progress. https://web.archive.org/web/20190901021206/http://en.powerchina.cn/2018-12/17/content_37413295.htm

S. Alam Group undated. SS POWER I LIMITED. http://www.s.alamgroupbd.com/sag_Compa_PnE_d.php

Spadaro JV &Rabl A 2008. Global Health Impacts and Costs Due to Mercury Emissions. Risk Analysis 28(3):603-613. http://www.arirabl.org/publications/spadarorabl-hg08-fig.pdf

Sullivan TM, Adams J, Milian L, Subramanian S, Feagin L, Williams J & Boyd A 2006. Local Impacts of Mercury Emissions from the Monticello Coal Fired Power Plant. Brookhaven National Laboratory. https://www.bnl.gov/isd/documents/33077.pdf