International finance for coal-fired power plants

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CCC/277

April 2017

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IEACCC Ref:	CCC/277
ISBN:	978–92–9029–600-3
Copyright:	© IEA Clean Coal Centre
Published Date:	April 2017

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Preface

This report has been produced by IEA Clean Coal Centre and is based on a survey and analysis of published literature, and on information gathered in discussions with interested organisations and individuals. Their assistance is gratefully acknowledged. It should be understood that the views expressed in this report are our own, and are not necessarily shared by those who supplied the information, nor by our member countries.

IEA Clean Coal Centre is an organisation set up under the auspices of the International Energy Agency (IEA) which was itself founded in 1974 by member countries of the Organisation for Economic Co-operation and Development (OECD). The purpose of the IEA is to explore means by which countries interested in minimising their dependence on imported oil can co-operate. In the field of Research, Development and Demonstration over fifty individual projects have been established in partnership between member countries of the IEA.

IEA Clean Coal Centre began in 1975 and has contracting parties and sponsors from: Australia, China, the European Commission, Germany, India, Italy, Japan, Poland, Russia, South Africa, Thailand, the UAE, the UK and the USA. The Service provides information and assessments on all aspects of coal from supply and transport, through markets and end-use technologies, to environmental issues and waste utilisation.

Abstract

Since 2013, publicly funded financial institutions such as multilateral development banks and export credit agencies based in OECD America and Europe have adopted strict lending rules for greenfield coal power projects. However, in 2014 these particular financial institutions supplied just U$9 billion out of a total of US152 billion funding of coal power and mining companies and therefore account for a small percentage of coal finance. There is evidence that many other banks are prepared to support cleaner and more efficient high efficiency low emission (HELE) coal technologies, especially in Asia.

However, there has been a geographical shift from western banks as the lead arrangers of project finance, towards Asian institutions taking greater leadership. For example, public funding agencies and commercial banks in Japan, Korea, and China are pursuing coal projects abroad partly to export their own HELE technologies, even into Europe. Between 2007-12, Asian public finance institutions accounted for 80% of the funding from such sources. They include the Japan Bank for International Cooperation and the China Development Bank. This funding reduces the impact of the new policies of the western public agencies. Furthermore, the arrival of the newly formed Asian Infrastructure Investment Bank (AIIB) could provide opportunities for funding cleaner coal technologies in the future.

This report provides a brief introduction to project finance and debt instruments. The policies and role of major financial institutions are examined, along with the global trends in coal finance and the increasing role of Asian funding and the terms and conditions often associated with lending from these agencies.

Acronyms and abbreviations

AFBC	atmospheric fluidised bed combustion
AfD	African Development Bank
AIIB	Asian Infrastructure Investment Bank
ASEAN	Association of South East Asian Nations
BAT	best available technology
BLA	bilateral lending agency
BLT	build-lease-transfer
BO	build-operate
BOO	build-own-operate
BOOM	build-own-operate-maintain
BOOT	build-own-operate-transfer
BREF	best available technologies reference document
BTO	build-transfer-operate
CCGT	combined cycle gas turbine
CCS	carbon capture and storage
CDB	China Development Bank
C-EXIM	Export Import Bank of China
CFBC	circulating fluidised bed combustion
CHP	combined heat and power, otherwise known as cogeneration
CIRR	commercial interest reference rates
CIS	Commonwealth of Independent States
CO	complete-operate
COFACE	Compagnie Française d'Assurance pour le Commerce Extérieur
COP	Conference of the Parties
CSP	concentrated solar power
DMC	developing member country
EBRD	European Bank for Reconstruction and Development
ECA	export credit agency (agencies)
EdF	Electricité de France
EGAT	Electricity Generating Authority of Thailand
EGCO	Electricity Generating Company Ltd (Thailand)
EIA	environmental impact assessment
EIB	European Investment Bank
EPC	engineering, procurement and construction
EPS	emission performance standards
ESI	electricity supply industry
ESP	electrostatic precipitator
ESS	environmental and social standards
EU	European Union
EU-SET	EU Strategic Energy Technology (Plan)
FBC	fluidised bed combustion
FGD	flue gas desulphurisation
FSA	fuel supply agreement
GDP	gross domestic product
GE	General Electric
GHG	greenhouse gases
GNI	gross national income

HELE	high efficiency low emissions
IBRD	International Bank for Reconstruction and Development
ICBC	Industrial and Commercial Bank of China Limited
ICC	International Chamber of Commerce
ICSID	International Centre for the Settlement of Investment Disputes (World Bank)
IDA	International Development Association
IFC	International Finance Corporation
IFI	international finance institutions
IGCC	integrated gasification combined cycle
IPP	independent power producer
JBIC	Japanese Bank for International Cooperation
JEXIM	Japanese Export Import Bank
JICA	Japanese International Cooperation Agency (JICA)
KEXIM	Export-Import Bank of Korea
KfW	Kreditanstalt für Wiederaufbau
K-SURE	Korea Trade Insurance Corporation
LCOE	levelised cost of electricity
LNG	liquefied natural gas
MDB	multilateral development bank
MIGA	Multilateral Investment Guarantee Agency
MIT	Massachusetts Institute of Technology
MLA	multilateral lending agency
MOU	memorandum of understanding
MTR	mountaintop removal
NEXI	Nippon Export and Investment Insurance
NOx	nitrogen oxides
NPC	National Power Corporation (Philippines)
NRDC	Natural Resources Defense Council
O&M	operation and maintenance
OBOR	One belt, one road
OECD	Organisation for Economic Co-operation and Development
PCC	pulverised coal combustion
PFBC	pressurised fluidised bed combustion
PLN	PT Perusahaan Umum Listril Negara (Indonesia)
PM	particulate matter
PPA	power purchase agreement
PURPA	Public Utilities Regulatory Policies Act
RMB	renminbi (China)
RMC	regional member country
ROL	rehabilitate-operate-lease
ROM	rehabilitate-operate-maintain
ROW	rest of the world
SEB	State Electricity Board (India)
SOx	sulphur oxides
SPC	State Planning Commission (China)
SPP	Small Power Producer (Thailand)
STEAG	Steinkohlen Elektrizitätswerke AG
UN	United Nations
UNCITRAL	United Nations Commission on International Trade Laws

US EXIM	US Export Import Bank
VEB	Export Import Bank of Russia
WBG	World Bank Group
WEPP	World Electric Power Plants (database)

Units

GWe	gigawatt (electrical)
kW	kilowatt
kWh	kilowatt hour
MWe	megawatt (electrical)
MWh	megawatt hour
US$/kWe	US dollars per kilowatt electrical capacity

Acknowledgements

The following individuals are acknowledged for their assistance with the preparation of this report.

Paul Zakkour	Carbon Counts
Takahiro Ueno	CRIEPI
Murray Birt	Deutsche Bank
Manuela Naessl	EBRD
Judy Raphael	Eskom
Nigel Hales	GE Power
Leo Kirby	GE Power
Keith Burnard	IEA
Shelly Hsieh	IEA
Simon Keeling	IEA
Juho Lipponen	IEA
Stephen Mills	IEA CCC
Hugh Lee	Independent
Yuki Tanabe	JACSES
Masahiro Jaraku	JICA
Alfred Becker	KfW
Daniel Plankermann	KfW
Michael Heap	Orbis Portfolio Management (Europe) LLP
Liam McHugh	WCA
Ayaka Jones	US DOE
Scott Smouse	US DOE

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1 Introduction

In the last few years, there have been several major policy changes by government-backed financial institutions in relation to funding overseas coal-fired power plants. In 2013, leading American and European financial institutions announced strict measures to assess such projects. They included high-profile multilateral development banks (MDB) such as the World Bank Group, the *European Investment Bank* (EIB), and the *European Bank for Reconstruction and Developme*nt (EBRD). The measures meant that financial support for any new coal-fired power plants would only be considered under 'rare and exceptional circumstances'.

The trend spread across other western funding agencies that engaged in overseas development funding. The first affirmative action came in 2013 from the export credit agency (ECA) the Export Import Bank of the United States (US EXIM) which reversed a decision to assist the 1200 MW Thai Binh subcritical coal-fired power plant in Vietnam, citing environmental reasons (Palmer, 2013). Elsewhere, the Scandinavian countries issued a joint announcement to heavily restrict public finance for new coal-fired power plants while the UK *Development Finance Institution* (DFI) and the *Commonwealth Development Corporation* (CDC) also ended support for unabated coal plants overseas.

All these policies were adopted in conjunction with changes in guidelines from the *Organisation for Economic Co-operation and Development* (OECD) which harmonised the approach to funding coal projects for all OECD-based export credit agencies. In most cases, support for subcritical coal plants was ruled out for large-scale projects, steering coal power developments towards *high efficiency low emissions* (HELE) coal technologies.

While the funding from multilateral development banks has reduced, there are still a small number of new coal projects in various stages of planning. These plants are in countries suffering from severe power shortages in Asia and Eastern Europe. Furthermore, the *Asian Infrastructure Investment Bank* (AIIB) is a new MDB led by China, and whose members comprise both OECD and non-OECD countries. The AIIB was set up in 2015 to finance large-scale infrastructure projects such as power plants. In its first year, the AIIB had no coal power plants included in its project portfolio, yet the AIIB has adopted a more open policy towards coal power projects and appears to have none of the lending restrictions prescribed by other multilateral development banks.

The adoption of World Bank style policies by the wider financial community remains mixed; these strict policies seem at odds with the outlook for investment in new coal-fired power which remains buoyant in certain regions of the world. A great deal more coal power capacity is due to be commissioned in coming years, and even more plants are in the planning stage. According to Platts *World Electric Power Plant* (WEPP) database, 280 GWe of new coal-fired capacity is already under construction and will come online by the end of 2022. A further 660 GWe are in various stages of planning. Eight out of the top ten countries planning new power plants are Asian and 70% of the new capacity is being built in China and India. The IEA (2016) sees SE Asia as the growth area for new coal-fired power in coming decades. All of this new and

planned capacity either has finance committed or will require it. Many of these stations have been planned with no expectation of funding from the AIIB. The IEA CCC estimates that in 2014 alone, global investment for coal power plants, mines, and associated transport infrastructure could have amounted to US$152 billion.

Each financial institution has its own motivation, and their policies towards coal investments are determined by their perceptions of the risks and rewards for coal power projects. Some of the risks will affect the economic viability of a project compared with alternatives to coal power, and other risks are related to environmental and climate regulations. While various multilateral development banks and export credit agencies announced a retreat from coal funding, other banks and institutions, predominantly Asian, are readily available to fill the gap.

Based on this premise, the report examines the current and future status of funding for coal-fired power plants. The study opens with an introduction to project finance, followed by the current global regulatory framework, chiefly COP21 and changes to the OECD export credit rules. Next is a discussion on trends in coal finance from major institutional sources from both public and private sources. The report estimates the scale of direct funding from multilateral development banks and examines the lending policies of various funding sources, notably the commercial banking sector and other government-backed lending agencies.

The strong geographical dimension for new coal developments and funding is recognised. Most of the new generating capacity will emerge in faster growing economies, and this report examines the importance of overseas funding needed in smaller low and middle income economies outside China and India. Particular attention is paid to the role of large Asian financial institutions which have usurped western banks in terms of project finance for large scale infrastructure developments. Some of the most interesting aspects of coal finance are reviewed, such as lending practices and competition between different lending agencies.

Furthermore, financial assistance can be combined with wider strategic government policies, for example where debt for power plant projects is exchanged for access to natural resources or other commodities. This report investigates how these arrangements work and how finance deals can be used to boost exports of power plant equipment from lending countries. One of the outcomes of this report is that Asian countries with large funding agencies are also exporting HELE technologies, such as boiler, steam turbine and generator components to overseas power projects. With Asian equipment companies enjoying a lead in supplies of coal finance and equipment supply, the report considers how western equipment manufacturers are adapting to keep pace with competition in the expanding Asian market.

The report concludes with the multilateral development banks themselves. The, policies for each bank are examined and the differences in approach to assessing coal power developments are highlighted. The driving force behind MDB policies are considered, such as member country climate goals, and the report also considers how stricter coal funding policies can impact economic development in low and middle income economies. The emphasis of the report is on funding for new greenfield plants, however the upgrading of existing plants, retrofitting environmental equipment, and adapting stations to be carbon

capture ready are outside the scope of this report, but such opportunities for financial institutions should be considered for future research.

2 The basics of project finance

Power utilities and independent power producers need to raise finance for new projects at the lowest possible cost to help them balance a variety of stakeholder demands and maximise value from the venture, such as attaining the lowest possible electricity tariffs, while providing investors with a secure cash flow that earns high returns. Debt and equity are the two major ways to raise financial capital to develop infrastructure projects such as large-scale power plants. Depending on the project, debt financing is often the cheaper form of financing, and so it is not unusual for debt to account for most of the funding, typically 80% of investment capital.

2.1 Debt

There are two main types of debt financing: *corporate borrowing* and *project finance.* In corporate borrowing, also known as on-balance sheet finance, the project company that is developing the power plant accepts all the project risk. If the project fails sometime during its life, the lender has the project company's balance sheet assets as security. This is a low risk position for the lenders and loans can be arranged quickly at low rates of interest.

Project finance is a form of non-recourse or limited-recourse finance, also called *off-balance sheet* finance. The project becomes a standalone business entity and carries the risk of the project. Non-recourse lending receives repayments from the cash flow generated by a successful project. In the event of a project failing, payment recovery comes only from the value of the project assets. The individual partners' balance sheets and their parent companies are therefore not liable. This type of financing covers many large infrastructure projects, such as power plant projects. Limited-recourse is where the lenders have some recourse to the assets of a parent company sponsoring a project (BIS, 2005).

Loan/debt finance comes in many forms which are used in various combinations. One of the simplest is the *direct loan*. The lender provides funds to the project, which the borrower then draws on to finance engineering, procurement, and construction (EPC) as and when they are needed. The interest rate and repayments are arranged and agreed between the Project and the Lender's account as regular amounts over a fixed term.

Bonds are similar to loans, but where a loan is a fixed agreement between two parties, a bond is much more flexible and can be traded from one lender to another. Bonds are also known as securities, notes or debentures. The issuer, usually the power project company, agrees to pay the bond holder the amount of the bond, plus interest, on fixed future instalment dates. The buyers of bonds are investors looking for a long term fixed return without taking equity risk, such as pension funds and insurance companies. Bonds take the form of a paper certificate although this is now superseded by electronic registration.

In *lease finance* the equipment that is being financed is owned by the lessor (lender) rather than the lessee (borrower). This is similar to hire purchase agreements. The borrower pays lease rentals instead of interest and principal repayments (debt service) on a loan. Leasing is commonly used for procuring vehicles, factory

machinery, and similar equipment. It offers finance to clients who cannot otherwise raise funds, based on the security offered by the value of the equipment (Yescombe, 2014).

In *vendor finance* the seller of the equipment, such as the manufacturer of boilers, turbines and generators provides the finance. One example of this is GE, whose subsidiary GE Capital provides commercial and equipment finance amongst others. Such financiers have a better understanding of the technical risk of the project than a commercial lender. Vendor finance can be in the form of a loan, lease of equipment or the guarantee of bank finance. A bank providing finance on behalf of a vendor, without a guarantee, is not vendor finance (Yescombe, 2014).

Islamic finance is based on the koranic prohibition of charging interest, but still enables a profit to be made. Islamic finance is more common in parts of the Middle East and SE Asia. According to the IEA (2016), these regions will see a considerable growth in new coal power projects, and infers Islamic finance could have an increasingly important role in this sector.

2.2 Equity

Although debt typically provides most of the project finance, equity still accounts for around a fifth of infrastructure project finance. Equity funding is issued in stock markets and can be more expensive than debt funding. However, a loan tends to tie a finance institution to the project for many years. If the domestic stock market is small and unable to fund large transactions, international capital markets can provide funds.

Equity may be necessary where the risk of lending is particularly high, such as in politically or economically unstable countries. Equity shares are usually held by the project sponsors, often these sponsors are power utilities. Each partner might have a role, such as project management, operating expertise (in the case of the utilities), or finance. The level of equity will be limited by the sponsors' desire to maintain control of the project company and to avoid being bought out or restricted in taking decisions. Some lenders, such as those from China and Japan prefer to limit their exposure to equity, but this could change in future.

The benefit of having an equity interest in a project is the flexibility of ownership it provides. For example, a company with a turnkey construction contract, may trade their share once their development role is over, so freeing up capital for their next project. Sponsors that are involved in the operation and maintenance (O&M) of a plant are likely to hold on to their share.

2.3 Guarantees

Guarantees are similar to insurance products, and are often interpreted as financial products in themselves. A financial guarantee is where a party accepts the responsibility of ensuring that any debt is repaid in the unlikely event of the project failing. Guarantees come in many forms and will cover a variety of concerns for a lender such as financial risk, political risk, economic risks (adverse exchange rate movements), and so on. A credit guarantee might cover a specific loan whereby the guarantor will honour the payment obligations of the borrower (the Beneficiary) under the terms of the loan agreement in the event of default.

Sovereign guarantees might be issued by a state in order to financially promote projects that are deemed to be in the public interest. The guarantees are used as economic incentives for the capital market to finance the power projects. An international institution may provide political and economic guarantees when trying to attract lenders to less stable or economically deprived regions of the world. In this case the role of the MDB or ECA can be important (*see also* Chapter 6).

2.4 Project financing parties

The key players in project finance include the:

- Sponsors – the party proposing a power station development.
- Borrower – the company that will develop the project for the sponsor, known as the *special purpose vehicle*, or SPV.
- Finance providers (for example international banks, domestic banks, and export credit agencies).

The project sponsors may be a power utility or an industrial autogenerator, and sponsors may own a large proportion of the equity in the project and claim financial returns or dividends *after* the repayments for debts to banks have been settled for any given period. The *project company* borrows the finance and exists as a separate legal entity; it comprises several partner companies, but does not exist as a subsidiary or part of a company that already exists.

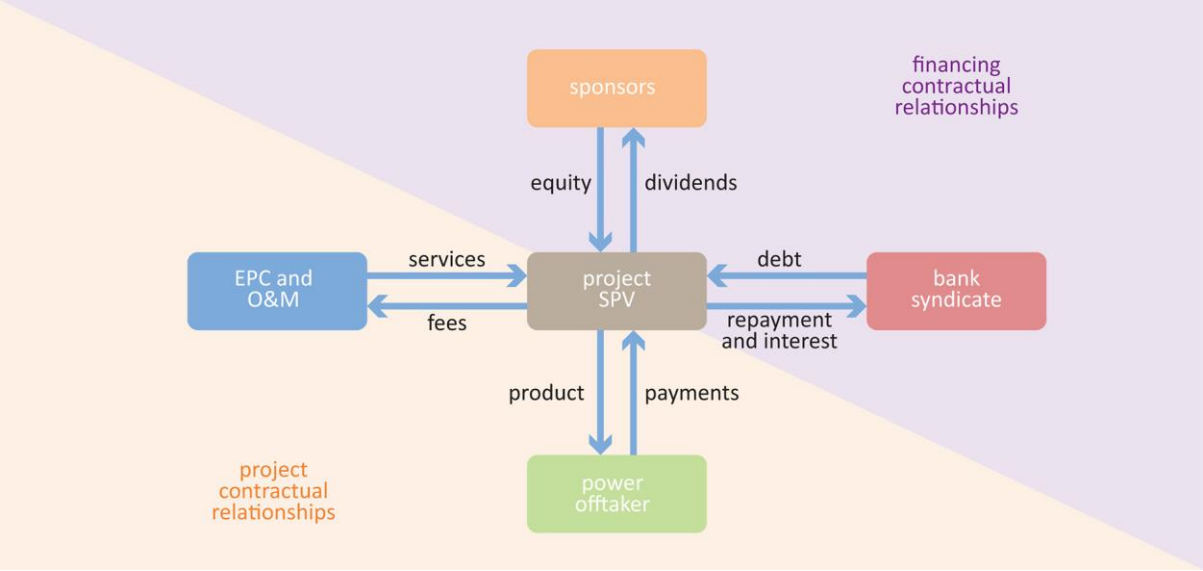

Figure 1 Introduction to project finance (Tzouanos, 2015)

The project company is the main borrower of finance and oversees the development of the project; this is the project SPV (*see* Figure 1). The SPV enters into contractual agreements with all the other parties involved. The contracts form the framework for the project and determines the allocation of risk and reward. One example of a contractual relationship includes power purchase agreements (also known as offtake agreements), which may require a long-term agreement for coal supply as well as operation and maintenance (O&M) contracts. Further information on contracts and contractual relationships between

fuel suppliers and power plants is available in the IEA CCC report *Coal contracts and long-term supplies* (Baruya, 2015).

Financial contracts create a flow of funds between the lenders, the project company, and various equipment suppliers, construction companies and other suppliers of goods and services. The direction of financial flows will vary throughout the phases of construction and operation. The bottom half of Figure 1 shows the project development and operational relationships. During construction, the funds to build the plant are drawn down from accounts dedicated to the project; loan interest is usually accrued during the construction phase, thus increasing the overall debt. The contracts for the power plant itself will involve numerous companies for:

- construction and operation;
- engineering procurement and construction (EPC);
- O&M;
- power offtake agreements; and
- coal procurement, and other materials and commodities (Fight, 2005).

The repayment of debt is usually deferred until the plant is fully commissioned. For projects with a long construction period, financial guarantees and insurance products increase the financial security, but assurances often add to costs. State-led power projects may come with sovereign guarantees and ease the burden of risk for private sector stakeholders. The participation of multilateral development banks and export credit agencies also add assurance to commercial banks.

When the plant becomes operational, offtake agreements with utilities, capacity payments and other government support mechanisms, provide cash flow from which the debts are serviced with regular payments over a period of 5–20 years. Debt servicing is usually a percentage of the cash flow. Where the cash flow is variable the repayment of the debt may also vary if allowed by the terms of the loan.

The *providers of debt have first claim to the cash flow* and the remainder goes to the project company via blocked accounts. The blocked account cannot be accessed by the borrower, and is held in reserve for payments to the lenders. The banks usually have priority to recover their funds over other finance providers. Within the banking syndicate, there may be a hierarchy.

The *lead lender has entitlement to claim any repayments due before other lenders and debtors*. Subordinated debt ranks after repayments to bank lenders or bondholders (senior lenders with senior debt), but before payments of profits to investors. Banks further down the hierarchy may charge higher interest rates due to the higher risk of not being repaid in the event of a project failure (Yescombe, 2014). As a result, comparing the loan rates from bank to bank in any single project may not be as clear as first appears without fully understanding the role of the particular banks, and such terms may be commercially sensitive.

2.5 The syndicate

Construction of coal plants are capital-intensive energy projects and the amount of funding required may often be too large or risky for a single utility or company to finance from existing cash flows and balance sheets. Project finance is suitable as it arranges several sources of external funding into a single pool and is often the only method of finance for developing large infrastructure projects. Several banks that work together on a single project is called a syndicate.

Where a project is part or largely funded by loans, the standard approach is to appoint a bank which will underwrite the debt as the lead arranger. In a public project or one involving a public finance body like an MDB or ECA, there are formal procedures to observe during the process of assessing project viability, including choosing private sector participants in a tender process.

Underwriting is an insurance to lending parties, that in the event of a default by the project to repay any debt owed, the lead arranger will cover the repayments to the lender. The underwriter takes the risk of recovering payments from the project. More than one underwriter can be used for a large project. The syndicate is organised to balance risk across a variety of lending agencies which include:

- arranger – or lead manager that organises the term sheet, credit and security documentation;
- manager – the managing bank may take the largest proportion of the debt, and so assumes much of the underwriting;
- facility agent – administers the loans on behalf of the syndicate and it needs to be a lender, underwriter or otherwise responsible for credit decisions;
- technical and engineering banks – monitor the technical progress and performance of the project;
- account bank – the bank through which all project cash flows are monitored, collected and disbursed;
- insurance bank – undertakes negotiations for project insurances to ensure the lenders are covered; and;
- security trustee – co-ordinates security and other such interests for different groups of lenders or creditors.

Financial institutions generally offer similar financial products, but as the list above shows, each bank may develop different competencies and experience in different facets of the business. It is common for public and private enterprises to work as partners, for example, an MDB or ECA may offer export guarantees and insurance, while another public or private bank provides the funds.

Banks with experience of financing coal projects will accept a greater leadership role in financing or underwriting. Banks with less expertise or smaller banks may undertake a subordinate role. Large international banks can provide a degree of security and confidence to encourage other investors to join the syndicate; domestic banks can provide an understanding of local business, regulatory, and legal issues. Asian financial institutions have become particularly adept at taking on leadership roles in funding overseas power projects.

3 International agreements

A financial institution's approach towards coal-related investments is driven by a number of factors, including the bank's attitude to risk, the ownership structure of the firm, and guidelines developed in response to international treaties and agreements. Multilateral agreements relating to climate change and the role of coal can have major impacts on attitudes and confidence amongst international, regional and local financial institutions.

3.1 The Organisation for Economic Co-operation and Development (OECD)

The OECD comprises a 34-member country council plus an EU representative, 250 committees, working groups and expert groups, and a secretariat of 2500 staff. The Organisation is the key negotiating forum where officially supported export credits are agreed and implemented. It enables governments to co-operate in developing and implementing various financial governance standards, to establish equal opportunities for all exporters while eliminating financial subsidies. The OECD also facilitates transparency and the sharing of official information on export credit policies and practices among export credit agencies and governments. Detailed terms on which an ECA provides support for export credits in the form of direct loans, interest rate subsidies or credit insurance for lenders are governed by international agreements under the aegis of the OECD.

In November 2015, participants to the *Arrangement on Officially Supported Export Credits* agreed new rules on support for coal-fired power plants. The rules were published by the Trade and Agriculture Directorate in the documents TAD/PG (2015)9/FINAL and were revised on 1 February 2016 (TAD/PG (2016)1) (OECD, 2015, 2016a).

The rules do not eliminate financial support for new coal power projects, but remove support for large subcritical coal-fired power plants; the rules permit the support for supercritical (SC) and ultrasupercritical (USC) coal-fired power stations, provided all other alternative methods of power generation have been investigated (Clarke, 2015). Countries where at least 10% of the population lacks access to electricity can receive backing for some new plants. Smaller plants in low income countries can still use subcritical technologies as deemed appropriate. The restrictions will not apply to any plants equipped with operational CCS (Japan Times, 2015). The development of commercially viable CCS will therefore be critical to the acceptance of greenfield coal-fired power amongst some western funding agencies.

The Participants in the Arrangement are: Australia, Canada, EU, Japan, Korea, New Zealand, Norway, Switzerland and the USA. The Arrangement is an *understanding which is based upon the trust of both or all parties, rather than being legally binding* (OECD, 2015, 2016a). The latest rules came into effect on 1 January 2017, and are subject to a mandatory review starting in 2019. As of 2016, the new rules added upper limits to the repayment terms to new coal-fired power plants (*see* Table 1) and distinguish between:

- the size of the plant;
- the design steam pressures and temperatures; and
- the level of poverty and electrification in the country.

Table 1 Maximum repayment terms for coal-fired power (OECD, 2016a)

Plant unit size (gross installed capacity)	Unit >500 MW	Unit ≥300 to 500 MW	Unit <300 MW
Ultrasupercritical (with a steam pressure >24.0 MPa and ≥593°C steam temperature). OR emissions <750 g CO_2/kWh	12 years*	12 years*	12 years*
Supercritical (with a steam pressure >22.1 MPa and >550°C steam temperature). OR emissions between 750 and 850 g CO_2/kWh	Ineligible	10 years and only in IDA-eligible countries*ŧ‡	10 years and only in IDA-eligible countries*ŧ‡
Subcritical (with a steam pressure <22.1 MPa). OR emissions >850 g CO_2/kWh	Ineligible	Ineligible	10 years and only in IDA-eligible countries*ŧ‡

* Where eligible for official support, an additional two years' repayment term is allowed for project finance transactions, subject to the maximum repayment terms in Article 2 of Annex VII of the Arrangement.
ŧ To help address energy poverty, ten-year export credit support may be provided in all countries where the National Electrification Rate (as per the most current IEA World Energy Outlook Electricity Access database) is reported as 90% or below at the time the relevant completed application for export credit is received.
‡ Export credit support may be provided in non-IDA-eligible countries under certain circumstances. For details *see* OECD (2016a,c).

The recipients of funding can be in countries with a low electrification rate including Cambodia, Indonesia, Laos, Malaysia, Myanmar, and the Philippines as well as countries that are eligible for *International Development Association* (IDA) resources such as Vietnam as well as countries in Africa, and South and Central Asia.

Table 1 shows how USC plants are eligible for export credit support subject to a maximum repayment term of 12 years. Other restrictions scale-down the repayment period to just 10 years and subcritical plants larger than 300 MWe are ineligible for funding. Plants that were proposed before 1 January 2017 are not subject to the restrictions provided all *environmental impact assessment* (EIA), including technical and social feasibility assessments have been carried out.

The OECD estimates that two-thirds of the coal-fired power projects that received support between 2003 and 2013 would not have been eligible under the new rules (Digges and others, 2016). These policies apply only to eligible export credits, and only to certain sizes and classes of coal power plants and appear to exclude coal mining and associated infrastructure such as rail and network grid investment. This implies there are still opportunities for OECD governments to support coal investments.

3.2 UN Conference of the Parties

Global environmental agreements have brought about immense change to the way energy markets operate. In 1992, the United Nations Conference on Environment and Development in Rio de Janeiro brought sustainability and climate change higher up the international agenda as 130 nations signed the UN Framework Convention on Climate Change (FCCC). Since 1992 there have been annual meetings of the Conference of the Parties (COP) to the UNFCCC.

At COP21 in Paris in November 2015, 195 countries agreed to reduce their carbon output 'as soon as possible' and to do their best to keep global warming 'to well below 2 degrees'. The Paris Agreement entered into force on 4 November 2016. Each Party has to prepare, communicate and maintain successive *nationally determined contributions* (NDC) that it intends to achieve as its contribution to meeting the goals of the Agreement. The Intended Nationally Determined Contributions, or INDC, outline future emission targets, deadlines for targets to be met, and the baselines from which the cuts are measured; the methodology of the targets varies depending on the country's economic status. The INDC include measures such as limiting the construction of subcritical coal-fired power plant while ensuring that HELE technologies are used on new plants. COP22 in Marrakesh, Morocco, met in November 2016 and came at a time of political change in the USA. The election of the Republican president Donald Trump has created uncertainty in the energy policy of the USA.

3.2.1 Intended nationally determined contributions (INDC) in emerging economies

Prior to the Paris Agreement in 2015, 19 non-OECD countries including the largest coal economies submitted pledges to push forward with low emission coal technologies to meet planned NDC. With the inclusion of Indonesia and North Korea, a total of 21 countries representing over 50% of global emissions pledged to use HELE for a lower carbon pathway (McHugh, 2016; WCA, 2015).

According to the IEA (2016), SE Asia will be a region that will lead a rise in the demand for coal-fired power. Yet, most SE Asian economies have CO_2 emission targets for 2030 as part of their INDC. It raises the question, how will coal-fired power have a role in the post-COP21 era?

Some national greenhouse gas (GHG) goals in these regions are complicated by the fact that the target reductions are measured against future emissions or against GHG intensity per GDP against a base year of 2005. All SE Asian nations must reduce their emissions against a business as usual (BAU) trajectory. For example, Indonesia must reduce average GHG emissions by 29% by 2030 compared to its future BAU emissions. Similar targets are set for Vietnam (BAU -8%); Thailand (BAU -20%); Philippines (BAU -70%); Bangladesh (BAU -5%) (CAIT, 2016).

Elsewhere, the targets for some countries aim to cut the emissions intensity per unit of GDP. For example, Malaysia aims to reduce emissions per unit of GDP by 45% by 2030 compared with the base year 2005. A similar approach has been taken by China (-60%) and India (-35%). Such approaches to cutting CO_2 emissions give a degree of flexibility and does not explicitly exclude coal technologies not fitted with CCS.

In summary, most of the low and middle income countries looking to coal power as a future source of electricity are also signatories to the Paris Agreement. Many of the targets agreed involve cuts relative to BAU scenarios, or GHG intensity. The structure and targets of the NDC means that some Asian countries could include HELE coal technologies as part of their portfolio with other lower carbon solutions.

4 Global trends in coal power and mining project finance

In 2014, total worldwide funding for all coal projects such as power plants, mining and transportation was estimated at US$152 billion (author's estimates). The 20 largest commercial banks in the world dominate the funding and provided finance of US$45.4 billion to the power sector and US$53.8 billion to the mining sector (*see* Figure 2). Surprisingly, half of the banks' lending to the power sector were European, the rest were mainly from China and Japan; in future, Asia could have a bigger share of the market. Public funding bodies such as multilateral development agencies and export credit agencies provided approximately US$9 billion through mechanisms such as debt and underwriting. The provision of these services will also attract a proportion of commercial sector funding. The role and influence that public finance institutions may have on project finance is therefore disproportionate to the direct financial support they provide, but the lack of available data makes quantifying this difficult and beyond the scope of this report.

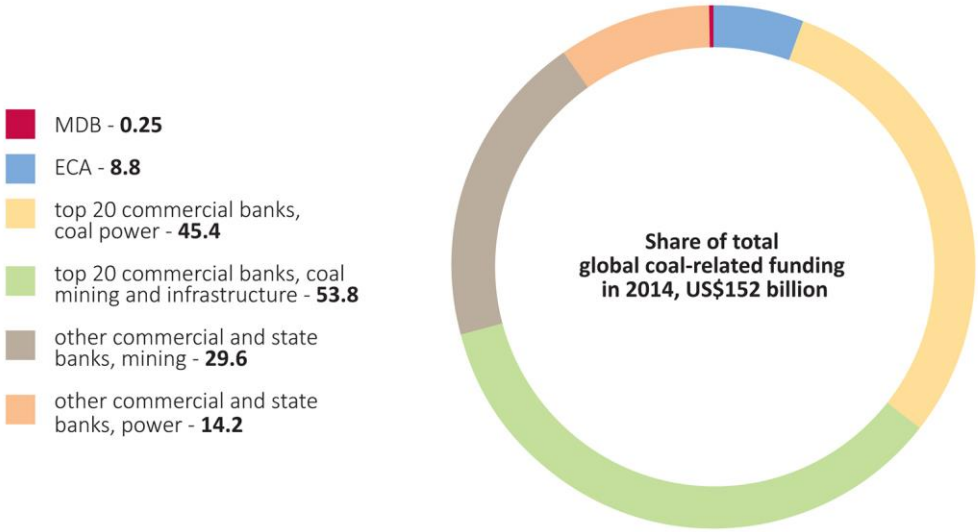

Figure 2 Funding share of coal power and mine projects in 2014 (IEA CCC estimates based on Ran, 2015; IEA, 2016b)

Of the top 20 commercial banks that provided finance to the mining sector, 13 were from China. Outside China, other commercial and state-run banks funded US$29.6 billion for mining and infrastructure; an additional US$14.2 billion funded the power sector. Capital spending by coal companies around the world is now focused on projects aimed at improving productivity and lowering operating costs (IEA, 2016b; RAN, 2015).

The financial investment in coal-fired power exceeds that for gas and oil due to activities in China which accounts for half the world's coal production and consumption (*see* Figure 3). Coal investments increased in 2015, despite investment in fossil fuel power generation falling by 8% to US$111 billion. Total spending on coal-fired plants rose to US$78 billion due to gross capacity additions of 84 GW. Overall investment was softened as the average cost of building fossil fuel power stations fell due to a shift in finance to emerging economies where costs are lower (IEA, 2016b).

The global fleet of coal-fired stations is young; more than 35% of plants have been built since 2005. Investments in China, India and other non-OECD Asian countries have driven this trend; around half of the new coal capacity being built is in China where new low cost units replace older, smaller, inefficient technology.

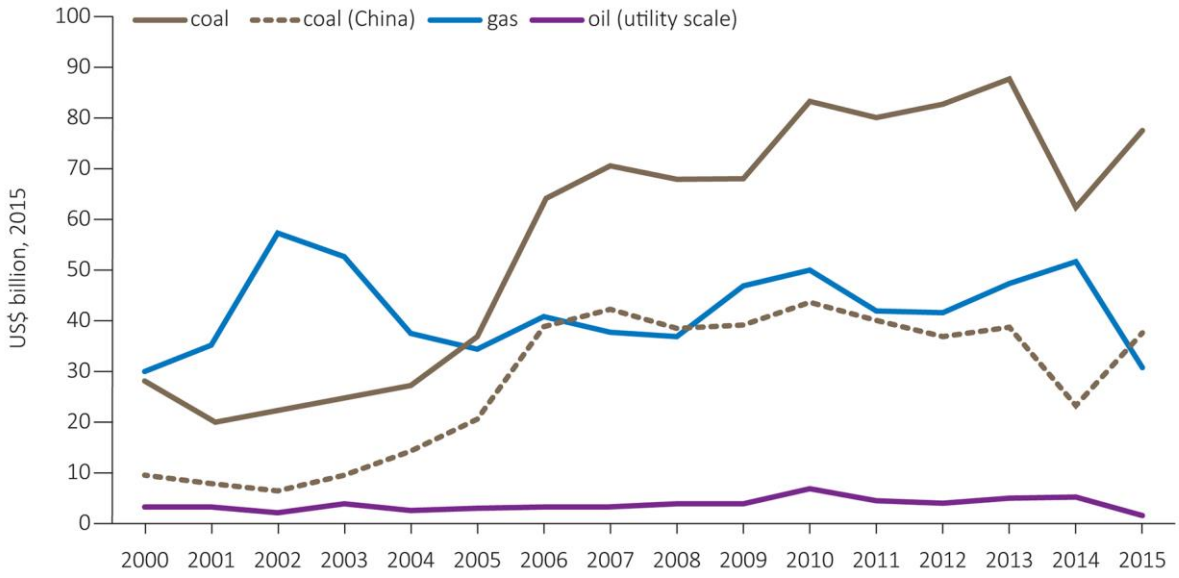

Figure 3 Global fossil power investment (IEA, 2016b)

Worldwide, sluggish economic growth and a slowdown in electricity demand has limited the building of new coal plants in some regions, notably OECD America and Europe. Stringent emission regulations and competition from gas and renewables in these regions have almost halted commercial coal developments, although coal and CCS are ongoing in several countries. In industrialising Asia, Africa, and the Middle East, coal is a desirable source of stable base load electricity, and often the fuel of choice for countries diversifying away from gas and renewables such as Indonesia, Malaysia, and Vietnam.

4.1 Implications of future trends in coal-fired capacity

According to Platts (2016) WEPP database, 90% of all the new coal-fired capacity currently under construction around the world is located in Asia. Analysis by the IEA CCC suggests:

- more than half the capacity will come online in China, and 40% in low to middle income countries such as India, Indonesia and Vietnam;
- between 2011-16, global coal capacity increased by 522 GWe leading to an estimated cumulative investment of US$405 billion, averaging US$81 billion per year, which is consistent with IEA (2016) analysis shown in Figure 2;
- during 2017-22, 190 GWe will be under construction, amounting to a cumulative investment of US$158 billion, or US$31 billion per year; and
- plants in the planning stage (until 2028) currently total 660 GWe, requiring an estimated US$630 billion, or US$52 billion per year.

According to the IEA (2015c), the period between 2013 and 2040 will see an additional US$1.6 trillion of investment of new coal-fired capacity out of an electricity sector total of US$19.7 trillion. This is equivalent to an annual investment of US$59 billion for new coal plant capacity. This figure is less than that seen in past years, but it is significant and *indicates an ongoing and considerable opportunity for HELE investment by the international financial community*. This scenario excludes the investment required for CCS. Most of this new investment will be in Asian economies where the coal fleets are still young, although in China and India some new capacity will replace ageing plants. As Figure 3 shows, investment in coal has risen considerably since 2000, and has increased again more recently following a dip in 2014.

4.2 Energy divestment

In some western economies, there are campaigns to encourage financial divestment from fossil fuels. The number of investment bodies with divestment commitments rose from 180 in 2014 to more than 500 in 2016. This divestment represented t financial holdings of US$3.4 trillion in 2016 (IEA, 2016b quoting The Electricity Journal, 2016).

Critically, *divestment requires the sale of equity, and what is not clear is which companies purchased the divested equity*, and whether the new equity holders continued the operations. For example, since 2013, the Czech company EPH has purchased 10 coal- and lignite-fired power plants and their related mines at discounted prices in deals worth a total of more than US$7 billion. EPH is one of several companies seeking value from coal-fired power. Acquisitions by EPH include Germany, Hungary, Italy, Slovakia, and the UK. Elsewhere, the international engineering company GE doubled its fleet of turbines for coal plants by acquiring the power business of Alstom (France), and plans to build coal plants in low and middle income economies such as India, where demand for reliable cost effective electricity is high. Electricity of Vietnam Group (EVN), the state utility, is also investing in coal-fired power plants in Vietnam where the government has projected coal-fired power will increase its market share to 49% by 2020, up from 25% in 2014 (Salvaterra, 2016).

Despite the divestment campaigns, the impact on the overall availability of finance for coal-fired power appears to be marginal. Investors continued to fund new coal power projects to the tune of an estimated US$78 billion in 2015. However, an increase in large-scale divestment could raise the cost of capital, restrict loans, or reduce access to capital markets for project developers. In low and middle income economies with less developed capital markets, reduced international financing could undermine projects. However, divestment campaigns largely involve equity investors involved in coal mining assets, who are likely to have only indirect impact on the availability of finance for power projects (Baron and Fischer, 2015). The bulk of international coal power finance comes from lending by commercial and public banks, especially in developing Asia, and the current planned trends suggests this will continue for several years.

5 Role of global commercial banks in the coal sector

Commercial banks play a leading role in financing energy-related infrastructure. They can fund directly through project finance or indirectly by providing corporate loans. They can also act as an agent for a project in the financial markets, assisting with share and bond issues, or managing equity and bonds for their own accounts or third parties (Banktrack, 2014). Commercial banks usually cooperate with each other, and can form a syndicate with an MDB or an ECA.

In mature energy markets, such as OECD Europe, North America, Japan, China, Russia, India, Australia, and Indonesia, coal power and mine developers are well-established and have ready access to domestic and international financial markets. In times of strong economic growth, the rewards for investing in coal projects can be desirable for the commercial banking sector.

In 2014, the top 20 commercial banks alone are estimated to have provided funding of US$100 billion to companies engaged in coal power or coal mining activities (IEA, 2016b). However, current trends in new coal-fired power projects in Europe and North America have almost halted and could lead to western commercial banks participating in coal projects elsewhere via their international offices in Asia. These funding trends will be determined by the business strategies of the banks and their responses to environmental regulations and market conditions that will vary from region to region. Thus, it is uncertain whether all this funding will be available for new unabated coal plants in the future. Coal plants with CCS however may attract a great deal of commercial funding over the long term.

It is difficult to gather financial data for the global commercial banking system due to the many thousands of banks and financial institutions in operation. Obtaining an accurate global figure for coal related finance is similarly difficult, although some data has been gathered and analysed by environmental non-governmental organisations (NGO). Often the data are not representative of global trends as they only capture selected banks that have invested in overseas projects. Nevertheless, estimates of the cumulative funding that occurred in the years 2009-14 are provided in Table 2 for 27 commercial banks. The table was compiled by the Rainforest Action Network (RAN) and includes a wide range of transactions such as fuel procurement and insurance, as well as direct loans for capital investments (RAN, 2015). Additional information on coal and HELE policies are provided by the IEA CCC.

The largest financiers of coal power projects appear to be western banks, namely JP Morgan Chase, Citigroup, Barclays, BNP Paribas, and the Royal Bank of Scotland. Each of these banks has funded US$9–10 billion in total over the period 2009 to 2014. A similar amount of funding was provided to the coal mining sector. Unusually, Asian banks do not appear at the top of the table, although eight of the 27 banks in Table 2 are from China and Japan. The results are in stark contrast to research carried out in 2014 when Chinese banks were the largest three financiers of coal (Banktrack, 2014) and studies by the IEA (2016) which showed half of the 20 largest commercial bank lenders in 2014 were Chinese banks.

Table 2 also provides a summary of the policies of each bank with respect to coal power and mining investments. Six of the banks have explicit policies restricting mountain top removal (MTR), while 10 banks

have general policies that pledge a reduced activity in the coal extraction sector. Most commercial banks appear to have policies that impose restrictions on their financial exposure to coal mining activities, but few have policies that impose strict criteria on coal power investments. The few banks that have restrictions on financing coal power plants are some of France's largest banks and HSBC of the UK.

Table 2 Commercial banks' participation in coal power and mine projects, coal policies and power performance (HELE) policies (RAN, 2015 and author's estimates)

Bank	Funding of coal power in 2009-14, US$ billion	Funding of coal mining in 2009-14, US$ billion	Total funding of all projects in 2009-14, US$ billion	General cost policy	HELE policy
Citigroup	9.91	9.74	19.65	Exclusion or reduction in commitment	
Barclays	9.60	4.21	13.81	Prohibited/reduced support for MTR* and/or restricted project finance	
BNP Paribas	9.21	5.63	14.84	Exclusion or reduction in commitment	Minimum performance standards for efficiency or CO_2/kWh; and/or CCS
RBS	8.74	7.12	15.86	Prohibited/reduced support for MTR* and/or restricted project finance	
Deutsche Bank	7.41	6.44	13.85	Performs due diligence on mine and power projects	
Bank of America	6.67	7.77	14.44	Exclusion or reduction in commitment	
Credit Agricole	6.30	3.20	9.50	Exclusion or reduction in commitment	Minimum performance standards for efficiency or CO_2/kWh; and/or CCS
Morgan Stanley	5.38	8.01	13.89	Exclusion or reduction in commitment	
UBS	5.58	5.29	10.87	Prohibited/reduced support for MTR* and/or restricted project finance	
Goldman Sachs	5.39	3.63	9.02	Prohibited/reduced support for MTR* and/or restricted project finance	
China Construction Bank	5.33	2.44	7.77		
Credit Suisse	5.30	5.62	10.92	Enhanced diligence on mine and power projects	
Mitsubishi UFJ Financial	5.25	4.08	9.33		
Société Générale	5.12	3.42	8.54	Exclusion or reduction in commitment	Minimum performance standards for efficiency or CO_2/kWh; and/or CCS
Unicredit	4.15	3.23	7.38		Minimum performance standards for efficiency or CO_2/kWh; and/or CCS
Bank of China	3.60	4.67	8.27		
HSBC	3.35	3.67	7.02	Prohibited/reduced support for MTR* and/or restricted project finance	Minimum performance standards for efficiency or CO_2/kWh; and/or CCS

Table 2 continued					
Bank	**Funding of coal power in 2009-14, US$ billion**	**Funding of coal mining in 2009-14, US$ billion**	**Total funding of all projects in 2009-14, US$ billion**	**General cost policy**	**HELE policy**
ING Group	3.21	3.54	6.75	Enhanced diligence on mine and power projects	
Well Fargo	3.00	2.39	5.39	Exclusion or reduction in commitment	
ICBC	2.90	4.87	7.77		
Mizuho Financial	2.70	1.98	4.68		
Santander	2.09	2.41	4.50		
Sumitomo Mitsui Financial	2.02	3.14	5.16		
Agricultural Bank of China		2.1	2.10		
JP Morgan Chase		8.43	8.43	Prohibited/reduced support for MTR* and/or restricted project finance	
Total funding	**122.71**	**117.03**	**239.74**		
* MTR = Mountaintop removal					

Table 2 is not exhaustive and does not provide a complete picture of the way the funding is distributed due to a number of factors:

- funding for new capacity building is aggregated with other lending to cover transaction costs (for example fuel procurement) or activities such as mergers and acquisitions, underwriting and other guarantees;
- spending related to the coal power plant may be included, such as rail transportation or transmission grids to and from coal-fired power stations; analyses may not consider the benefits of gaining new infrastructure such as a robust transmission system, or a new rail scheme which could be shared with passenger transport; and
- lack of information on banks operating in India and Russia.

Reforms in the banking sector could affect future commercial funding. These regulatory changes were developed both nationally and internationally to deal with the aftermath of the 2007-08 banking crisis.

Restrictions on financing the mining sector have been led by financial institutions in the USA. In the past the Bank of America was a major provider of finance for coal-related projects. In December 2008, the Bank issued a policy that limited its financing for MTR. This was soon followed by Citi Bank and Credit Suisse in 2009 (RAN, undated).

In the period 2008-14, coal mining in the USA using MTR methods fell by 62% from 52 Mt/y to 20 Mt/y; this collapse in MTR output was significantly more dramatic than the decline in total US coal production (EIA, 2015). In May 2015, the Bank of America committed to further reducing its financial exposure to the coal mining sector. This played a pivotal role in steering sentiment in the financial community in North

America and elsewhere. Limits to credit exposure to coal extraction operations would be applied globally for the Bank and other coal related transactions would be subject to more stringent due diligence (McDonagh, 2015).

The Bank of America supports CCS and aims to promote the right conditions to develop the deployment of this low carbon technology. Policy details for the Bank of America are available at: http://about.bankofamerica.com/assets/pdf/COAL_POLICY.pdf

Morgan Stanley, which is headquartered in the USA, has fairly typical coal investment policies for the commercial banking sector with respect to coal mining investments. The Bank is committed to reducing its exposure to coal mining globally and will not provide finance where the specified use of proceeds would be for MTR. However, Morgan Stanley has stated that Australia's US$14 billion thermal coal export industry can be part of the solution to the global emissions abatement challenge, as well as commanding premium prices. Its position is based on the move towards HELE coal-fired power stations in the Asia-Pacific region, leading to more demand for the higher quality coals Australia produces. The investment bank said that despite perceptions, thermal coal was not facing a permanent decline in the face of the need to reduce emissions (Fitzgerald, 2016).

In the USA, Morgan Stanley will reduce its support for new coal-fired power plants or expansion of existing ones, unless there is sufficient CCS or equivalent emissions reduction technology in place (Morgan Stanley, 2016). This policy extends to investments in any developed nation. This statement does not appear to exclude the participation of Morgan Stanley in coal power investments in low to middle income countries, providing opportunities for business in Asia, Africa and the Middle East. There appears to be no specific technical criteria guiding its funding.

"The common perception is that coal-fired power has no role to play in a low-emissions future. We believe this is not the case, as carbon emissions can be reduced by over 20 per cent (in HELE plants), with the benefit further complemented by further reduction through the use of higher energy coal."
Morgan Stanley (Fitzgerald, 2016)

In 2013, the Basel III reforms provided international banking regulations developed by the Bank of International Settlements in Basel Switzerland. The purpose was to promote stability in the international financial system and prevent banks from taking excessive risks similar to those that led to the subprime mortgage lending crisis. The regulations required a careful monitoring of the quality and quantity of regulatory capital, assets and liabilities by measuring liquidity (cash) through a series of stress tests. The outcome of Basel III is that there may be a reduction in lending which could lead to a rise in lending rates but empirical evidence on the effects on coal projects is not yet known (Bezoen, 2015; BIS, 2013).

5.1 Voluntary principles of western commercial banks

Banks worldwide have signed up to voluntary agreements to reinforce internal procedures for carrying out environmental assessments. These agreements are not legally binding and provide guidance on good practice and governance related to power plant planning, developing, and operation. The most prominent

examples include the *Equator Principles*, the *Carbon Disclosure programme*, the *UNEP Finance Initiative*, the *Global Reporting Initiative*, as well as banks' internal due diligence and environmental impact assessment (EIA) guidelines.

Table 3 lists over 100 banks and their participation in voluntary standards. The implementation of voluntary standards is variable from region to region. Banks in China, India, Poland, Russia, Spain, and the USA do not appear to have applied them to a great extent, while those in France, Netherlands and the UK appear to have a high rate of adoption.

Table 3 List of commercial banking signatories to selected voluntary agreements

Country	Bank	Assets	Equator principles	Carbon disclosure	UNEP finance initiative	Other environmental policy	Global reporting initiative	Corporate social responsibilities
Australia	ANZ		✓	✓	✓			
	Commonwealth Bank		✓	✓	✓			
	Macquarie			✓				
	NAB	945 AUS$ billion	✓	✓	✓			
	Surcorp			✓				
	Wespac		✓	✓	✓			
Canada	BMO		✓	✓	✓			
	CIBC		✓	✓	✓			
	RBC		✓					
	Escotia Bank	856 Can$ billion	✓	✓	✓			
	Toronto-Dominion Bank		✓	✓	✓			
China	Bank of Beijing							
	Bank of China							✓
	Bank of Communications			✓				
	Bank of Nanjing							
	Bank of Ningbo							
	China Construction Bank					✓		✓
	China Everbright Bank							
	China EXIM							
	China Merchants	388 US$ billion			✓			
	China Minsheng					✓		
	CITIC Bank International					✓		
	Hua Xia Bank							✓
	ICIBC	3300 US$ billion		✓				
	Industrial Bank	659.5 US$ billion	✓	✓	✓			
	Ping An Bank				✓			✓
	Shanghai Pudong Dev Bank							✓

Table 3 continued

Country	Bank	Assets	Equator principles	Carbon disclosure	UNEP finance initiative	Other environmental policy	Global reporting initiative	Corporate social responsibilities
Egypt	AAIB		✓					
France	BNP Paribas		✓	✓	✓	✓		
	Credit Agricole		✓	✓		✓		✓
	Crédit Mutuel							
	La Banque Postale							
	Natixis	500.3 € billion	✓	✓				
	Societe General	334 € billion	✓	✓	✓	✓	✓	✓
Germany	Allianze						✓	
	Bayern LB					✓		
	Commerz Bank		✓				✓	
	Deutsche Bank			✓	✓		✓	
	DZ Bank		✓	✓			✓	
	GLS Bank						✓	
	Helaba				✓			
	HSH Nord Bank							
	KfW				✓		✓	
	KfW IPEX Bank		✓	✓	✓	✓		✓
	LBBW			✓	✓		✓	
	Munchener Bank				✓		✓	
	NORD/LB				✓	✓		
Hong Kong	Wing Lung Bank	30 US$ billion						
India	Axis Bank					✓		✓
	Bank of India							✓
	Exim Bank of India							
	HDFC Bank			✓			✓	✓
	ICIC Bank							
	IDFC	77623 INR crores	✓	✓			✓	✓
	IDBI							
	Life Insurance Corp of India							
	Power Finance Corp					✓		✓
	State Bank of India			✓				✓
Indonesia	Bank of Central Asia							
	Bank Danamon					✓	✓	
	Bank Mandiri	6 US$ billion						
	Bank Rakyat Indonesia							
Italy	Intesa San Paulo	700 € million	✓	✓	✓		✓	✓
	Medio Banker			✓				
	Unicredit							
Japan	Bank of Tokyo-Mitubishi UFG		✓	✓	✓		✓	✓
	Mizuho Financial Group		✓	✓	✓		✓	✓
	Sumitomo Mitsui Banking Corp	1660 US$ billion	✓	✓	✓	✓	✓	✓
Malaysia	CIMB						✓	

Table 3 continued

Country	Bank	Assets	Equator principles	Carbon disclosure	UNEP finance initiative	Other environmental policy	Global reporting initiative	Corporate social responsibilities
Morocco	BMCE Bank							
Netherlands	ABN Amro		✓		✓	✓	✓	✓
	ASN Bank		✓	✓	✓	✓	✓	✓
	FMO		✓					✓
	ING		✓	✓	✓	✓	✓	
	NIBC	9.94 € billion	✓	✓	✓			
	ROBO Bank		✓	✓	✓	✓	✓	
	SNS Bank							
	Triodos Bank							
Poland	Bank Gospordarki Zymnoscioeej							
	Bank Gospordarstwaki Krajowejo B GK							✓
	Bank Millemium							
	Getin Noble Bank							
	PKO Bank Poloski							✓
Portugal	Banco Espirito Santo							
Russian Fed	Alpha Bank							
	Otkritie Bank							
	Sberbank							
	Vnesheconombank							
	VTB							
South Africa	Absa Bank Ltd							
	FirstRand		✓	✓			✓	
	Nedbank		✓	✓	✓	✓	✓	
	Standard Bank		✓	✓	✓		✓	
Spain	Bankia							
	BBVA							
	Santander							
Switzerland	Credit Suisse							
	UBS			✓	✓		✓	✓
Thailand	Bangkok Bank							
	Ksikorn Bank							
UK	Barclays		✓					
	HSBC		✓					
	LLoyds		✓	✓	✓	✓		✓
	RBS		✓	✓	✓	✓		✓
	Standard Chartered		✓	✓	✓	✓		✓
USA	Bank of America		✓	✓	✓	✓		✓
	BNY Mellon							
	CITIC Bank International							
	Goldman Sacs							
	JPMorgan Chase		✓	✓	✓	✓	✓	✓
	Morgan Stanley							
	PNC							
	US Bancorp							
	Wells Fargo		✓					

One of the most influential set of guidelines is the Equator Principles (EP). The EP are based on the World Bank Group's IFC Performance standard on Environmental and Social Sustainability. As of 2016, the EP had been adopted by 83 financial institutions. The Principles determine, assess, and manage environmental risk in individual projects. The EP Financial Institutions, or EPFIs, have adopted the Principles to ensure that projects are developed in a socially responsible manner and reflect sound environmental management practice. The EP assesses a potential coal plant on its local impacts, and so is similar, but more rigorous than the usual EIA that is carried out by financial institutions (EP, 2013). The Principles rely on the openness and disclosure reporting and local community engagement related to EIA. The EPFI will only provide project finance and project-related corporate loans to projects that meet the requirements of the 10 Principles, which are published in full at www.equator-principles.com. Even an MDB such as the EBRD are drawing on the Principles to set their own standards

Successful projects are subject to a series of requirements some of which include environmental and social assessment, stakeholder engagement, independent review, independent monitoring and reporting, and reporting transparency. Unavoidable impacts resulting from the power plant development during construction and operation should be reduced, mitigated and/or compensated for appropriately. The EP only apply to new projects, and are not intended to be applied retroactively. The Principles are not restricted to any single location, but apply globally and to all industry sectors. A plethora of similar agreements such as Climate Principles, Extractive Industries Transparency Initiative, Banking Environment Initiative, Carbon Disclosure Project, and others are all applicable depending on the bank.

Countries which appear to have banks that have not adopted these voluntary principles comprehensively, or where there is a lack of information regarding their participation include China, India, Indonesia, Poland, Russian Federation, Spain and the USA.

5.2 Technical benchmarks set by commercial banks

This section looks at the stricter guidelines used by three commercial banks, HSBC, BNP Paribas and Société Générale. In 2011, the UK bank HSBC introduced GHG performance standards for power plants larger than 500 MWe in capacity to reinforce its existing environmental impact assessments and financial models. The limits are based on the CO_2 emissions intensity as CO_2/kWh and are determined by the intended location of the power plant development. The limits are as follows:

- Maximum emissions of 550 gCO_2/kWh for developed countries; and
- 850 gCO_2/kWh for developing countries.

The definitions of 'developed' and 'developing' used by the HSBC are not clear as there is no formal demarcation, although the UN use the term 'developing' for 159 nations. The levels set for developed countries are similar to that achieved by a natural gas CCGT plant. Unless a coal plant can be fitted with partial or full CCS, coal plants in developed countries are effectively non-compliant with HSBC criteria.

In developing countries, the emissions limits are easily achieved using commercially available clean coal technologies. For comparison, the global average CO_2 emissions from coal-fired plants are about 958 gCO_2/kWh (Williams, 2016d). A modern commercial scale USC plant emits around 740 gCO_2/kWh, and the advanced USC plants in development promise efficiencies approaching 50% and emissions of 670 gCO_2/kWh (WCA, 2016).

In 2015, BNP Paribas adopted the EP and World Bank policies as overall guidance on environmental and social impacts. BNP underlying criteria for assessing coal-fired power projects are detailed and ensure that the investment portfolio is in line with climate targets, leading to a withdrawal of support for coal mining activities and no more financing of coal-fired power plants in high income OECD countries. In low-income countries, new power projects in the Bank's portfolio should have a much clearer commitment to reducing GHG emissions, leveraging more investments towards low carbon energy, which is reflected in the Bank's commitment to doubling investment in renewables. Companies seeking funding from BNP may have to demonstrate a reduction in the share of coal in the power generation mix (BNP Paribas, 2015).

Based on its corporate social responsibility (CSR) sector policy for coal, BNP imposes technical requirements for greenfield coal power projects on units above 350 MW. The net energy efficiency (LHV) must be a minimum of 43%; this is applicable to plants that cofire biomass and/or are designed as CHP stations (BNP, 2016). BNP Paribas does not exclude coal equipped with CCS. BNP will progressively integrate the use of an internal carbon price in its financing decisions, more in line with western multilateral development banks, but these are yet to be determined.

In January 2017, Société Générale, (SG), ceased lending to coal-fired power projects worldwide, and intends to scale back its outstanding loans to the coal industry, with a goal of reducing the proportion of coal-fuelled share in power production financed by the bank to 19% by 2020 (SG, 2016). However, like most banks, their coal power polices are rarely straightforward and contain caveats which will support or reject projects on a case by case basis. Any client seeking funding from the Bank will need to prove that coal is not a large proportion of its business portfolio. Also, the CO_2 emissions of any project must fall within certain limits, and no coal-related investment can occur in a high-income country. The coal power sector policy for Société Générale is provided at: https://www.societegenerale.com/sites/default/files/2016/coal-fuelled-power-sector-policy-oct2016.pdf

For plants that emit more than 100,000 tCO_2eq during the operational phase, GHG emissions should be quantified annually and less greenhouse gas intensive options must be considered. CCS readiness of new plant should also be considered. This policy provides a power generation portfolio flexibility that enables a bank to finance coal, provided the bulk of the funding or generation portfolio is supplied to non-coal investments (SG, 2016).

Finally, in 2017 the German commercial bank Deutsche Bank (DB) announced a withdrawal from funding future coal mine and power projects.

5.3 Commodity prices and confidence in the coal sector

Most Asian banks suffered less than western banks in the banking crisis of 2007-08 due to a lower level of exposure to sub-prime mortgage defaults, with the exception of some Japanese banks that owned shares in American banks. As a consequence of the banking collapse, financial institutions in different regions may have a range of views on the risks associated with coal investments. Funding institutions within OECD Europe and North America may well have negative perceptions of coal financing, while international banks may have a more positive attitude to HELE coal-fired power in Asia, Africa, Latin America, and the Middle East.

The coal extraction industry has slumped since 2007. In 2015, the FT Dow Jones Coal Index showed the share prices of 234 listed companies had dropped by 85% between 2011 and 2014 (*see* Table 4). A 25% fall in commodity prices in 2015 alone left some of the largest international mining companies in a financially precarious state. The ratings agency Fitch estimated 2016 to be the fifth consecutive year of falling prices and declining demand for US coal. With mounting debts and a drop in global asset values, commercial banks have less interest in financing coal-related activities and have adopted policies to reflect this change. The US Energy Information Administration estimated that coal production would fall 16% in 2016, the largest annual percentage decline since 1958.

Table 4 Fall in mining stocks worldwide (Lee, 2016)

Mining company	Percentage fall in share price over 3 years from 2011-14, %
Global Mining	
Anglo American	87
BHP Billiton	70
Glencore	79
Rio Tinto	54
USA	
Alpha	98
Arch	89
CONSOL	84
Peabody	87
Others	
Teck (Canada)	87
Whitehaven (Aus)	87
China	
Shenhua	67
Yanzhou	78

The worsening market conditions following the banking crisis forced several coal companies in the USA to file for bankruptcy in 2015. They were: Alpha Natural Resources, Edison Mission Energy, James River Coal,

Patriot Coal, and Walter Energy. In January 2016, Arch Coal filed for bankruptcy followed by Peabody, the world's largest private sector coal miner. These insolvencies sent shockwaves across the world commodity markets. As the current steam and metallurgical coal markets are in persistent oversupply, profitability in global coal mining in the foreseeable future is uncertain for many investors (Cloete, 2016; Nair, 2016).

Between 2014 and 2016, share prices dropped further but towards the end of 2016, steam and coking coal prices staged a recovery. A price recovery has boosted profits of some major coal companies. Rio Tinto's coal division was one of the company's fastest growing divisions for profit. A similar boost to profits was also experienced by Australia's Whitehaven Coal (MCR, 2017a, 2017b).

According to Goldman Sachs, coking coal prices were expected to remain robust in the foreseeable future as long as China maintained production constraints in its domestic market. Any relaxation of this policy and a boost in coal output would have a downward effect on prices (Biesheuvel, 2016).

Despite the uncertainties in the international seaborne coal market, the investment bank Morgan Stanley noted that there are 1926 coal-fired power generation units under construction or planned in SE Asia. According to Fitzgerald (2016) "*It is analysis based on cold hard facts, not wishful thinking. It underlines the fact that coal in general, and Australian coal in particular, will play an indispensable role in Asia's energy mix for decades.*"

Chinese banks maintained the capacity to lend large amounts during and after the financial crisis. Chinese lenders had a different perception of risks (project and country risks) compared with other international banks, and subsequently Chinese banks were willing to lend more money to a greater number of countries; this situation has not altered. In Eastern Europe, potential financiers have withdrawn from coal power tenders due to local political situations and risk, but Chinese EPC have been actively bidding for these coal projects with financial support from Chinese policy banks. These deals were promoted under the direction of the Chinese Ministry of Commerce. State-owned policy banks and export guarantors approach such regions with a long term strategic view, and so may forego risk and short-term economic benefits in order to gain a strategic foothold in emerging markets (Rodrigues, 2011).

Asian financial institutions appear to have increased their participation in project finance for infrastructure projects considerably since the crisis. Figure 4 illustrates the total amount of project finance that was committed by commercial banks in 2008 and 2012; the funding was for all types of energy and non-energy projects worldwide. Commercial banks in Europe saw a collapse in project finance commitments following the banking crisis, from more than US$90 billion to around US$37 billion. Most other regions also saw a fall in project finance commitments, the Middle East and North Africa experienced a drop, coinciding with a decline in oil prices. The Asia-Pacific region and Sub-Saharan Africa were exceptions, seeing a rise. Within these trends in total project finance, the coal power and mining sectors would compete for funding with all other infrastructure projects and the stark regional differences are clearly shown in Figure 4.

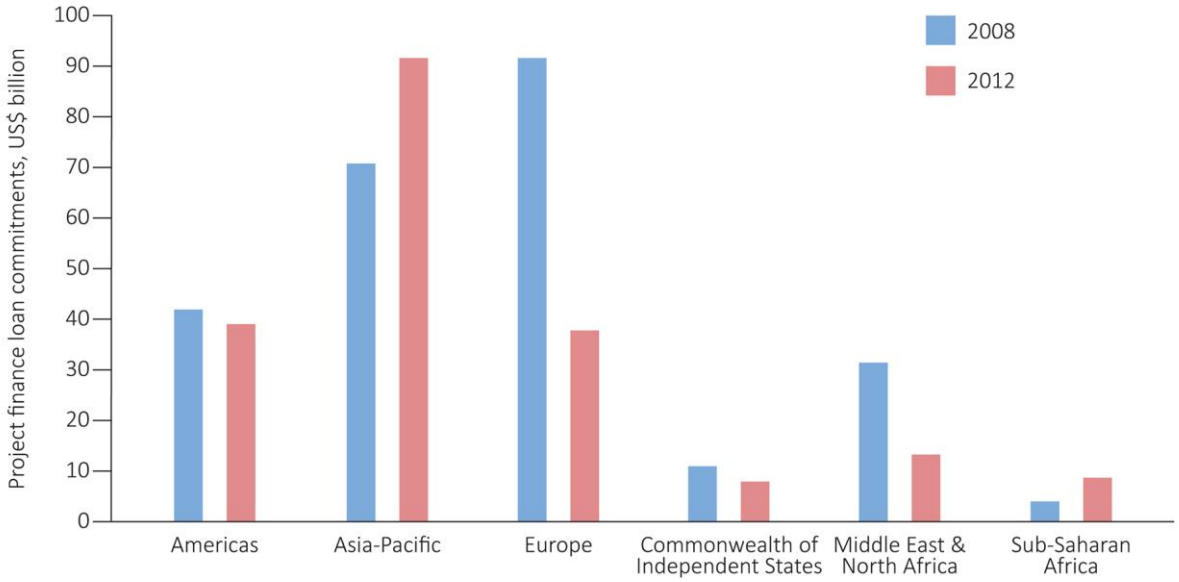

Figure 4 Commercial banks project-finance loan commitments, 2008 and 2012 (Yescombe, 2014)

There may be another potential risk for the banking sectors in India and China. While Asian banks avoided the worst effects of the 2008 banking crisis, the Asian economies are not immune to their own domestic debt issues. The Chinese banking system has grown from a base of US$3 trillion in 2006 to US$34.5 trillion in assets. This phenomenal rise was driven by an expansion in credit, and much of the finance was used to build infrastructure. There are concerns that the scale of credit could lead to a bigger banking crisis than that seen in the west (Shaffer, 2016). This analysis remains speculative and only considers the impacts of a crisis, not the likelihood of the event. India has undergone a similar level of scrutiny, forcing the Royal Bank of India to introduce banking reforms and encourage greater transparency in the reporting of bad performing loans. However, largescale funding by the China EXIM Bank appears very successful and to have a low rate of non-performing loans (Gallagher and others, 2012).

5.4 Summary

- According to records, the commercial banking sector provides the largest amount of funds to coal mining and power projects, in excess of US$100 billion in 2014. Whether this amount of funding will be made available in the future is uncertain. If the bulk of the business was OECD based, it is possible this level of funding will be released to either projects in non-OECD regions or used to finance non-coal projects.
- Asian banks have been much less-affected by the banking crisis; project finance for infrastructure development has actually increased since 2008 and they are now some of the largest banks in the world.
- Most western commercial banks have a cautious approach to project funding, but the main casualty has been the mining sector. Few banks have policies that rule out funding for coal-fired power plants.
- All banks have procedures for due diligence and carry out environmental impact assessments when developing coal plants, whether domestically or overseas. Developments are undertaken in accordance with local regulations, and increasingly, international voluntary standards are being

adopted. These standards ensure projects are monitored carefully for local impacts, including environmental and local community engagement.

- Confidence in coal finance is more likely to be stronger in Asia where project finance has not been affected by the financial crisis and growth in coal-fired power is set to continue.

6 Asian bilateral finance institutions

The role of bilateral finance institutions, particularly those based in Asia, and their commitment to supporting HELE technology for coal-fired plant is discussed in this chapter. The key distinction between a bilateral and multilateral institution is that bilateral institutions are funded by an individual country. A bilateral finance institution can be an ECA, a national development bank, or an agency that offers financial guarantees. An ECA's key objective is to support its homeland industry and commerce by offering funding or guarantees to facilitate trade, especially the export of goods and services. Its activities therefore serve national interests.

An ECA can offer export credits which help mitigate the level of commercial and political risk in a project. This includes protection against potential cash flow problems arising from the insolvency of project participants, or cover in case a buyer defaults on repayments, currency convertibility (such as exchange rate or controls), or where there is any disruption arising from political and civil unrest. In this way, the involvement of an ECA (or an MDB) can be immensely important for projects which are deemed too risky for private commercial banks to fund alone.

Long-term export credits offer security for funding, so the use of such credits tends to decline during periods of economic optimism, but gain in popularity after periods of economic crisis. In the first years of the century, the use of long-term export credit cover fell, until the financial crisis of 2007-08, since when it has increased (Yescombe, 2014). Direct lending by export credit agencies, rather than just the provision of guarantees, became increasingly important as other project finance banks struggled to provide long-term finance. A prolonged slowdown in the global economic recovery could maintain the significant role for the ECA as a source of public funding for coal for some time.

Although the commercial banking sector is large, interest from Asian-based credit agencies and other public finance institutions is growing, and they are featuring more in planned coal-fired projects across the world. Consequently, this type of financial institution should not be underestimated. The development bank has features common to both an MDB and an ECA. National development banks have a remit to promote development in low and middle income countries. Funding is provided to encourage economic development, transfer technical expertise, improve services such as health, education, training, and provide emergency disaster relief using either low cost concessional loans or grant aid.

Figure 5 illustrates how funding from an MDB such as the World Bank has decreased since 2009, but this has been more than offset by funding from export credit agencies. The largest public funding agency that finances coal projects is the *Japanese Bank for International Cooperation*, or JBIC (*see* Figure 6).

Since the 1990s, JBIC has gained immense experience, financing more coal projects than the World Bank, the *Asian Development Bank* (ADB), and the US EXIM bank. JBIC has been the top public financier of coal-fired projects since 1994 (providing US$8.1 billion between 1994 and 2009) and has cooperated with commercial banks. Countries in receipt of ECA funding are middle-to-low income economies; some of the largest recipients are Vietnam, South Africa and India. JBIC is discussed in greater detail in Section 6.3.

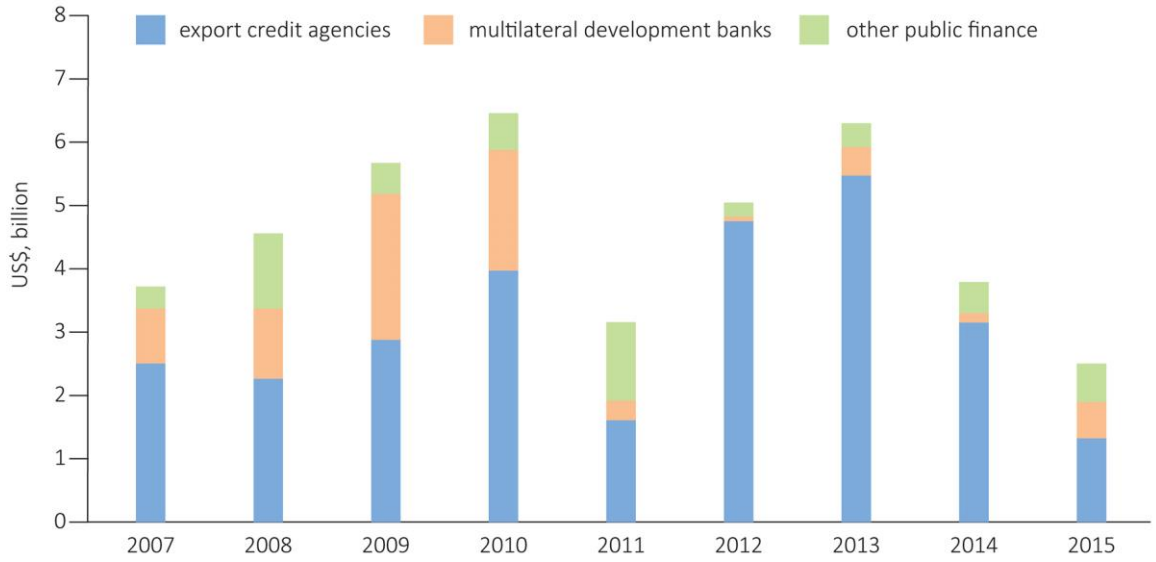

Figure 5 Annual coal funding by public financial institutions in 2007-15, US$ billion (NRDC, 2016)

Figure 6 lists the publicly funded agencies other than JBIC that are involved in coal-related projects with a funding commitment exceeding US$1 billion in the period 2007-14. These include a range of other multilateral development banks and bilateral finance institutions and in descending order are: World Bank Group, China EXIM Bank, the *Nippon Export & Investment Insurance* (NEXI) of Japan, and *Export-Import Bank of Korea* (Kexim). Interestingly, four of the top five institutions are nationally-owned bilateral finance institutions. Similar institutions include the *China Development Bank* (CDB) and the Bank of China, both of which feature lower down the ranking of coal finance. However, it is important to note that these results indicate funding in overseas projects only, and do not reveal the potentially vast funding allocated to projects within China's domestic market.

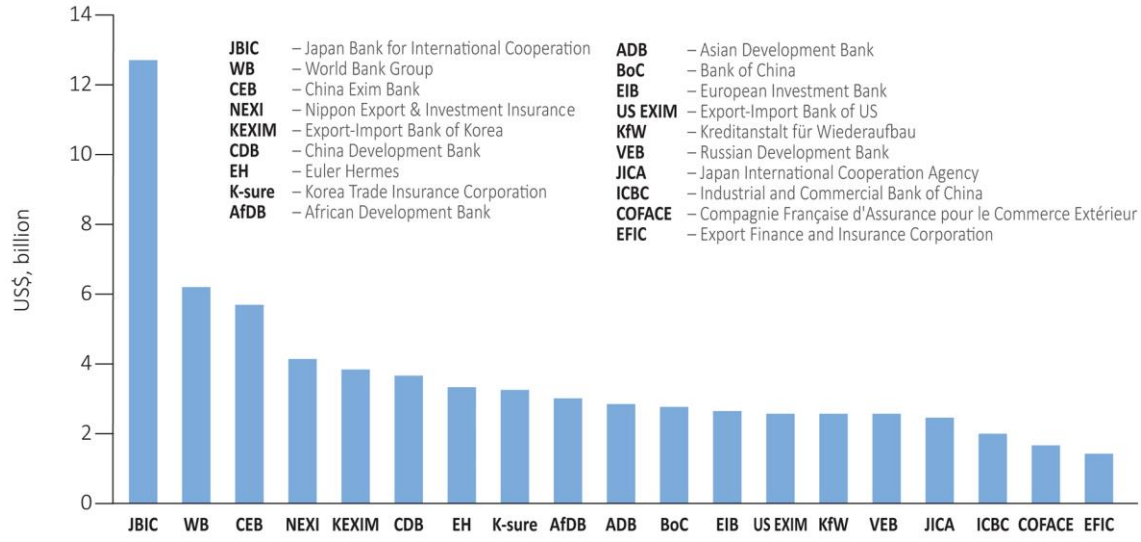

Figure 6 Institutions supplying more than US$1 billion in public finance for coal, 2007-14, US$ billion (NRDC, 2015)

6.1 The role of an ECA in the export of power generating equipment

Smaller industrialising nations may lack domestic capacity and expertise to manufacture coal-fired boilers, turbines, and generators and so will import these large components. Raising finance for a capital-intensive project such as a power plant is time consuming. Project sponsors, such as energy utilities may be under pressure to sponsor the building of new power plants within relatively short timescales due to the high growth in demand for electricity, especially in SE Asian energy markets such as Indonesia and Vietnam.

Open bidding for finance can lengthen the period it takes for infrastructure projects to start construction. One way to streamline the process is to arrange projects using publicly backed funding via an organisation like an ECA. If the project contract signatories are two governments, the ease of gaining sovereign guarantees can smooth the process of risk management. Gaining development and land permits and tender negotiations can also be easier.

Thus, an ECA or any other bilateral finance institution is important in facilitating trade between nations. For example, JBIC and NEXI work together to promote Japanese heavy industrial equipment in overseas markets. Similarly, the China EXIM bank and the CDB promote export of Chinese technology. Similar organisations exist in every country.

This approach combines debt with pre-approved EPC contracts from the same country. For example, finance from Japanese firms can be packaged in contracts that favour Japanese equipment manufacturers for a large proportion of the power plant. A similar approach is taken by Chinese and Korean finance institutions. Such deals have obvious benefits, in particular the project development can proceed much more rapidly with less negotiation required and result in a more cost effective project. For example, the China EXIM Bank provided US$891 million to finance Phase 2 of the Norochcholai coal power plant in Puttalam, Sri Lanka via a preferential buyers' credit facility. The loan was charged at 4% interest, but required the selection process to include Chinese companies for project contractor and equipment procurement; at least 50% of the total procurement was from Chinese EPC firms (Sirimanna, 2011).

Conversely, borrowers seeking large amounts of funding can exert their own leverage in negotiations for finance and equipment. For example, in 2005 Vietnam adopted a policy stating that EPC contractors who arranged finance for their projects would be awarded another equipment or construction contract, to help the country meet urgent construction goals for new power plants.

Much of the 10 GW of capacity added in Indonesia under the country's Fast Track I scheme were Chinese-built coal plants. According to local power sector stakeholders, Chinese financed and designed plants could continue to dominate Fast Track II (part of the 35 GW growth plan) due to their persistently competitive bidding prices. In coming years, middle income countries such as Indonesia may benefit greatly from the surge in finance being made available from Japan and China.

Western equipment manufacturers are not excluded from any deals struck between Asian development and financial institutions. The preference for Asian equipment in some projects however means the market

will become squeezed and western manufacturers will adapt by working alongside Japanese and Chinese manufacturers, as well as offering their own different proprietary technologies and innovative services.

6.1.1 Export trends of HELE technology from selected Asian countries

Development banks and export credit agencies based in China, Japan and Korea frequently offer finance deals integrated with preferred equipment manufacturers from these respective countries. Consequently, those countries that are providing the finance will inevitably have some leverage on the choice of technology. This section discusses the trends in overseas power station installations using data from Platts WEPP database. The focus is on selected manufacturers of power plants from the three major Asian economies, and their contribution to exporting HELE technologies across the world.

Analysis of coal technology export trends in China shows the investment was moved from funding subcritical technology to supercritical power or better in seven years. In 2009, almost all the technology exported from China was a subcritical design. Current exports are mainly SC stations, accounting for 85% of the capacity installed by Chinese firms abroad. Just 15% are subcritical stations.

Figure 7 shows the amount of coal-fired capacity exported and equipped by manufacturers from China, Japan and Korea since 2008 into overseas power stations. This included boilers, turbines and generators. Japan exported 8005 MWe of USC capacity, China 1280 MWe and Korea 4923 MWe. These investments are part of a move towards HELE coal-fired designs which are evolving. The next stage of HELE could see efficiencies achieving 50% net or more with a variety of new materials or new station configurations. The overseas installations were mainly in SE Asia, the Indian subcontinent and Africa.

Figure 7 shows the amount of overseas boiler capacity installed by manufacturers based in China, Japan and Korea, these figures roughly translate to total plant investments of US$160 billion (or US$18 billion per year) between 2008 and 2016 (author's estimates). The estimates are based on an assumed capex ranging from 1200–2000 US$/kWe; the lower figure is for China and the higher is for Japan. UN trade data for *Steam or other vapour generating boilers* exports from these three countries shows export values equivalent to US$3.5 billion per year for the period 2007-14 (UNcomtrade, 2016). Turbine and generator exports will add a great deal more to this figure for boilers to match the total capex funding of US$18 billion per year. However, steam and generator data from the UN do not appear to separate out generator and turbine exports related to coal plants from those associated with gas, nuclear or hydroelectric stations. Also, some plants procure boilers from one country and steam generators and generators from another. On a MW capacity basis, Japan exports more steam turbines than boilers, and so Japanese suppliers will equip plants with boilers supplied from elsewhere. It is therefore difficult to determine true values of steam and generator equipment for coal power plant from any particular country with accuracy without further detailed research in this area.

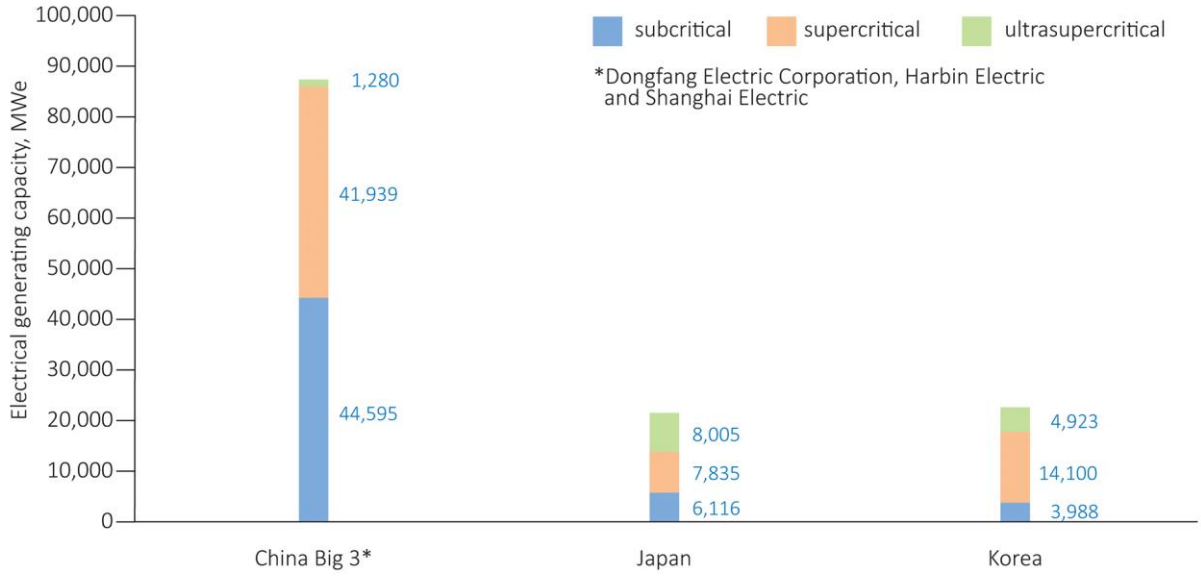

Figure 7 Historical supplies of coal boiler technology from China, Japan, and Korea to overseas power stations in 2008-2016, MWe (author's analysis based on Platts, 2016)

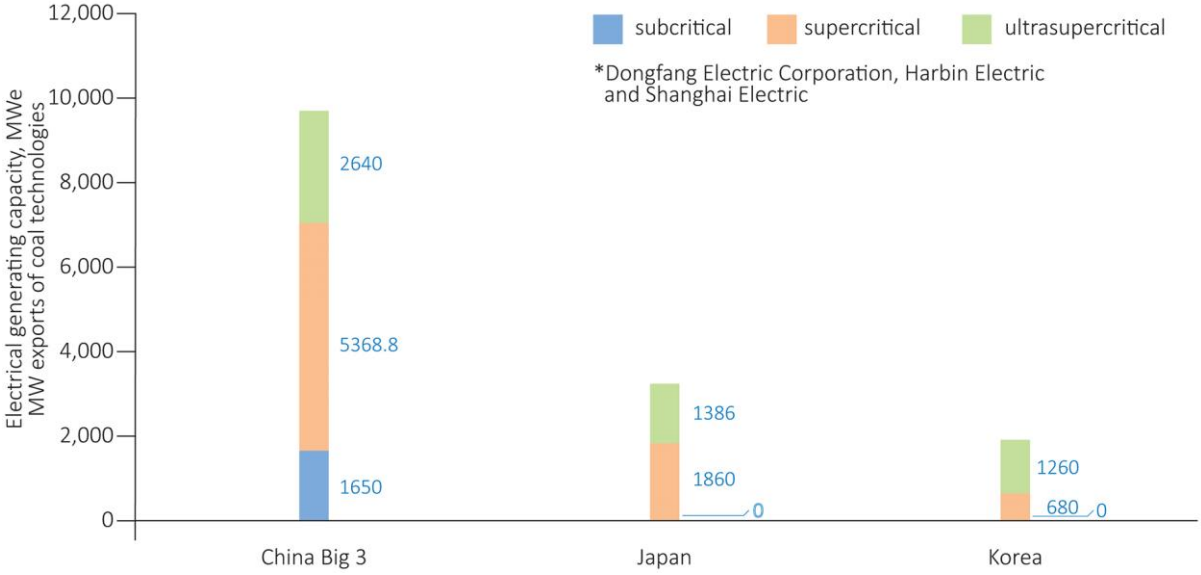

Figure 8 Projected supplies of coal boiler technology from China, Japan and Korea to overseas power stations in 2017-21, MWe (author's analysis based on Platt's, 2016)

Looking to the medium-term future, Figure 8 shows the amount of pulverised fuel (PF) technology that was supplied to plants under construction in 2016 which will come online in coming years. Just 1650 MWe of plants supplied from China will use subcritical technology. These are units smaller than 300 MWe. At this capacity, SC and USC technology are not appropriate. There is a clear trend towards the installation of higher efficiency boiler technologies compared to past installation illustrated in Figure 7.

6.1.2 Western technology manufacturers

It is possible that Asian equipment manufacturers will receive access to EPC contracts if they are closely affiliated with Asian banks. This leaves the question of how traditional western equipment manufacturers will adapt. The growth in new HELE coal-fired capacity in Asia is positive for all equipment suppliers.

Table 5 provides a list of selected major manufacturers of coal-fired power plants. The list is not exhaustive and many boiler manufacturers may be omitted if they operate more in their domestic markets. The companies are grouped based on their country of origin, and the total amount of major plant components each has installed in overseas plants to date or that are under construction (where known). Not all of these companies will be assisted by an ECA, but companies like the US-based company GE have their own financial subsidiaries such as GE Capital.

Table 5 Manufacturers of components in overseas coal plants (MWe), existing and under construction (Platts, 2016)

Manufacturer	Country	Boiler and steam systems, MW	Turbines, MW	Generator, MW
Dongfang	China	27,743	39,094	37,439
Harbin	China	35,834	25,939	25,879
Shanghai	China	29,394	34,582	
Wuhan	China	30,932		
Beizhong	China		3,760	3,760
Fuji	Japan		11,712	10,879
Hitachi	Japan		28,884	27,568
IHI	Japan	25,961		
Melco	Japan			40,014
MHI	Japan	33,319	48,566	
Toshiba	Japan		61,695	61,095
Skoda	Czech		9,037	9,533
Siemens	Germany		50,388	38,451
BHEL	India	1,866	1,656	1,656
ANSALDO	Italy	2,266	7,945	6,063
Doosan	Korea	17,228	6,496	6,496
ABB	Switzerland	14,288	17,644	17,744
BBC	Switzerland		50,313	45,162
Babcock & Wilcox	US	88,198		
Babcock-Hitachi	US-Japan	15,759		
GE (incl Alstom and CE)	US	64,793	114,267	255,741
Westinghouse	US		5,843	1,0421
Foster Wheeler	US	28,422		
Subtotal for overseas installations		**416,003**	**517,820**	**597,900**
World TOTAL domestic and overseas		**2,228,393**	**2,228,393**	**2,228,393**

GE has become the leading provider of overseas coal plant equipment worldwide with its acquisition of Alstom and CE (or Combustion Engineering, formerly a subsidiary of the Swiss company ABB), as shown in Table 5. Other significant manufacturers of boilers and turbine and generator capacity include Babcock and Wilcox (US), MHI (Japan), Toshiba (Japan), and Siemens (Germany). The Chinese manufacturers combined are becoming an increasingly important feature of the overseas market for power plant equipment.

While GE has spread its business widely, another US company Babcock & Wilcox owes much of its overseas business to China through its Beijing subsidiary. GE itself is gaining a foothold in India through its former Alstom India business. Most major suppliers licence their technologies for manufacture abroad. Equipment designed by GE and Siemens may licence technology to companies like Bharat Heavy Electricals Ltd (BHEL) in India, who supply all of their equipment to the domestic market. Under these circumstances, western designed components built in non-OECD manufacturing plants may not qualify for export credit finance from the ECA.

Chinese manufacturers of plants have emerged in the overseas market, such as Harbin one of the largest boiler producers, which has 35,834 MW installed or due online. Elsewhere, Toshiba of Japan, Siemens of Germany, and the Swiss companies ABB and BBC have also been key providers of turbines and generators in the past. It is common for various equipment producers to work on the same project. While western suppliers may see their domestic markets decline due to restrictions on unabated coal plants, the opportunities worldwide are still good for new HELE plants and refurbishments.

GE has sought prospects in new businesses including a range of HELE and digital solutions designed for coal-fired power stations. GE's acquisition of Alstom in 2015 indicates that they had identified a need to modernise and develop power stations worldwide. Alstom already accounts for 20% of the world's steam turbine capacity as well as technology and services businesses. In the acquisition, GE have increased their foothold in Asia via Alstom India Limited and are now able to work with companies like BHEL. One growth area that has been identified by GE is retrofitting coal plants with digital technology to increase efficiency. A single percentage point in efficiency gain can cut emissions by 3% and add US$20 million in value to a plant over ten years (Williams, 2016c).

GE was also involved in the EPC contract to build and commission the 1 GW Tanjung Bin USC coal plant in Malaysia. The contract was worth US$1.1 billion and GE operated as the Leader in a consortium to build the plant. The plant is owned by Malakoff Corporation Berhad and uses GE steam turbines and generator, USC boiler and GE low-NOx boilers, seawater FGD and fabric filters (PE, 2016a).

As Table 5 shows, other western corporations experienced in building coal-fired stations worldwide include B&W, Babcock (including Doosan Babcock), and Foster Wheeler. These manufacturers, combined with GE (Alstom), were constructing 26 GW of new coal-fired capacity worldwide in 2016, of which some 22 GW comprised SC and USC plants.

For some years, western equipment manufacturers have sought stronger partnerships with Asian utilities and partnering with other equipment manufacturers is commonplace. In North America, political change

may not alter the business for companies like GE. Investment in emission reduction technology will continue and could be a strong part of the business for western companies (PE, 2016b).

6.2 Japanese ECA funding

The Japanese government, financial institutions and equipment manufacturers show strong support for exporting HELE technology as a means of minimising emissions from coal plants without compromising reliability and security of supply. In June 2014, the Japan Revitalization Strategy promoted high efficiency thermal generation using coal and LNG. Japan is committed to HELE coal power and this is demonstrated in its own domestic fleet of power stations. Japan also aims to develop emerging technologies with the view of making them cost-effective and to create a pathway that promotes CCS and CCU. The aims for coal-related technologies include:

- advanced USC using higher temperatures and pressures to improve the efficiency of coal stations to 46% in 2017; and
- IGCC technology that gasifies coal and generates electricity at 46–50% efficiency by 2019;
- to develop Integrated Gasification Fuel-cell Combined Cycle units with an efficiency rate of 55 per cent by March, 2026;
- to develop cost-efficient technologies for CCS along with CCU sometime after 2025; and
- to develop hydrogen power generation technology by around 2030 (Obayashi, 2016).

Thus, Japan is one of the world leaders in financing HELE coal technologies and in 2016 committed US$14.5 billion to coal-fired power plants in Indonesia alone. The five large power plants that are being funded by Japan are in planning stages or under construction. They are: 2 GW USC Central Java, 2 GW USC Tanjung Jati, 1 GW USC Cilebon, 1 GW USC Indramayu, and the 0.3 GW SC Lontar (Juraku, 2016).

The *Japanese Bank for International Cooperation* (JBIC) and the *Japanese International Cooperation Agency* (JICA) are two of the country's leading agencies that work with Japanese industry overseas. These organisations have slightly different roles. JBIC is an ECA that provides loans and guarantees to promote exports of Japanese equipment and JICA is a finance agency with similar goals to an MDB that promotes development projects. These banks cooperate with other major commercial banks from Japan such as the country's largest, the Bank of Tokyo-Mitsubishi UFJ, the Sumitomo Mitsui Banking Corporation, and Mizuho Bank.

Favourable finance arrangements and concessionary deals may be offered provided the project developer awards a large proportion of the EPC contracts to Japanese manufacturers. The terms of such contracts are typically confidential, but tie-in deals are known to operate. For example, JBIC co-financed the Hai Phong 2 power plant in Vietnam, and major components such as the steam turbine and generator were supplied by Japan's Fuji Electric (Platts, 2016).

6.2.1 JBIC and NEXI

JBIC is part of the Japan Finance Corporation and has headquarters in Tokyo. The Bank is controlled by the Japanese government. Its mission is to promote overseas development and secure foreign natural resources that are critical to the Japanese economy. It supports projects that maintain the competitiveness of Japanese export industries, and generally funds little more than 60% of the debt for any individual project. It funds exports by providing buyer credits to overseas projects to purchase Japanese goods. These credits are co-financed with commercial banks and import loans to Japanese companies operating overseas (Tanabe, 2016). JBIC also provides overseas grants and untied loans as part of Japan's aid programme.

The partnership between JBIC and the export credit insurer NEXI is geared towards projects related to sourcing raw materials such as oil and natural gas. The NEXI agency was formed from the Export-Import Insurance Division of the Japanese *Ministry of Economy Trade and Industry* (METI). NEXI's liabilities are reinsured by METI. NEXI insures up to 100% of lenders' commercial and political risks. This covers currency convertibility, civil unrest, war, and other occurrences that can impact on an overseas project.

As a member of the OECD, export loans offered by Japanese institutions must adhere to the *Commercial Interest Reference Rates* (CIRR) system that sets minimum variable interest rates (OECD, 2016b). The CIRR publishes the minimum interest rates stipulated by the Arrangement on Officially Supported Export Credits, which are established for each currency and set on the 15th of each month.

JBIC also participates in equity ownership, but this is a small proportion of its overall business. JBIC has outstanding loans amounting to 13,844 trillion yen, and outstanding guarantees of 2465 trillion yen (as of 31 March 2016) (JBIC, 2017). The Bank's portfolio of lending is illustrated in Figure 9, with a mix of loans, guarantees and bonds (JBIC, 2015; Yescombe, 2014).

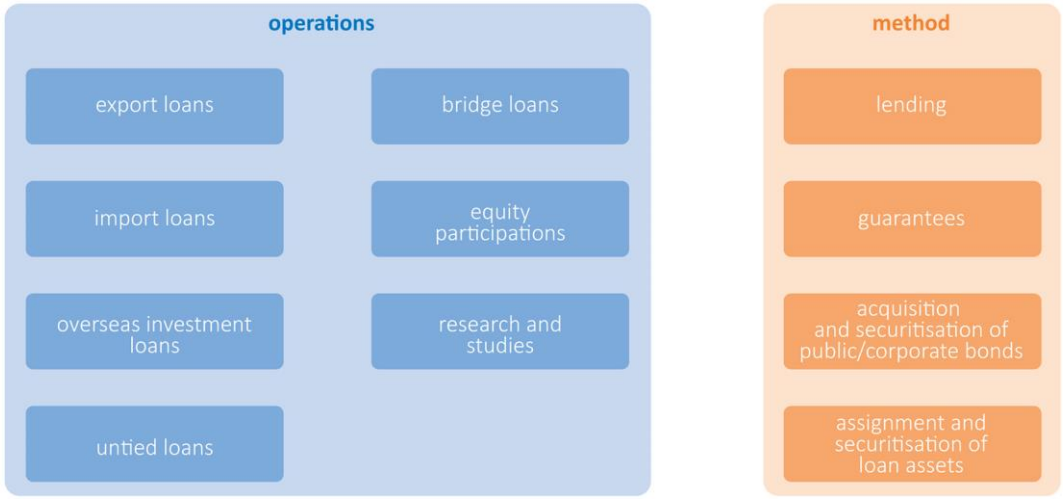

Figure 9 Financial instruments used by JBIC (JBIC, 2015)

Between 2003 and 2015, JBIC invested in 23 coal-fired projects amounting to 24 GW of new power capacity mainly in Asia. Six of these projects were in India, five in Indonesia, five in Vietnam, and two in Morocco (*see* Table 6). In the early part of this period, the financial support went mainly to subcritical power stations.

Between 2009 and 2015, more funding was provided for supercritical and USC technology. The few subcritical stations that were funded in this latter period were generally smaller units. Thus, the current plans to finance power stations across the world largely focus on SC and USC with environmental pollution controls. JBIC's portfolio of investments (in MW capacity terms) showed subcritical plants accounted for roughly 30% of the total capacity they funded (Tanabe, 2015; Kiko Network, 2015). The remaining 70% of the capacity that was funded used supercritical and USC technology; more than the global average of 65%. Despite the use of smaller subcritical plants in some regions, often the technology choice used in low and middle income countries is determined by local needs and affordability.

Table 6 JBIC funded coal plants 2003-15

Year funded	JBIC investment, US$ million	Unit	Country	Company	MW	Status	Operation year	Boiler control	Particulate control	SO_2 control
2003	91	Mindanao STEAG 1 Mindanao STEAG 2	Philippines	STEAG State Power Inc	116	OPR	2006	SUB	BH	WL
2003	91	Paroseni 4	Romania	SC Complex Energetic Hunedoara	150	OPR		SUB	ESP	FGD
2003	721	Tanjung Jati-B No 1 Tanjung Jati-B No 1	Indonesia	PT Central Java Power	660	OPR	2006	SUB	CSE	WLST
2004	408.6	BLCP 1 BLCP 2	Thailand	BLCP Ltd	717	OPR	2006	SUB	CSE	SWFGD
2004	138	Maritza East-2 No 1-4	Bulgaria	TPP Maritza East-2 Plc	696	OPR	2007-2009	SUB	ESP	WLST
2006	62.4	Hai Phong Thermal-I No 1 Hai Phong Thermal No 2	Vietnam	Hai Phone Thermal Power JSC	300	OPR	2011	SUB	BLANK	BLANK
2007	380	BARH 1 BARH 2 BARH 3	India	NTPC Ltd	660	CON	2015	SUP	ESP	CF
2007	38	Hai Phong Thermal-II No 1 Hai Phong Thermal-II No 2	Vietnam	Hai Phone Thermal Power JSC	300	OPR	2013 2014	SUB	ESP	CF
2008	1753	Tanjung Jati-B No 3 Tanjung Jati-B No 4	Indonesia	PT Central Java Power	660	OPR	2011 2012	SUB	ESP	WLST
2010	1458	Paiton-3	Indonesia	PT Painton Energy	815	OPR	2012	SUP	ESP	FGD
2010	216	Cirebon 1	Indonesia	PT Cirebon Electric Power	700	OPR	2012	SUP	ESP	CF
2010	273	Pacifico-II No 1	Mexico	Comision Federal de Elec	700	OPR	2010	SUP	BLANK	BLANK
2011	110	Jaypee Nigrie 1 Jaypee Nigrie 2	India	Jaiprakash Power Ventures Ltd	660	CON	2014	SUB	ESP	CF
2011	81	Rajpura Nabha 1 Rajpura Nabha 2	India	Nabha Power Ltd	700	OPR CON	2014	SUP	ESP	CF
2011	58	Vung Ang-1 No 1 Vung Ang-I No 2	Vietnam	Petrovietnam Power Corp	600	CON	2014	SUB	ESP	WLST
2012	216	Jorf Lasfar 5 Jorf Lasfar 6	Morocco	TAQA North Africa	350	CON	2014	SUB	ESP	FGD
2013	500	Cochrane AES 1 Cochrane AES 2	Chile	AES Gener SA	286	CON	2017	SUB	BH	CFBS

2013	86	Thai BinH-2 No 1 Thai BinH-2 No 2	Vietnam	Petrovietnam Power Corp	600	CON	2017 2018	SUP	ESP	WLST
2014	210	Kudgi 1 Kudgi 2 Kudgi 3	India	NPTC Ltd	800	CON	2016 2017 2017	SUP	ESP	CF
2014	90	Meja 1 Meja 2	India	NTPC Ltd	660	CON	2016 2017	SUP	ESP	BLANK
2014	908	Safi 1 Safi 2	Morocco	Safi Energy Company SA	693	CON	2018	USC	ESP	SWFGD
2014	202	Vinh Tan-4 No 1 Vinh Tan-4 No 2	Vietnam	EVN Genco No 3	600	CON	2017 2018	SUP	ESP	SWFGD
2015	409	Duyemn Hai Extension	Vietnam		688	CON	2018	SUP	ESP	SWFG
Total	8498.9				23933					

SO_2 control

SWFGS	seawater FGD scrubber
CF	compliance fuel (no scrubbers)
CFBS	semi-dry circulating fluidised bed FGD scrubber
FGD	flue gas desulphurisation
WLST	wet limestone FGD scrubber
WL	wet lime FGD scrubber
BLANK	no Sulphur control

Particulate control

BH	Baghouse (fabric filter)
CSE	cold-side ESP (downstream of air preheater)
ESP	unspecified type of electrostatic precipitator (electrofilter)
BLANK	no particulate control

In June 2016, JBIC committed US$2 billion (212 billion yen) to fund the 2 GW Batang coal plant in Indonesia. The total project cost was $3.4 billion and the plant will be built and operated by Bhimasena Power Indonesia (BPI) which is a joint venture between Adaro Energy and Itochu Corp & Electric Power Co. This large project is part of an export business model that supports resource rich countries like Indonesia which has a wealth of coal and natural gas. Other countries that are keen to exploit Indonesia's natural resources are China, India, and Korea.

While SE Asia has a large building programme for coal plants, fledgling economies elsewhere are also benefiting from Japanese partnerships. In 2012, JBIC signed a buyers' credit agreement totalling US$216 million with the Jorf Lasfar Energy Company of Morocco to purchase steam turbine, boiler and principle components by Mitsubishi Heavy Industries, and IHI Corporation. JBIC's support for the export by Japanese firms of machinery and equipment to Jorf Lasfar created business opportunities in Morocco where demand for electricity is expected to increase (JBIC, 2012).

An interesting development is JBIC's loan to the Petra Nova CCS project at the W.A. Parish coal plant near Houston in Texas. Japan's involvement in Petro Nova is considerable, with JBIC and the Mizuho Bank Ltd providing loans totalling US$250 million, and JX Nippon Oil & Gas Exploration Corp, Japan's largest oil producer running the 50:50 joint venture with NRG Energy (providing a combined US$300 million in equity). The plant deploys a commercial amine-based CO_2 removal system developed by Mitsubishi Heavy Industries Ltd that was originally developed for industrial applications. The plant will remove 90% of the CO_2 from the flue gas along with particulates, SOx and NOx removal (Umair, 2016).

6.2.2 New lending rules for JBIC

In 2016, JBIC changed its lending rules to permit a higher degree of risk with some funds to bring the bank more in line with competing lenders from China. JBIC's previous strict credit requirements limited its ability to lend to projects with higher risk profiles, such as those requiring longer repayment periods or those at risk of default through non-payment from local governments. Japan struggled to compete with Chinese lenders for rail projects in Indonesia as under JBIC's standard criteria sovereign guarantees from the Indonesian government would have been required. The Chinese banks won the finance contracts as they had no such requirement for sovereign guarantees, which made the bid cheaper and imposed fewer liabilities on the Indonesian government.

Japanese institutions still have to abide by the OECD rules, such as basing lending rates on the CIRR and using the lending criteria outlined in Section 3.3. Nevertheless, the amendment to JBIC's finance approval policy is part of the Quality Infrastructure Initiative that will add US$110 billion in new investment in infrastructure in Asia between 2016-20, a 30% increase over the previous five years. The extra funding will boost lending from JBIC, JICA, and the ADB (partly led by Japan) (HCCWTO, 2016).

6.2.3 Japan International Cooperation Agency (JICA)

Japan ranks fourth among member countries of the Development Assistance Committee of the OECD behind the USA, UK, and Germany, and total funding reached US$11.8 billion in 2013. One of the leading development agencies is JICA. The Agency's mandate is to help industrialising economies build local capabilities through financing infrastructure and community projects ranging from power generation and transport infrastructure to education and training, reduction of poverty and child mortality, environmental projects, and emergency disaster relief. JICA is active globally in Eastern Europe, Latin America, the Middle East and Asia.

JICA provides project finance for large infrastructure via export credits and direct investment, including private sector loans (*see* Figure 10). JICA's approach to funding energy projects prioritises:

- low life cycle cost and minimal external costs;
- lower carbon solutions, including high efficiency thermal plants, hydropower, geothermal and other sources of renewable energy, reducing transmission grid losses and promoting energy conservation; and
- low risk for stabilising and securing supplies of primary energy, realising an optimum mix of energy and power grid stabilisation.

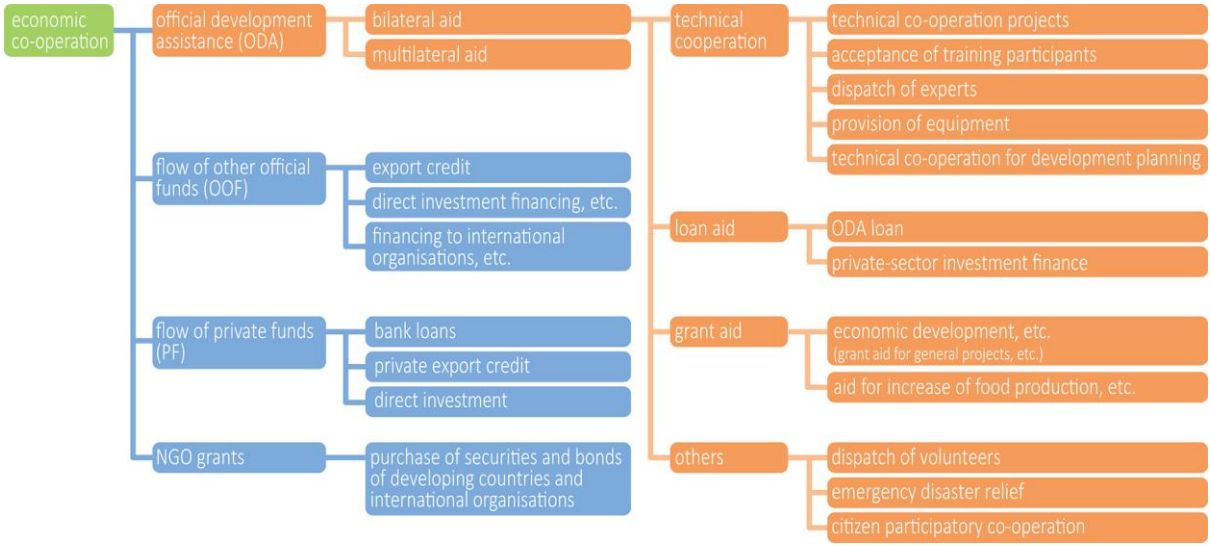

Figure 10 Chart of JICA financial operations and responsibilities (JICA, 2014a)

JICA carries out part of Japan's foreign policy in overseas development and uses its extensive experience on technological issues which is considered uncommon among other multilateral development banks. It is more transparent about its financial products and terms than almost any other financial institution. JICA offers loans with a variety of repayment terms ranging from 15 to 30 years with grace periods of up to 10 years. Interest rates on its general loans are 0.01–1.7% (fixed rates) depending on the economic status of the borrowing country (based on gross national income per capita).

Preferential rates are offered to socially and environmentally aware projects. Variable rates are offered with loans that track the Japanese yen LIBOR (London Interbank Offered Rates). LIBOR is a benchmark rate that some of the world's leading banks charge each other for short-term loans. JICA provides loans of up to 70% of the total project cost (although it can fund 80% in exceptional circumstances). Equity ownership is limited to no more than a 25% stake, and it does not have a majority shareholding in any project (JICA, 2015a). The terms of JICA loans are provided at: http://www.jica.go.jp/english/our_work/types_of_assistance/oda_loans/standard/2015_1.html

JICA seeks funding opportunities across the world and is quickly gaining expertise in incorporating technology solutions for pollution control into plants that Japan itself does not utilise, such as lignite-fired power plants. JICA sees coal as an area to extend its funding assistance, but with the view of promoting HELE technologies in low income countries like Bangladesh (JICA, 2015b).

Since 2000, JICA has undertaken numerous projects, from studies and technical assistance to loans, for power stations in various countries including: Bangladesh, Bosnia, Pakistan, Indonesia, Turkey, Myanmar, Egypt and Vietnam. JICA has funded several plants in Vietnam, including Nghi Son (2 x 330 MW) and Thai Binh (2 x 300 MW in operation; 2 x 600 MW, online in 2017-18), some of which are designed to use the local low volatile anthracite coal. According to records, all the plants use US boiler systems and Japanese turbines and generators from Fuji and Toshiba (Platts, 2016). The Thai Binh 2 plant uses supercritical

technology due to its larger unit sizes of 600 MWe, while the smaller 330 MWe units are limited to subcritical systems.

In Bosnia-Herzegovina and Serbia, JICA could fund the fitting of FGD equipment to two proposed plants to control SOx emissions, the 2 x 300 MW Ugleivik lignite ACFB plant (Bosnia), and the 744 MW lignite supercritical plant (Serbia). The former plant is intended to be fitted with a wet limestone FGD and the plant would be air-cooled (Platts, 2016). Serbia is a candidate for membership in the EU while Bosnia is a potential candidate, in both cases these nations are pressing for stable and low cost electricity from coal, but it is likely these plants will need to be designed, or adapted in the future, to comply with prevailing EU emission legislation.

6.3 Chinese financial institutions

China's international financial investments have involved securing access to natural resources; this is an important driver of overseas policies which China shares with Japan and Korea. China currently holds nearly US$4 trillion worth of foreign exchange reserves, two-thirds of which are in US dollars. Investing these vast foreign currency reserves in overseas projects, such as power plants, was considered attractive compared with alternative financial products such as US treasury bonds (FT, 2014). In recent years China's financial institutions have supplied US$60 billion to overseas coal projects and have been active in more than 30 countries (Hervé-Mignucci and Wang, 2015).

This outward thinking policy was strengthened in May 2015 when the State Council of China published guidance on exploring infrastructure developments in foreign countries. The guidance was intended for use by Chinese firms supplying equipment for large-scale infrastructure projects abroad. The government outlined several examples of support for overseas concessional funding including: syndicated loans, export buyers' credit and insurance, commercial loans, and equity investments (Bowring, 2014).

The major investment vehicles included the new Silk Road Fund, the China-Africa Development Fund (affiliated with the CDB), the China-ASEAN Investment Cooperation Fund (affiliated with China Exim Bank), and a subsidiary of the China Investment Corporation dedicated to overseas direct investment (NDRC, 2015). The Silk Road Economic Belt and the 21st Century Maritime Silk Road are two platforms to facilitate the export orientated Going Global strategy. Two major examples are the China-Pakistan Economic Corridor and the Bangladesh-China-India-Myanmar Economic Corridor (Houreld, 2015; Min, 2015; Xinhuanet, 2015) (*see* Figure 11).

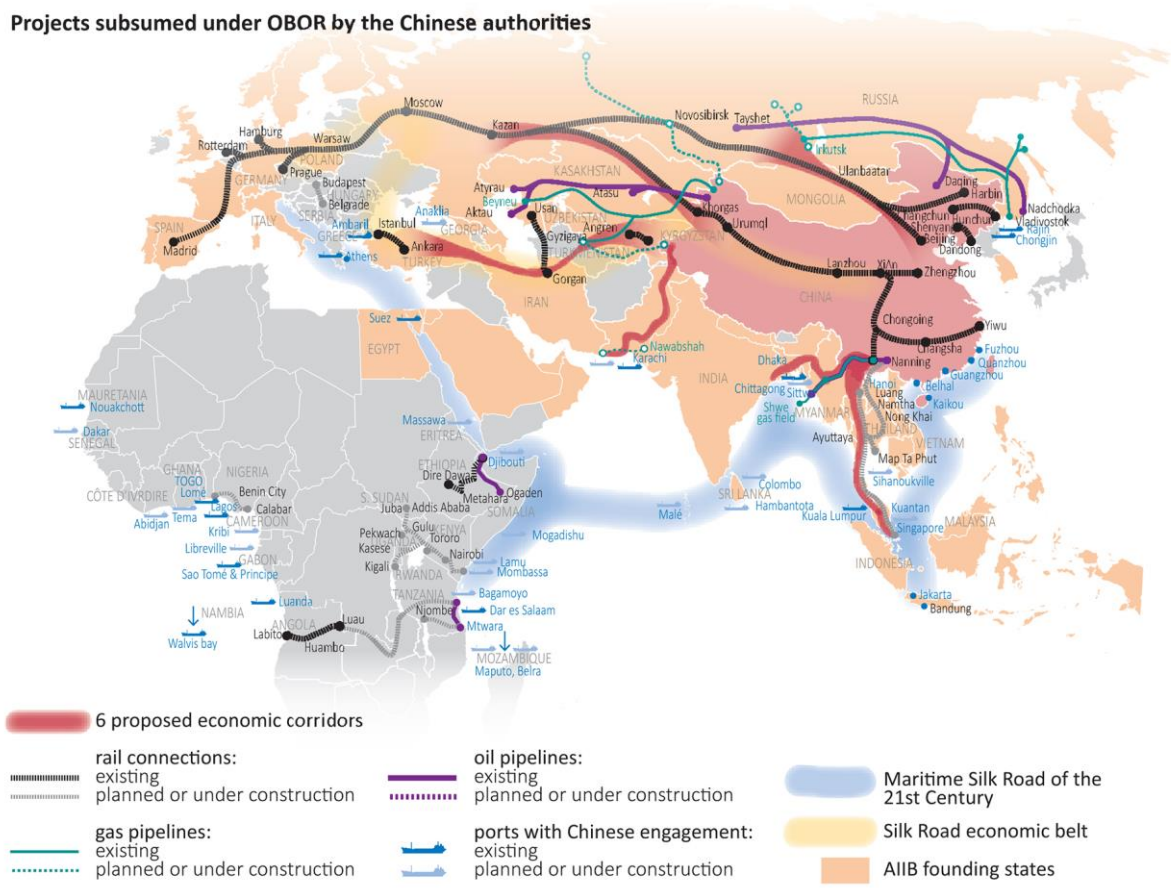

Figure 11 One Belt, One Road – projects completed and planned December 2015 (Rudolph, undated)

With China's 'Go Global' and 'Going Out' strategies, heavy industries are encouraged to participate in overseas infrastructure development projects and engage in cooperation with their foreign counterparts in building up production capacity abroad. One way of doing this is to scale up export credit insurance to provide for all insurable finance for large equipment exports.

China's policy banks have emerging environmental and social safeguards, although they are considered brief and of uncertain influence. The policies of Chinese commercial banks are still developing. All state-owned enterprises are overseen by the *State-owned Assets Supervision and Administration Commissi*on (SASAC), which is under the authority of China's highest administrative body, the State Council. SASAC performs audits of state-owned enterprises, and poor performance can result in disciplinary measures. SASAC issued 'Guidelines to the State-owned Enterprises Directly under the Central Government on Fulfilling Corporate Social Responsibilities' in January 2008. The Guidelines aim to 'give impetus to state-owned enterprises to earnestly fulfil corporate social responsibilities, so as to realise co-ordinated and sustainable development of enterprises, society and environment in all respects' (Focusweb, 2013). Projects backed by Chinese finance are less likely to be cancelled than those supported by other providers of finance due to the following:

- Chinese players provide lower bids with tied financing making projects less likely to be cancelled for financing reasons (although evidence shows that in some regions, loan rates are higher, albeit charged on a lower capex);
- Chinese projects are also about tied infrastructure deals and foreign affairs objectives hence they are fully-backed by the Chinese government; and
- Chinese lenders took over the financing of multiple projects from other financial institutions when the latter committed to cuts. Interestingly, data suggests that a total of US$825 billion is earmarked for planned investment (Hervé-Mignucci and Wang, 2015).

6.3.1 China Development Bank (CDB)

The CDB is one of China's three leading state policy banks. The Bank operates both domestically and overseas in infrastructure development projects. Its foreign activities are similar to that of a bilateral finance institution. Founded in 1994, the CDB has been instrumental in China's economic growth. It now has total assets in excess of US$1500 billion (*see* Figure 12). It supports policies laid out in the State Council Five-Year Plan involving electricity generation and infrastructure, transportation, oil and coal production, telecommunications and agriculture. The CDB raises capital by issuing bonds with terms of up to 30 years in both renminbi and other currencies. It is the second largest bond issuer in China after the Ministry of Finance, and enjoys a credit rating equivalent to government bonds. It is fully owned by the government enabling some loans to be charged at lower rates than other Chinese banks. The Bank is one of the top 10 underwriters in Asia Pacific (excluding Japan) and one of the top three in China (Kamal and Gallagher, 2016).

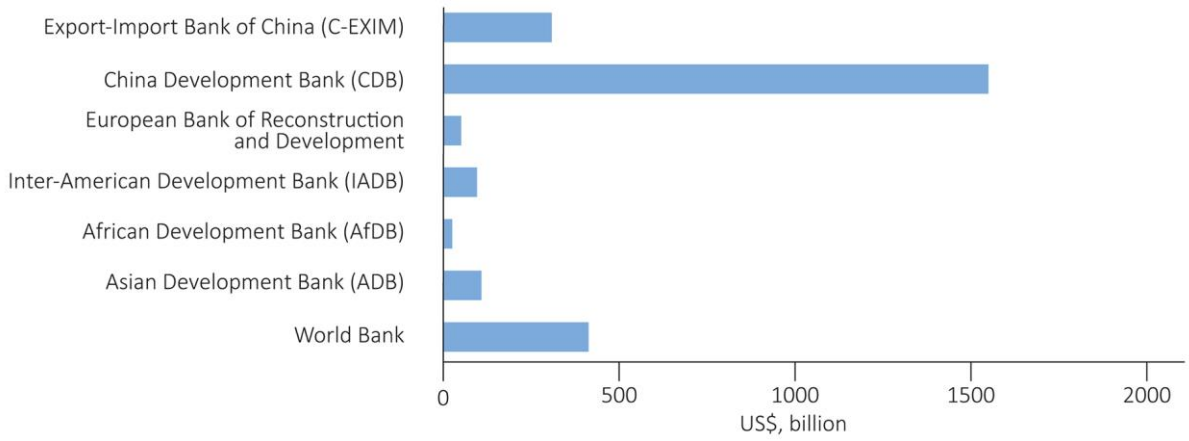

Figure 12 China-backed and Western-backed development banks measured by total assets US$ billion
(Gallagher and Kamal, 2016)

As part of the 'Going Out' policy, the CDB has been making loans to foreign governments since the early 2000s. In areas of Latin America and Africa, the CDB is the largest single source of development bank finance (Kamal and Gallagher, 2016). Through the CDB, China is rapidly taking a leadership role in the field of international finance. The Bank strengthened its cooperation with ministries and local governments by participating in the planning of the new Silk Road strategy of *One Belt, One Road* (OBOR). The Silk Road

strategy embraces many of the countries that are pursuing HELE coal developments such as Bangladesh, Pakistan and India (CDB, 2014).

The CDB has an environmental policy that is compliant with the State Council's 2003 Environmental Impact Assessment Law and the State Environmental Protection Agency's (now the Ministry of Environmental Protection) list of industries and projects that are considered environmentally sensitive. In 2010, the CDB introduced 142 performance indicators based on the UN Global Compact's ten principles related to human rights, environment, labour and corruption. According to the indicators, an EIA is required before a project starts, and the project must comply with local and regional laws and regulations. This means that after project completion, environmental assessment is required to ascertain that the client has fulfilled the commitments (Chatham House, 2013). For example, China is active in the Western Balkan projects which must comply with EU laws. In the Western Balkans, the CDB has so far financed the Stanari lignite-fired power plant, constructed by China's plant manufacturing company Dongfang, and the Ulog hydropower plant; both plants are being built in Bosnia and Herzegovina (Reuters, 2016).

At the end of 2014, the Bank's total loans to coal-related projects overseas and domestically were RMB 174.5 billion (US$28 billion). The Bank continued to implement its green credit lending practices, including for air pollution treatment and renewable energy. The Bank's lending to environmental protection and energy conservation projects is also significant at RMB 958.5 billion (US$156 billion) in 2014 (CDB, 2014).

Indonesia is one of the key growth areas for coal-fired power in SE Asia and underpins the massive development of HELE coal in the region using overseas funds. In September 2015, the CBD signed a loan commitment worth US$3 billion with three Indonesian state-owned banks, Bank Mandiri, Bank Negara Indonesia (BNI) and Bank Rakyat Indonesia (BRI). Loan facilities of around US$10 billion were offered to help build infrastructure, including mine-mouth power plants. The funding is intended to support PLN in achieving the 35,000 MW power expansion plan, originally due for completion in 2019 (Amianti and Amin, 2015).

6.3.2 China EXIM and Sinosure

The *China Export Import* (C-EXIM) bank focuses on large-scale projects in oil, gas, mining, and telecommunications. The China Exim bank extends loans in the form of export buyers' credits as well as issuing guarantees to foreign project developers to support their purchase of equipment. The C-EXIM bank has assets exceeding that of the ADB, AfDB, the EBRD, and the IADB. Total consolidated assets in 2014 were 2367 billion RMB, or US$338 billion (*see* Figure 12). Loans are generally made on a LIBOR plus margin basis (Reuters, 2014).

In 2009, Africa accounted for one third of the total asset base of the China EXIM bank compared with just 7% for the US EXIM bank. This illustrates China's desire to foster relations with countries that are rich in natural resources. Elsewhere, China EXIM bank is also investing in Europe. In 2014, the China EXIM bank arranged a 668 million euro loan ($833 million) to allow the utility EPBiH to build the 450 MW Tuzla power plant in Bosnia and Herzegovina.

C-EXIM bank published "Guidelines for the Environmental and Social Impact Assessment of China Export and Import Bank's Loan Projects" and sets basic requirements for the approval of loans and implementation of all C-EXIM bank funded projects. This includes:

- overseas projects must complete social and environmental impact assessments before any loan is approved;
- assessments must continue during the loan period and monitoring of impacts should occur after the loan has been granted; and
- the project implementer is required to abide by host country laws and regulations and acquire all the necessary environmental permits.

In cases where the necessary legal framework does not exist or is inadequate, Chinese or international practice should be followed; and local people's rights to land and resources should be respected, resettlement problems properly handled, and open public consultations held for projects with severe environmental impacts. The Guidelines state that if projects cause serious environmental and social problems during construction or operation, C-EXIM bank has the right to require the borrowers or project owners to take timely measures to eliminate these impacts. If the implementer fails to eliminate these negative impacts, the Bank has the right to stop disbursement of loans and demand early repayment (Focusweb 2013).

Sinosure is one of the most important institutions for overseas infrastructure and has been active in many of China's coal power projects abroad. Sinosure was established in 2001 when China joined the World Trade Organization, and was formed from the merger of export-credit insurance departments of C-EXIM Bank and the *People's Insurance Company of China* (PICC). Sinosure has been a critical vehicle in encouraging large equipment export and overseas engineering contracts (Sinosure, 2016). It offers short, medium and long term export credit insurance, bond, and guarantee facilities, investment insurance and credit information. Sinosure plays an important role in managing risks posed to export credit agency loans. In 2011, Sinosure provided medium to long-term buyers' credit insurance for a total insured amount of US$11 billion and guarantees of up to 85% of the amount of the EPC contract (Sinosure, 2011). Short term export credit insurance represented 80% of business.

6.3.3 Planned investment by Chinese banks

China's commercial banking sector works together with export credit agencies and development banks. In the period between 2005 and 2014, China invested a cumulative US$21 billion; a further US$35 billion was

identified for future planned plants (*see* Figure 13). The largest contributions came from the C-EXIM bank (US$9 billion) and the CDB (US$6 billion). Chinese commercial banks supplied US$6 billion, with contributions from the ICBC and the Bank of China (supported by Sinosure). In the past, equity was not a major method of raising funds, but this is about to change, as for future planned plants, equity could raise US$7 billion out of a total US$35 billion of investment.

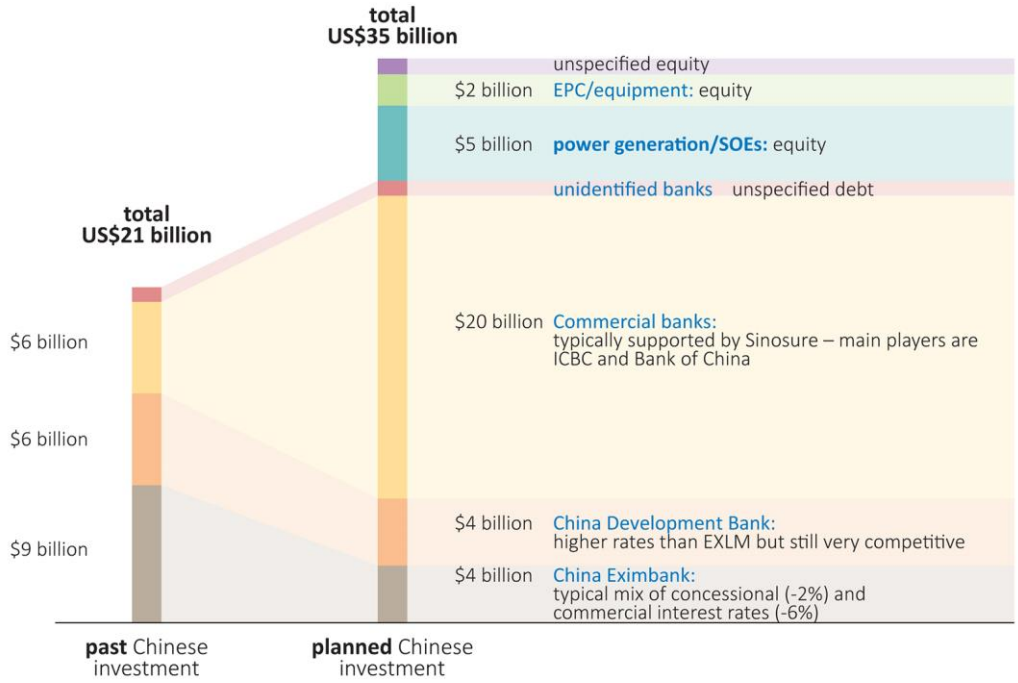

Figure 13 Chinese providers of coal power finance – confirmed financing only (Hervé-Mignucci and Wang, 2015)

Chinese funding agencies intend to increase ownership in power projects, and to boost equity to more than 20% of total Chinese financing. Equity however provides flexibility to sell the stock without being locked into a long-term debt commitment. Equity usually earns higher returns than loans but carries more risk. Equity investors benefit from favourable tax treatment in foreign projects. In 2004, the National Development and Reform Commission (NDRC) and the C-EXIM Bank announced a policy to support Chinese stakeholders' equity investment in overseas projects, including projects that promote export of equipment and technology (NDRC, 2008). Additional benefits that are provided for overseas equity investments include income tax deductions and tariff benefits for example (SCOA, 2011).

Figure 14 illustrates a similar trend for Chinese funding, but shows larger sums of finance due to the inclusion of both confirmed and unconfirmed projects. The chart shows how much of the past investment was concentrated in India, Indonesia, Vietnam and Turkey. However, the various Silk Road projects will generate more investment in Pakistan and Bangladesh, as well as significant investments in Russia.

Some projects are small at 30 MWe, but the average capacity is 800–900 MWe. One of the largest projects is the proposed 8000 MW Erkovetskaya plant in Russia where Chinese funds could provide US$13,088 million out of a US$15,000 million total project cost. The plant will be part owned by Inter RAO, the State Grid Corp of China and the Huaneng Group. Occasionally, Chinese funds provide all or most of the

finance and equity for a project. For example, the China Development Bank and Huadian are funding the 426 MW Celukan Bawang power station in Indonesia. Another high-profile project is Pakistan's Thar power plant which could have CDB financing of US$1105 million out of a total project cost of US$1300 million (Hervé-Mignucci and Wang, 2015). The C-EXIM bank has also assisted the Kostolac lignite plant in Serbia, and plans to be involved in Phase 2 of the project

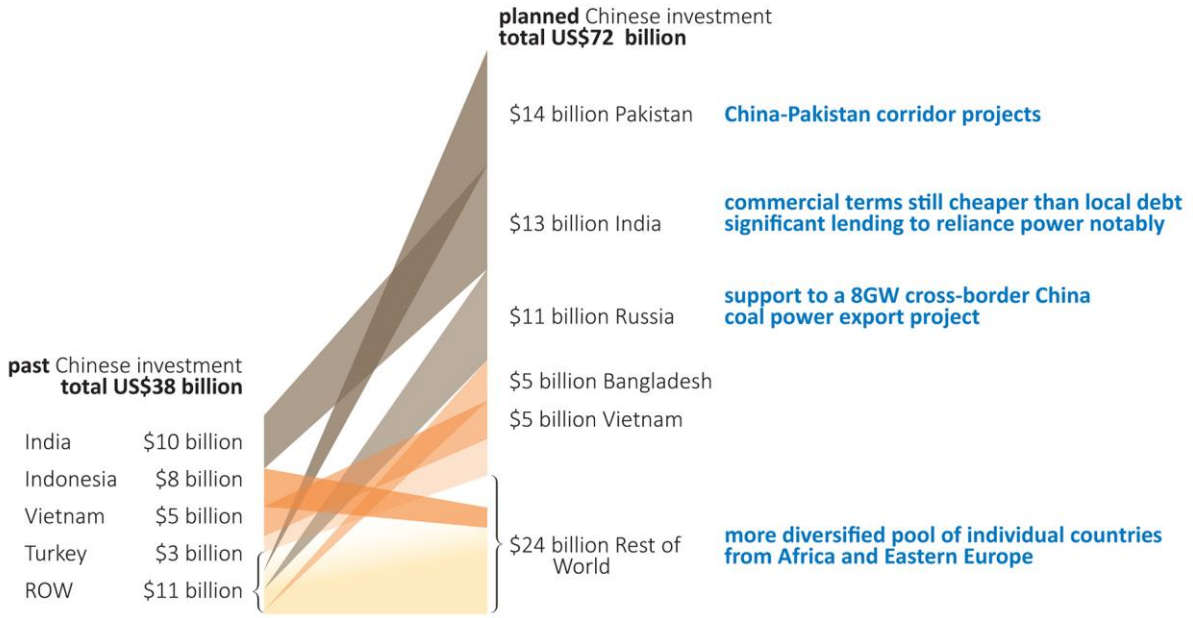

Figure 14 Top destinations for Chinese overseas coal power finance – confirmed and unconfirmed deals (Hervé-Mignucci and Wang, 2015)

6.3.4 Lending practices of Chinese banks

For a foreign project to qualify for a bank loan from one of China's finance institutions, Chinese stakeholder involvement must be substantial, usually more than US$2 million. The buyer of the exported goods must provide at least 15% down payment, and the policy banks will lend the remaining 85% (or less) of the value of the contract to the project developers. These arrangements are not dissimilar to those seen in Japanese finance deals. Other Chinese state-owned commercial banks have also financed foreign coal power projects through syndicate loans particularly in South and South East Asia (Chunlin, 2010; CC Solutions, 2012).

Compared to other countries, Chinese EPC contractors benefit from economies of scale and lower construction costs, and inexpensive skilled labour. Furthermore, the Chinese Yuan to US Dollar exchange rate in recent years has benefited overseas project costs. These competitive benefits enabled Chinese companies to advance their market presence in overseas coal projects. For example, China outbid Japan and Korea to become the general contractor of 60% of Vietnamese thermal-electric power projects between 2003 and 2011 (74% if subcontracts are included) (VCCI, 2014; VCC, 2010).

Chinese EPC contractors can often enjoy access to low-rate loans from the Chinese policy banks and self-arrange low-cost financing from China without the additional time and cost that is required to arrange syndicate loans from other countries. China also supports domestic EPC companies with a wide range of tax reduction programmes. Since 2013, the project design phase has not had to pay value-added tax, while

the supply of equipment and raw materials receive an export tax rebate, and construction under an EPC contract is exempt from business tax. Moreover, China has signed agreements with 99 countries and regions to avoid double taxation. These agreements also include tax treaty benefits. For example, EPC projects are exempt from income tax for a limited period (in the host country) and project staff are exempt from personal income tax while working abroad (Sinosure, 2014).

In order for overseas power projects to secure Chinese concessional lending, the governments of the host countries could provide sovereign guarantees for these projects, or designate a supply of natural resources as the form of repayment (or as collateral) in contracts with Chinese companies. (Sinosure, 2011). For example, Chinese loans-for-oil generally combine a loan agreement with an oil-sale agreement. The majority of Chinese loans-for-oil in Latin America are linked to market prices and benefit the oil exporting country in the event of rising commodity prices, but benefit China when prices are falling. In some cases, China may grant a large loan to an oil-exporting country and the funds are payable into a Chinese held account, from which the CDB draws repayments (from itself), reducing the need for currency exchange fees and other administrative hurdles (Gallagher and others, 2012).

China's lending agencies are seen as highly competitive, and capable of undercutting financial institutions from elsewhere. Some of China's banks have made loans to projects in India on commercial terms, yet are cheaper than local ones from domestic Indian banks (Sirimanna, 2011). In Sri Lanka, loan rates range from 2–7%, with maturity terms of up to 20 years extendable by five years and with a two to five-year grace period (delaying the first repayment). In some examples, Sirimanna (2011) cites the UK bank HSBC offering loans at 9% interest while China's banks can offer rates as low as 0.5%. Elsewhere, the C-EXIM bank provided loans at 2% interest to Jamaica and Bolivia, and offered similar loans to some African countries. On average, China's loan rates were 1–2% below the prevailing rates offered by the US EXIM bank. While China's interest rates seem very low, the World Bank and ADB have offered soft loans at similar rates (Sirimanna, 2011).

Western multilateral development banks often offer loans with conditions, such as moves to reform and regulate energy markets. Chinese banks tend to demand fewer such conditions from the borrowing government or project. Often loans do not require regulatory or market reforms, or strict adherence to the Equator Principles. Chinese lenders may also give greater spending and tracking freedom to the borrower. Loans can be denominated in dollars or yuan; the latter are convenient to purchase Chinese goods and services, or provide a simple line of credit to a Chinese company already established and operating in the company developing the power project. In this way Chinese banks reduce their exposure to default risk and currency fluctuations. The C-EXIM bank is successful and appears to have a low rate of non-performing loans (Gallagher and others, 2012).

Despite offering highly competitive loans, some debt from banks such as the CDB can be charged at rates similar to commercial banks. Funds from China's policy banks are guaranteed by the state, and can offer low interest rates, but not in all cases. Some CDB loan rates can be high compared to other Chinese and western banks and are charged to cover the full cost of finance (Sirimanna, 2011). When circumstances

permit, China's banking industry will be motivated to earn profits for development projects. The CDB has offered interest rates higher than that of the World Bank to borrowers in Argentina. For example, the CDB offered a US$10 billion loan at a rate of equivalent to 6% points above LIBOR. The World Bank's IBRD offered US$30 million at 0.85% points above. Although the interest rate charged by the World Bank was low, the size of the loan offered was a fraction of that offered by the CDB (Gallagher and others, 2012).

6.3.5 Chinese equipment manufacturers

EPC contracts are being tied up with financial products as a desirable package to streamline the process of plant development in a timely and cost effective manner. Large equipment manufacturing firms in China have the capacity to produce power station boilers and turbine generator systems. As part of the Going Out policy, China's domestic plant suppliers seek opportunities overseas. Most steam boiler systems were exported by just three large equipment manufacturers in China:

- Dongfang Electric Corp;
- Harbin Electric International; and
- Shanghai Electric Corp (author's analysis of Platts, 2016).

According to the WEPP database, China's heavy industrial manufacturers have supplied 32–33 GWe of boiler, turbines, and generators in foreign countries. These three companies already account for 640-700 GWe of China's domestic coal fleet. Each manufacturer has the capacity to produce 30 GW of new coal-fired power plants every year, so the potential for China to export its technology is considerable.

Many emerging economies have limited capability to manufacture large components so overseas supplies are the only source. Other equipment manufacturers that may be vying for overseas business include: *China Energy Engineering Group Corporation* (CEEC) and its subsidiary *China Power Engineering Consulting Group Corporation* (CPECC); *Power Construction Corporation of China* (POWERCHINA) and its subsidiaries, *Shandong Electric Power Construction Engineering Corporations* (SEPCO I, II, III); and *China National Machinery Industry Corporation* (SINOMACH) and its subsidiaries, *China Machinery Engineering Corporation* (CMEC), *China National Electric Engineering Corporation* (CNEEC), and *China National Heavy Machinery Engineering Corporation* (CHMC), China Gezhouba Group and Sinohydro, Wuhan Kaidi Electric Power, and Sichuan Hongda Company.

6.3.6 Domestic investment in China

China is the largest investor in coal-fired generation with a young and sizeable fleet approaching 1000 GWe in capacity. Investment jumped suddenly in 2015, reflecting the commissioning of a sizeable 52 GW of new coal-fired plants. Investment in gas-fired power also increased, but remains less than a sixth of that directed to coal power (IEA, 2016b).

Most Chinese coal-fired plants operate at partial load as average utilisation is 50–60%, and so recovering debt could be an issue. However, coal-fired plants are profitable and even USC plants in China can recover their investment costs in 10 years, as regulated tariffs remain high compared to the low capex (600-800 US$/kWe) and lower coal prices. Often power purchase agreements (PPA) with local utilities are

generous and even higher than average European wholesale prices. Apart from the attractive finance and profitable regulated tariffs, around a quarter of coal-fired plants built in the last 10 years supply district heating networks, which underpin utilisation rates and protect the returns on investment (IEA, 2016b).

The massive fleet of coal-fired plants equipped to supply district heating could create major investment opportunities in the future in China. The country's pledge to peak coal use and cut GHG intensity (emissions per GDP) in coming decades could be partly achieved with the existing coal fleet. Conversion of non-HELE power units to HELE with cogeneration could be combined with cofiring sustainably sourced biomass. There remains a great deal of potential for China to continue modernising and replacing its existing fleet with advancing HELE coal capacity while lowering emissions.

6.3.7 Green bonds in China

Green bonds are assets that serve to finance environment-friendly and low-carbon projects, representing nearly US$37 billion worldwide in 2014. By the middle of 2016, the global green bond issuance reached US$21 billion. China leads the market for green bonds to finance some domestic projects. Some of the banks involved include Shanghai Pudong Development Bank (US$5 billion), Industrial Bank (US$1.5 billion) and Bank of Qingdao (US$0.6 billion). Elsewhere around the world, the EIB and World Bank's IBRD are just some of the large multilateral development banks that have offered green bonds (Hughes and others, 2016).

The parameters for eligible green projects are not clear cut as there is no fixed definition of green. This leaves room for subjective assessments, usually at the discretion of the issuer of the green bond. Internationally, coal technologies are generally not eligible for support from green climate bonds, even if the outcome of the deployment reduces emissions significantly. The Chinese definition of clean coal, appears to include simple techniques of coal quality improvements such as coal washing, as well as gasification. This definition is commonly accepted across parts of industrialising Asia.

China could have some influence over the global governance of green funding. However, some critics outside China such as the International Capital Market Association wish to dismiss clean coal as an unacceptable technology (Tu, 2016). Generally, the programme that monitors and oversees the certification of climate bonds internationally is the Climate Bonds Initiative, which makes all fossil fuels ineligible for green bonds.

The green bond eligibility criteria set by an MDB strikes a balance between the need for economic growth and environmental integrity in industrialising countries where they finance projects. For example, Brazilian landfill projects financed by the World Bank may reduce GHG emissions, but remain controversial. However, imposing overregulated international standards on frontier markets could be counter-productive (Jones, 2016). Despite criticism of investment in coal power, China has overtaken the USA to become the largest issuer of green bonds. Around 95% of China's green bond offerings were denominated in yuan, and local standards and exclusions differ from those internationally (BNP Paribas, 2015).

6.4 Korean financial institutions

The *Export-Import Bank of Korea* (KEXIM) and *Korea Trade Insurance Corporation* (K-Sure) are large sources of public funding (*see* Figure 6 on page 41). KEXIM provides export credits on a CIRR basis, and loans for investments, debt finance for overseas companies where Korean companies have an equity stake, plus guarantees to foreign banks making loans to Korean companies abroad. The Bank also provides finance for importing commodities to Korea. According to the KEXIM, the Bank established internal policies that contribute to sustainable development compliant with the OECD Recommendation of the Council on Common Approaches for Officially Supported Export Credits and Environmental and Social Due Diligence 'the OECD Common Approaches'.

In 2012, the KEXIM bank lent US$8747 million supported by guarantees from K-Sure. Much of KEXIM business supports investments in natural resources, maritime shipping, and steel. The Bank is responsible for the operation of two government funds: the *Economic Development Cooperation Fund* (EDCF), a Korean *Official Development Assistance* (ODA) programme, and the *Inter-Korean Cooperation Fund* (IKCF), an economic cooperation programme to promote exchange with North Korea.

While Korea is planning to shut its ageing domestic coal-fired power plants, the country is using its extensive expertise and manufacturing capabilities to develop coal projects overseas through its export credit agencies (Williams, 2016).

KEXIM is connected with a variety of projects in Asia and Africa, notably in Vietnam. A total of US$1.6 billion is required to complete the Vinh Tan 4 coal plant in Vietnam, and 85% of this is reported to be provided by KEXIM, K-Sure, JBIC and NMEXI. The remaining 15% is from domestic banks led by the Bank of Investment and Development in Vietnam (BIDV) (VEO, 2016). Construction of Vinh Tan 4 started in 2014 and the two 600 MW units are scheduled to come online in 2017 and 2018. They are USC units supplied by Doosan with FGD, ESP and SCR and will generate 7.2 TWh/y of electricity. KEXIM has also made various loans to PetroVietnam such as credit worth US$330 million for the Thai Binhh 2 coal plant, and a commercial loan with credit insurance worth US$270 million (Vietnamnet, 2015).

KEXIM worked in conjunction with Hyundai Engineering and Construction, where the latter signed a US$1.27 billion contract with the project sponsor EVN to build a 1000 MW plant in Mong Duong, Vietnam. Apparently, Korean and Japanese firms were sought following delays and equipment defects in plants built by Chinese constructors. KEXIM were also able to assist after the ADB faced finance issues, which led to a cofinancing arrangement between the two organisations (Tradefinance, 2013).

K-Sure provides credits to buyers with interest rate subsidies or direct loans for investments and guarantees where a Korean company is a co-investor. It also provides insurance for investments and loans for natural resource projects. K-Sure was formerly known as Korean Export Insurance Co and changed its name to Korea Trade Insurance Corporation in 2010 to include an import insurance scheme which aims to secure commodities and natural resources (including coal) that the government deems vital to South Korea's economy (NRDC, 2015).

6.5 Summary

- Export credit agencies become prevalent during periods of low economic growth. A prolonged slowdown in the global economic recovery could maintain the significant role for the ECA as a source of public funding for some time.
- The largest public finance institution is the JBIC.
- Japanese commitment to infrastructure development is strong and it takes a more lenient approach to some higher risk projects, making funds available and competing with Chinese firms.
- China's manufacturing capacity has a scale of economy that means it can build power stations with a lower capex than most other countries. Chinese banks often offer the lowest interest rates on loans.
- China has already confirmed US$35 billion funding for new coal-fired capacity abroad which could rise to US$72 billion. Japan is committing US$14.5 billion in Indonesia alone for just five coal power plants.
- Finance institutions from China, Japan, and Korea may offer cost effective deals to governments and utilities abroad, but rules may apply. A large proportion of equipment procurement must come from companies shortlisted as preferred suppliers from the lenders' country. By offering a one-stop-shop, China, Japan and Korean banks simplify the project development, and can be vital to a country under pressure to develop new generating capacity.
- While past trends showed a majority of subcritical installations being built by major equipment manufacturers from China, Japan and Korea, the future trend looks more promising, with HELE plants being the technology of choice; OECD rules could lead to a positive push for USC investments by OECD Asian financial institutions.

7 Multilateral development banks

Multilateral development banks provide a small contribution to overall coal funding worldwide (*see* Figure 2 on page 24). However minimal, the participation of an MDB can influence the viability of a project that is otherwise too risky for commercial banks to undertake alone. Thus, the participation of an MDB in a project can attract private sector funding, but quantifying the influence of, or the amount of extra finance that an MDB can attract is difficult due to a lack of available data and is beyond the scope of this report. The same issues also apply to the role of export credit agencies and national development banks that are discussed in Chapter 6.

An MDB can also influence the plant performance standards adopted by other lending institutions. For example, the organisation UK *Export Finance* (UKEF) is the UK's export credit agency and a government department, and follows the guidelines set by the World Bank. In commercial banking, the French bank BNP Paribas has also adopted World Bank guidelines.

Each MDB is owned by more than one country – hence *multilateral*- and are subject to international law. The shareholders are generally national governments with a range of voting rights depending on their membership and the funding structure (Nelson, 2015; WBG, 2016c). The members determine the Banks' energy policies and the direction they take to lending to coal related projects. An ECA on the other hand is operated by a single country.

The most prominent MDB is the World Bank Group; and its leading bank, the *International Bank for Reconstruction and Development* (IRBD) is owned by many countries, the largest voting shares are held by the USA which has 16.5%. The next largest voting share is held by Japan with 7.1%, while almost all the other major countries hold approximately 5% or less. The smaller shares in descending order are held by China, Germany, UK, France, India, Russia, Saudi Arabia, Italy, Netherlands, Korea, and Mexico. The remaining member countries hold 1.5% or less. The World Bank policies on climate and environment therefore reflect this membership.

The EIB and EBRD are largely owned by European nations. The EIB is entirely owned by EU countries and promotes EU policies abroad. The EBRD is owned by the EU, the EIB, and 65 other countries and since January 2016, includes China as a shareholder. Unusually, the EBRD is led by the USA, while EU nations have a smaller share of the capital, but the combined European ownership is a majority share. The EBRD's breadth of funding is partly due to its wider ownership, which includes Japan, Korea, China, Australia as well as other non-European countries. The EBRD has expressed an interest in working with the new Asian Infrastructure Investment Bank (AIIB). The EBRD will cooperate with projects but will not lend within China. These leading banks are joined by several others including:

- Asian Development Bank (ADB) – led by Japan and the USA and 65 other countries split between non-borrowing and borrowing nations. The non-borrowing nations are 27 countries, mainly OECD, which have two-thirds of the shareholding, and the borrowing countries comprise 40 countries and

hold a minority of the shares at 33.3%. China, Indonesia and India each hold roughly 6%, compared with Japan and the USA that hold 16% each.

- African Development Bank (AfDB) – led by Nigeria (9% of shares) and 53 African nations; 41% of shares are held by non-African nations, chiefly in North America and Europe.
- Asian Infrastructure Investment Bank (AIIB) – led by China, India and Russia; membership of 57 countries which include European, African and Middle Eastern nations, but not the USA.
- Inter-American Development Bank (IADB) – led by the USA.
- Nordic Investment Bank (NIB) – led by Sweden.
- North American Development Bank (NADB) – jointly led by USA and Mexico.
- New Development Bank (NDB) – BRICS countries (Brazil, Russia, India, China, and South Africa).

Apart from the World Bank Group, all these banks operate regionally, although funding can extend beyond traditional borders. Smaller development banks include:

- Islamic Development Bank (IDB) led by Saudi Arabia;
- Eurasian Development Bank (EDB) – led by Russia;
- Corporacion Andina de Fomento (CAF) – Latin America and Caribbean; and
- Central American Bank for Economic Integration (CABEI) – Guatemala, Honduras, El Salvador, Nicaragua, and Costa Rica.

An MDB has social and environmental safeguarding policies (WBG, 2015b). Environmental impact assessments (EIA) are fully integrated into many of the principles of the MDB, and consider the emissions and discharges that may cause a material change to air, water and land that can impact communities and ecosystems. Almost all of the multilateral development banks have principles that apply specifically to power generation and supply, and demand management. Due to the high output of CO_2/kWh from unabated subcritical coal-fired power plants, leading western multilateral development banks treat coal power as one of the fuels of last resort. Most will consider lending for coal power projects only under rare and exceptional circumstances.

One the most interesting recent developments was the creation of the AIIB in 2015. China's role in existing multilateral development banks has been limited to minority shares, and so the China-led AIIB is setting its role as an ambitious and responsible lender to large scale infrastructure projects such as power generation. It is a new bank, but the AIIB has not imposed strict conditions on coal-fired power projects (*see* Section 7.8).

7.1 Overview of MDB coal policies

Policies on coal are usually steered by the prevailing climate strategies adopted by the national governments of the individual members. However, some uncertainty may be cast over the position of US-led banks like the World Bank due to the 2016 US presidential election. In time, the policies of President Trump could influence institutions where the USA is prominent, such as the ADB and the EBRD, but at the

time of writing remain unchanged (April 2017). The combined shareholdings of EU national governments in these banks is strong and any change in their approach to coal power may be resisted.

World Bank: In 2013, the World Bank became symbolically important with respect to coal investments, when it announced that it would no longer fund greenfield coal projects except under exceptional circumstances. This would include situations where there is a lack of feasible alternatives to coal and an absence of alternative financing for coal power.

Asian Development Bank: The 2009 energy policy of the ADB states that the Bank will support coal-fired power plants selectively if cleaner technologies are adopted and adequate mitigation measures are incorporated into project design. The Bank will now only support coal projects that use HELE technologies.

African Development Bank: The AfDB 2012 energy sector policy states that the Bank will only support coal investments when such finance is determined to have a strong development impact and is also environmentally responsible, among other conditions.

European Bank for Reconstruction and Development: The 2013 energy sector strategy of the EBRD states that the Bank will not finance investment in coal except in rare and exceptional circumstances where there are no feasible alternative energy sources.

Inter-American Development Bank: IADB's 2009 guidelines on coal-fired power plants are that the Bank will only support plants that are designed to use HELE technologies.

European Investment Bank: In 2013, EIB introduced an emissions performance standard which effectively means that the Bank will not be able to lend to most coal-fired power plants (Piccio, 2016).

Asian Infrastructure Investment Bank: There is no clear policy with respect to coal investments, whether funding relates to power or mining projects. In October 2016, the bank published its Energy Strategy, and an Environmental and Social Framework document in February 2016. Neither document excludes coal in any future investment portfolio.

New Development Bank: There is no clear policy with respect to coal investments, whether funding relates to power or mining projects.

From 2007 to 2013, multilateral development banks provided an accumulated US$13.5 billion for coal projects, 89% of which was for coal power plants and 7% for coal mining activities; this averages out at US$0.25 billion per year during the period. MDB coal support peaked in 2009 and 2010 when two large South African coal power projects, Medupi and Kusile received funding, along with the Tata Mundra power project in India (*see* Figure 15). Since 2009, there has been a marked decline in MDB financing for coal-fired power plants which fell to US$1.5 billion in 2014 (Piccio, 2016). In terms of projects in the planning stages, the World Bank and the ADB maintain support for small coal plants in countries desperately short of electricity where cost-effective gas and renewable resources have been proven inadequate.

The World Bank Group provided almost half of the total investment made by multilateral development banks in the period 2007-13, followed by the AfDB (21%), the ADB (13%), the EIB (12%) and the EBRD (5%) (*see* Table 7). Funding generally goes to the power sector due to the high capital intensive nature of the projects. However, for the EBRD, more funding went to the less capital intensive mining sector, which accounted for 64% of their coal-related investments.

It is difficult to calculate how much coal funding has been affected by the stricter policies. However, one proxy is the amount of funding that has been earmarked for alternative non-coal power sector investments. By 2015, the six major multilateral development banks had amassed US$20 billion for climate mitigation (plus US$5 billion for adaptation), of which US$6 billion was dedicated to renewable energy projects, including hydroelelctricity (MDB, 2016). The funding for renewables in 2015 alone was more than the total coal funding from the same multilateral development banks in the period 2007 to 2013.

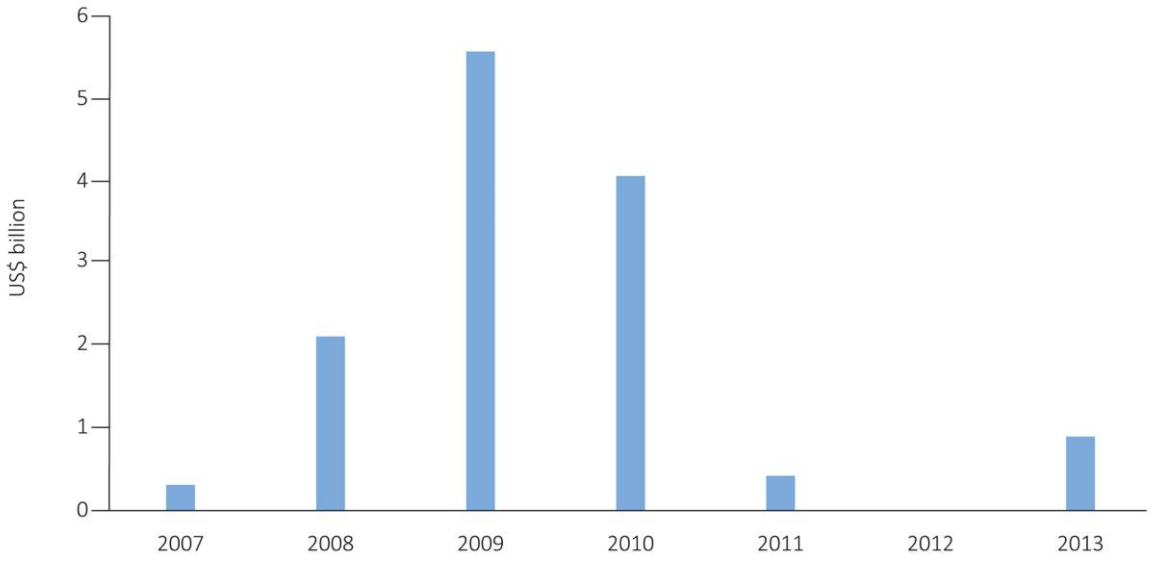

Figure 15 Annual support for coal by multilateral development banks 2007-13, US$ billion (WWF, 2014)

Table 7 Coal finance provided by multilateral development banks in 2007-13 (WWF, 2014)

	Total coal aproved	Coal power plant	Coal mine	Plant emissions control	Transmission and distribution	Other/ unspecified
US$ billion						
Total Multilateral Banks	13.51	12.07	0.35	0.04	1.00	0.06
World Bank Group of which:	6.54	5.39	0.09	–	1.00	0.06
IBRD	4.66	3.60	0.06	–	1.00	–
IDA	0.05	0.01	0.02	–	–	0.02
IFC	1.83	1.78	0.02	–	–	0.04
AfDB	2.84	2.84	–	–	–	–
ADB	1.69	1.69	–	–	–	–
EIB	1.58	1.54	–	0.04	–	–
EBRD	0.66	0.41	0.26	–	–	–
IADB	0.20	0.20	–	–	–	–

While current and future spending commitments by multilateral development banks are leveraged towards renewable energy, there has been recognition of the need to decarbonise fossil fuel combustion processes, including CCS. In terms of coal and CCS, financial commitment is limited to a few projects around the world and funding often relies on government-backed grants. With the exception of involvement from the ABD and the Greengen IGCC project, there is little evidence of multilateral development banks backing CCS or clean coal technologies. Nevertheless, under the EIB Energy Lending Criteria, there are important observations regarding the status of energy technologies and the inclusion of CCS in spending plans for programmes like the EU-SET Plan (EIB, 2013).

7.1.1 World Bank Group

The World Bank group funded almost US$3 billion to coal-related projects over a period of nine years between 2007–15 (NRDC, 2016). The World Bank is made up of five institutions: International Bank for Reconstruction and Development (IBRD), International Development Agency (IDA), International Finance Corporation (IFC), International Centre for Settlement of Investment Disputes (ICSID), and Multilateral Investment Guarantee Agency (MIGA) (Fight 2005).

The World Bank Group's sphere of influence extends beyond its own portfolio of projects. For example, UK Export Finance (UKEF) is a government body that uses the World Bank rules to guide its own decision making in coal investments. Commercial banks also use World Bank policy as a guide on power sector investment decisions such as BNP Paribas (France). The World Bank is therefore perceived as a convenient single-point source for a unifying set of guidelines that that can be used by any financial institution in order to assist decision-making.

The World Bank Document *Toward a Sustainable Energy Future for All: Directions for the World Bank Group's Energy Sector* outlines the overall Group strategy of improving access to energy for the poor, providing reliable affordable energy, and ensuring sustainability and environmental criteria are followed. The review document is available at the following link: http://documents.worldbank.org/curated/en/745601468160524040/pdf/795970SST0SecM00box377380B00PUBLIC0.pdf

The March 2010 World Bank Report *Criteria for screening coal projects under the Strategic Framework for Development and Climate Change* determines the Bank's approach to assessing coal-power. It is found at: http://siteresources.worldbank.org/EXTENERGY2/Resources/CGN_20100331.pdf (WBG, 2010).

Lending decision are also determined by the IFC's Performance Standards on Environmental and Social Sustainability, which has become a globally recognised guide for good practice in dealing with environmental and social risk management.

The World Bank has a stringent approach to assessing new coal projects, but coal is still considered to have a role in many economies where alternatives are insufficient to meet a country's energy needs. The Bank's last major coal-fired project was the Medupi power plant in South Africa which goes some way to address the power shortages experienced in the country. Several World Bank shareholders, including the USA and

UK, cited that without a significant carbon offset, the plant would be incompatible with the World Bank strategy of pursuing growth and poverty reduction in environmentally sustainable ways (Picio, 2016). As private financiers abandoned the project due to the banking crisis of 2007-08 the World Bank stepped in to cover the US$3.8 billion gap in funding. Any future coal funding from the World Bank may not be at this scale again.

Nevertheless, the Medupi plant is a supercritical 6 x 795 MWe plant. The first unit was finally completed in 2015 after many delays and cost overruns. Unit 5 was synchronised in October 2016 and due to be online in a matter of months. The remaining four units are earmarked to come online between 2017 and 2018. Once completed, Medupi would be the fourth largest coal-fired power plant, and the largest dry-cooled power station in the world (SABC, 2016).

In 2014, the WBG also provided US$399.9 million of finance spread across a variety of projects in countries such as Pakistan, Mozambique, Senegal and China (*see* Table 8). Most of the projects appear consistent with its current policies as these are low and low-middle income countries. The coal developments are financed by the IDA and IFC.

Table 8 World Bank coal finance in FY 2014 (OCI, 2015)

Project	Institution	Country	Description	Total finance in FY 2014 (US$ million)
Power sector reform development policy credit	IDA	Pakistan	Power sector development strategy anticipates an increase in coal projects	200
Stora China III	IFC	China	Board and pulp mill powered primarily by coal	146.97
ACWA Equity	IFC	Mozambique and South Africa	Equity investment in ACWA Power/International Company for Water and Power projects includes support for a 270 MW coal power plant in Mozambique and a 450 MW coal power plant in South Africa	33.33
Ninth poverty Reduction Support Credit	IDA	Mozambique	Include government strategy development for increasing coal and natural gas extraction	12.3
Second governance growth support credit	IDA	Senegal	General energy sector support that includes coordination with the development of the 125 MW Sendou coal power plants	7.5
			FY 2014 TOTAL	399.9

One notable project that is in the planning stages, and falls within the guidelines of the World Bank policy is the proposed coal plant in Kosovo. The plant has the strong backing of the Kosovan Government to support economic growth. At the time of preparing this report (2016), the World Bank was still considering the coal project. Currently, the Kosovan electricity system is supplied by two ageing coal power plants that are due for retirement, and irregular power supplies cost the country US$332 million every year. The country possesses the world's fifth largest lignite reserves (Williams, 2016).

Elsewhere, the World Bank Group's IFC supported the Tata Mundra project in India. The 4150 MW plant was developed by Coastal Gujurat Power Limited, at the port of Mundra. The plant was designed with supercritical technology and came online in March 2013. The IFC Performance Standards and the World

Bank's Environment, Health and Safety Guidelines provided a platform for the Indian project with regards to good practice in the development, construction and operation of a coal plant.

Since the IFC rules were more stringent than Indian emission standards, this resulted in a station designed to be run at higher efficiencies with lower emissions than required by Indian domestic law. The plant was designed to produce just 764 gCO_2/kWh and avoided the discharge of 3.2 $MtCO_2$ /y compared with a similar size plant using subcritical technology. Despite the advantages of supercritical plant versus subcritical plants, they do not qualify for clean development mechanism (CDM) credits (IFC, 2014).

IFC financing helped the project obtain funds from other international and Indian institutions. The IFC and ADB provided US$450 million in loans each, Korean Export Credit Agencies funded US$800 million and local banks provided a combined US$1.5 billion. The project cost of US$4.2 billion was financed by US$1 billion in sponsor equity (IFC, 2014).

Case study - Plant rehabilitation in West Bengal

The World Bank has been active in a rehabilitation project in West Bengal, India. The project involves the renovation, modernisation, and improved operations and the maintenance (O&M) of existing power stations. One example was a US$180 million loan (Loan No. 7687-IN) and a US$45.4 million Global Environment Facility (GEF) grant (Grant no TF094676-IN) for pilot schemes to explore new approaches to renovate and modernise plants. The scheme was called the Coal Fired Generation Rehabilitation Project.

The 2009 scheme is also known as the National Renovation and Modernization Program and aims to upgrade 27 GW, equivalent to a fifth of India's installed capacity back in 2009. Phase 1 of the scheme intended to upgrade 630 MW of capacity at three units at 210 MW Unit 5, Bandel in West Bengall, 210 MWe Unit 6 Koradi in Maharashtra and 110 MWe Units 3 and 4 (total 220 MWe) Panipat in Haryan.

These refurbishments would use domestically manufactured equipment from one of India's largest heavy manufacturers of power stations, Bharat Heavy Electrical Ltd (BHEL) (WBG, 2015a; WBG, 2009; Mozumder, 2009).

7.1.2 African Development Bank (AfDB)

After the WBG, the AfDB has been one of the larger MDB providers of coal finance in past years. The Bank has a membership of 54 African countries, led by Nigeria which has 8% of member votes, followed by South Africa (5%), Egypt (5%), then Algeria, Libya, Morocco, and Cote d'Ivoire (each 3–4%). AfDB headquarters are in Abidjan, Cote d'Ivoire (AfDB, 2016b).

The overarching objective of the AfDB Group is to spur sustainable economic development and social progress in its regional member countries (RMC), thus contributing to poverty reduction. This has been achieved to date building up a total asset value of US$35,123 million.

The AfDB has a number of green growth policies which aim to triple climate finance to US$5 billion per year by 2020 as well as to leverage US$50 billion over five years to help achieve the goal of universal energy access by 2025. This will be done by adding 162 GW of new generation, 130-mile (209-km) grid connections and 75-mile (120-km) off-grid connections, and promoting cleaner cooking fuels in 150 million households (AfDB, 2016).

The AfDB is the largest clean energy financier in Africa, investing some €3.2 billion (US$3–4 billion depending on the exchange rate) in energy technologies since 2007, which is more than the World Bank. In 2012, almost 90% of the AfDB's energy financing went on clean energy projects, including renewable energy and hydropower. The issue of what constitutes 'clean energy' has yet to be resolved (AfDB, 2013).

The AfDB sector policy is based on nine principles which include energy security, governance, clean energy, social and environmental responsibility, and climate change. Section 2.2.2. of the Bank's Energy Sector Policy states "*Moving towards a cleaner energy path: Given the urgent need to increase access to energy for all, fossil fuels will continue to play an important role in power generation in Africa*".

The AfDB has been the second largest provider of funds to coal projects by an MDB since 2007 (*see* Table 7). After approving US$2.6 billion in finance for the Medupi power plant in South Africa, the AfDB may consider further funding for the plant if necessary (Picio, 2016). Thus, the AfDB will support power generation from any source that promotes the most affordable, clean and efficient technology and will assist the adoption of cleaner technologies. The Bank will encourage CCS readiness for new-build coal-fired plants provided the technology is fully proven and commercially viable. In March 2015, the Bank pledged a further US$200 million of support for coal-related power projects as partial risk guarantees for the power sector in Africa. Currently, some countries, including Nigeria, are becoming more interested in their abundant coal reserves and are keen to develop their economy with coal power (TN, 2016).

7.1.3 Asian Development Bank (ADB)

The third largest MDB in terms of coal funding is the ADB, with headquarters in Manila, Philippines. Unlike the AfDB, the ADB membership comprises both OECD and non-OECD countries. Of the Asian countries, Japan has the largest proportion of the member votes (12.8%), Australia, Indonesia, India and China each have 4–5%, and the remaining members have less. Of the non-Asian countries, the USA has 12.7%, almost the same as Japan. Canada has 4% and various major European countries have 2–4%. Therefore, the Bank receives input from a broad range of economies. The Bank provides loans and technical assistance for a wide range of development activities. It raises funds through bond issues on world capital markets. Based on the Bank's 2009 Energy Policy:

- Many existing coal-based power plants have been operating for a number of years. They need retrofitting to improve efficiency, reliability, and operating life and to comply with current higher environmental standards. Such retrofit projects will be cost-effective, and will reduce emissions of pollutants and improve efficiency.

- As and when new technologies—such as pressurised fluidised bed combustion, integrated gasification combined cycle (IGCC), and carbon capture and storage are commercially viable, power companies will readily adopt such technologies. Meanwhile, ADB needs to proactively support the dissemination and deployment of new technologies in developing member countries. To achieve this, developed and industrialising countries need to collaborate on long-term technology transfer agreements, if necessary with the active support of bilateral and multilateral donors (ADB, 2009).

The ADB priorities are in network transmission and distribution projects to increase access to electricity as well as power projects fuelled by biofuels, hydro, and solar power. According to the ADB, lobbying from the USA, as well as other western nations, prevents countries from approaching the ADB for assistance in financing coal projects (Picio, 2016).

Despite political pressure from its western members, the Bank has been active in advanced clean coal investments in China. The Greengen and Tianjin projects are examples. The ADB provided initial capacity building assistance for the Greengen IGCC plant in China before approving a US$135 million loan and a US$5 million grant to finance the project in 2010. The IGCC process turns coal into a syngas, removing impurities and particulates before combustion in a highly efficient combined cycle gas turbine. It achieves 99% sulphur removal, 85% removal of NOx, and reduced CO_2 emissions due to its high efficiency.

The GreenGen programme supports the development of IGCC and CCS technologies and established the Greengen Company to lead the research, development, and demonstration of advanced clean coal technologies. The first phase of China's Greengen CCS programme involved building a 250 MW demonstration power plant in Tianjin Harbor Industrial Park. Greengen is the first IGCC clean coal project in the industrialising world. The Tianjin IGCC power plant began operation in December 2012 and is designed to reduce annual coal consumption by 134,000 t and CO_2 emissions by 372,000 t. The project is also expected to use 35% less cooling water and generate significantly less solid waste than a conventional plant.

ADB case study – the Jamshoro plant Pakistan

In 2013, the ADB approved a US$900.5 million loan for the 1320 MW Jamshoro coal-fired power plant in Pakistan. The plant was considered a least cost option to address the energy needs for the region. The plant is the first ever ADB-funded coal power project (at large scale) and will require US$1.771 billion. The project will use SC technology and is co-financed with the Islamic Development Bank (IDB) which is funding US$220 million. Pakistan will provide 25% counterpart financing. Pakistan is facing rising oil expenditure and declining gas reserves. The country spends more than US$14 billion per year on importing oil and its reliance on this to fuel power plants is becoming increasingly less affordable. Chronic power shortages have often caused social unrest, and cost the country about 2% of its gross domestic product growth each year (EC, 2016).

7.1.4 European Bank for Reconstruction and Development (EBRD)

European multilateral development banks have had little interest in coal investments. The Sustainable Energy Initiative of the EBRD states that it will actively invest in projects that move away from coal to lower carbon alternatives including natural gas and renewables. In September 2014, the EBRD published a comprehensive and transparent document entitled 'Methodology for the assessment of coal fired generation projects' (EBRD, 2014).

The activities of the EBRD in the energy sector for the period 2014 to 2018 are governed by its Energy Sector Strategy, approved on 10 December 2013 by the EBRD Board of Directors (EBRD, 2013). Only the highest performance designs are permitted, and then after all other options have been considered and deemed insufficient on economic and development grounds. Plants that are unabated with respect to CO_2 emissions, will be financially supported only under 'rare and exceptional circumstances'. If such circumstances occur, the following key criteria for coal power apply:

- the infrastructure being financed must be the least carbon-intensive of the realistically available options;
- the infrastructure must use best available technologies (BAT), as defined in the EU Industrial Emissions Directive; and
- the plant must comply with the EU Industrial Emissions Directive requirements in relation to carbon capture and storage readiness.

At the core of the analysis is the levelised cost of electricity (LCOE) assessment for different technologies, but within this is a plethora of external costs for pollutants and CO_2. Combined heat and power plants (CHP or cogeneration) convert all energy outputs to MWh, and so the LCOE is a factor of fuel energy in, and all useful energy output. In a typical LCOE, capital costs, operating fuel costs and O&M are assessed on cents per kWh basis or its equivalent. The cost of greenhouse gas emissions will be set at 35 €/tCO_2-e for an emission in 2014 and in 2014 prices. The marginal abatement costs will increase over time; EBRD will apply a 2.0% real growth rate per year to this cost.

An incumbent electricity system must have enough reserve margin before embarking on a new project. In the absence of flexible capacity to meet variations in intermittent sources of electricity, the EBRD adds these costs if necessary which could affect the economics of intermittent renewable energy. For fossil fuelled plants, the Bank attributes costs of emissions of SO_2, NOx, $PM_{2.5}$ and PM_{10}. A *Value of a Life Year* approach is used which attributes a euro cost to each tonne of such emission based on impacts on mortality. EBRD will use the following costs, in 2014 euros:

- SO_2 8215 €/t
- NOx 7915 €/t
- $PM_{2.5}$ 27,404 €/t
- PM_{10} 27,795 €/t

In the period 2007-13, the EBRD provided US$660 million of funding for coal, roughly two thirds of which went to coal power projects and a third to mining (*see* Table 7). Of the major MDB, the EBRD has provided the least funds for coal related projects, apart from the Inter-American Development Bank.

7.1.5 European Investment Bank (EIB)

The EIB is the European Union's bank whose shareholders comprise the 28 EU Member States (as of 2016). Outside the EU, the Bank is active in over 150 countries where it supports projects which contribute to the EU's external cooperation and development policies. In 2012, some 90% of the EIB's total financing of €52 billion was for projects located within the EU.

The EIB is guided by EU policy. Since its activities are mainly within the EU, its lending policies are probably some of the strictest in the world. This is evident in the cumulative coal funding in the period 2007-13 which was just US$1.58 billion, of which US$40 million was invested in emission controls for coal plant, the rest was used for power generation funding (Galindo, 2015). The EIB coal policy is available in the document Energy Lending Criteria (EIB, 2013b). While there is no apparent support for coal power, there is a recognition of technologies that can partially decarbonise coal plants. According to the Bank:

"…the current and, in all likelihood, future EU energy policy does not prohibit the construction of any new fossil fuel fired power stations. While it aims for a drastic reduction in carbon emissions from fossil fuel generation, for instance through clean technologies like CCS or biomass cofiring, EU energy policy does not mandate a particular fuel mix and it is for the Member States and utilities to decide on the mix of plant that will be consistent with that Member States 2020 renewable energy source (RES) targets and compatible with emission limits under the EU Emissions Trading System (ETS)" (EIB, 2016).

The Bank's cost benefit analysis uses methods based on international best practice, as described in the Energy Lending Criteria (EIB, 2013b). Coal investment decisions must first pass a general screening criteria, and once passed, the project then goes through a set of sector specific criteria. Similar to the EBRD, the EIB includes comprehensive costs of externalities in the LCOE calculations for fossil fuel generation. The EIB also examines the GHG impact of proposals using the following set of screening criteria:

- EIB will screen out projects whose carbon footprint benchmark – or the emission performance standard (EPS) in g/kWh – is above a threshold level of 550 gCO_2/kWh. Exceptions may be made for projects which contribute to the security of supply of isolated energy systems, such as small islands with no mainland energy connection, where there is no economically viable alternative.
- Fossil fuel plant operators must demonstrate that they comply with the CCS Directive. The Bank will continue to support projects in research, development and deployment of clean fossil fuel technologies, including CCS demonstration projects (EIB, 2013).

The EIB gCO_2/kWh requirements would rule out most coal plants, but pulverised fuel (pf) technologies are emerging in Asia that are getting closer to these levels (Jianxiong, 2017). The possibilities of adding biomass cofiring (using sustainably sourced biomass), retrofitting partial CO_2 capture, or operating in a combined heat and power plant could make these new coal plants compliant with strict EIB standards in this respect.

In addition, the CCS Directive requires new coal plants to be CCS *ready*. This capture readiness requirement means that the combustion plant must retain sufficient space to build a capture installation and to build all necessary installations for the transport of the CO_2 (such as a compressor station, and pipelines.). However, while new plants might only be 'capture ready', three criteria must be met:

- suitable storage sites being available;
- transport facilities being technically and economically feasible; and
- it is technically and economically feasible to retrofit a CO_2-capture facility.

The EPS is calculated as the moving average of the ratio of targeted annual carbon emissions from power plants to the electricity generated by the same plants in the same year. The annual carbon emissions of a plant must consider the requirements of the Emissions Trading scheme (ETS) Directive (2009/29/EC). The emission standards set by the EIB favour natural gas, although supercritical coal with biomass cofiring is commercially available and a realistic possibility provided the biomass is sourced sustainably (Holmes and Tindale, 2013). This explains the minimal participation by the EIB in the coal sector.

7.1.6 Inter-American Development Bank (IADB)

The IADB is active in Latin America and the Caribbean and is led by the USA. Similar to the EIB, the IADB has a low participation in coal projects, but provides a comprehensive policy called the *oal Fired Power Plants Guidelines, An Approach to Reconciling the Financing of Coal-Fired Power Plants with Climate Change Objectives*, (2009). It is available at: http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=2242924

Unlike most other multilateral development banks, the IADB policy considers CCS to be a promising development for the effective mitigation of GHG emissions from coal plants at reasonable costs. The IADB will support coal plants that are designed to meet minimum performance criteria in terms of efficiency and GHG emissions intensity as a way to promote access to modern forms of energy while not undermining climate change mitigation efforts. Technologies acceptable for IADB finance are those that comply with the minimum performance criteria in Table 9 or, at least, commit to meeting them. The criteria are based on:

- performance of model coal plants as defined by the US Environmental Protection Agency and Department of Energy;
- typical performance of coal plants specified by the International Energy Agency (IEA); and
- the EU Best Available Technologies, or BAT, Reference Document (BREF) for large combustion plants.

These criteria preclude inefficient coal-fired plants, but the required standards appear readily achievable. The selection of BAT should consider: the source of fuel and whether the coal is indigenous (and thus a local natural resource) or needs to be imported; the reliability of the technology; the overall efficiency of the technology; and the GHG emissions per MWh produced. A comprehensive options analysis including environmental externalities and GHG emissions should be carried out to justify the proposed technology.

According to the Bank, BAT includes cogeneration, SC and USC boilers and turbines, IGCC, and CCS ready designs. Subcritical pulverised coal technology is not considered to be BAT. Subcritical CFBC may be considered BAT for plants less than 300 MWe depending on the grid size, type and source of fuel, possible biomass cofiring to reduce GHG emissions intensity, and overall efficiency. Table 9 may be updated as new developments in modern coal power technology become commercially available.

Table 9 Minimum performance criteria of new coal-fired power plants that may be supported by the IADB (IADB, 2009)

Technology	Supercritical (PCC)	Ultrasupercritical (PCC)	Circulating fluidised bed combustion (CFBC)	Integrated gasification combined cycle (IGCC)
Net plant, HHV, efficiency % butiminous coal	>38.3*	>42.7*	>36.0†	>38.2‡
Net CO_2 emissions intensity, kg CO_2/net MWh	<832§	<748§	<890§	<832

* US EPA (2006); † I Wu (2006); ‡ US DOE (2007); § Based on US EPA emissions factors for bituminous coal (93.47 kg CO_2 per million Btu and minimum net plant efficiency)

7.1.7 Asian Infrastructure Investment Bank (AIIB)

In recent years, China has been instrumental in creating two global development banks, the AIIB and the *New Development Bank* (NDB). These new institutions have emerged to meet the development aims and objectives of non-OECD nations and to complement banks such as the ADB and AfDB. The AIIB is the first major MDB created in decades. The AIIB was inaugurated in January 2016 and is potentially the most important of these new institutions. Unlike the World Bank Group and *International Monetary Fund* (IMF) that are led by the USA, no country member has powers of veto over decisions at the AIIB (Kamal and Gallagher, 2016). However, China holds sufficient share of the voting rights (more than 25%) to block decisions involving structure membership, capital increases and other significant issues.

The new bank also comes as Chinese President Xi Jinping is gearing up the One Belt, One Road plan to finance and build new infrastructure throughout Asia. The AIIB allows bidding for funding to any country and is not restricted to Asia, compared to the ADB which restricts contracts exclusively to member countries. The AIIB aims to be a 'green' bank; this may include HELE plants and other clean coal technologies, but as of December 2016, no coal investments have been announced.

The AIIB's board approved its first four deals worth US$509 million in mid-2016 with three projects co-financed with the World Bank, the ADB, the UK Department for International Development, and the EBRD. The projects include a slum renovation in Indonesia and highway construction in Pakistan and Tajikistan. A power grid upgrade project in Bangladesh will be solely financed by the AIIB (Blanchard, 2016). Under the new First Energy Strategy which was published in October 2016, the AIIB announced the funding of two new power plants: a hydroelectric station in Pakistan and a gas CCGT plant in Myanmar. By the end of2016 a total of seven projects were approved and seven projects were at the proposal stage, none of which are related to coal (AIIB, 2016b).

Questions have been raised as to how the Bank's activity will fit with that of existing multilateral development banks but initial announcements suggest the AIIB will address the infrastructure needs of developing countries and help empower emerging markets in the global economy. There is speculation about whether the newly-formed AIIB will fall short of adopting internationally-recognised best practices on governance, procurement, and environmental and social safeguards (Nelson, 2015). However, the AIIB's most recent ventures have been in collaboration with the World Bank and the EBRD, and under these circumstances, the higher standards are likely to prevail.

The AIIB will require projects to be legally transparent and to protect social and environmental interests, but it will not force borrowers to adopt the free-market conditions that are favoured by the IMF and World Bank, which some say impose unreasonable demands on borrowing countries (Wong, 2016).

A list of requirements is included in the Environmental and Social Framework document (February 2016), which includes three standards covering: environmental and social assessment and management; involuntary resettlement; and rights for indigenous peoples (AIIB, 2016a). The standards are similar to the Equator Principles, which also include engagement with local communities and transparency of aims and solutions as part of the process. The AIIB supports the Paris Agreement of December 2015 on the mitigation of climate change, adaptation and the redirection of financial flows. In summary the Bank aims to:

prioritise investments promoting greenhouse gas emission neutral and climate resilient infrastructure, including actions for reducing emissions, climate-proofing and promotion of renewable energy.

There is a list of exclusions which includes items such as child and forced labour, illegal substances or any banned materials and chemicals, trade in wildlife, weapons and direct threats to biodiversity among many others. *All the exclusions are outlined in some detail; coal is not included on the list*. It is possible that a coal power or mine project may fall within an exclusion if located in an area of protected land, but a proposed coal plant would be bound by the rules and due diligence carried out for all projects (AIIB, 2016a).

Some economic and political tension has arisen from coal exporting country members of the AIIB. For example, Australia has submitted A$932 million in paid capital to become the sixth largest shareholder (Scott, 2015). Australian membership was based on an understanding that the AIIB would fund projects across Asia that would create opportunities to boost demand for Australian services and commodities, such as steam and coking coal. The wording of the AIIB documentation is careful and does not commit to any projects or any particular technology, and advocates technology neutrality. However, concerns have been raised that development goals for low and middle income countries in Asia may become a secondary concern to environmental and climate change goals without considering clean coal technologies (Shanahan. 2016).

In 2017, the AIIB announced a new policy proposal to address fossil fuelled power projects:

Supported fossil fuel based generation facilities would be expected to use commercially available least-carbon technology. In many countries, gas-fired power generation would form part of such transition. Carbon efficient oil and coal-fired power plants would be considered if they replace existing less efficient capacity or are

essential to the reliability and integrity of the system, or if no viable or affordable alternative exists in specific cases, particularly in low income countries. (AIIB, 2017)

7.1.8 New Development Bank (NDB)

The NDB, previously known as the BRICS Development Bank, is a multilateral development bank that was established by Brazil, Russia, India, China and South Africa,. It was launched in July 2015 to provide finance for infrastructure in industrialising countries. The headquarters of the Bank are in Shanghai, China (Jeffrey and Trevisani, 2014). The first regional office of the NDB will be opened in Johannesburg, South Africa. The Bank provides support for public and private projects through loans, guarantees, equity participation and other financial instruments. The initial authorised capital of the bank is US$100 billion divided into 1 million shares having a par value of US$100,000 each (NDB, 2015).

Similar to most other multilateral development banks, the NDB plans to prioritise projects that develop renewable energy sources. The Bank aims to cooperate with other institutions to accelerate the expansion of 'green' financing and to promote environmental protection. The aim is to finance one project from each member state with the money raised via its first bond issue (TASS, 2016). It is not clear what the aims are for the NDB with respect to coal investments, but with the exception of hydro-rich Brazil, the other BRICS nations possess huge fossil fuel reserves and are some of the largest coal markets in the world.

7.2 Potential impacts of stricter MDB coal policies

With the financial backing of the member country governments, the multilateral development banks can borrow money from the world capital markets at the lowest available market rates. The banks can relend this money to their borrowers at much lower interest rates than the borrowers would generally have to pay for commercial loans. In this way, the multilateral development banks can fulfil their mandates to provide affordable finance to low and middle income countries and to play an important role in the economic and welfare development of some of the poorer nations.

There is a notion that if a western MDB withholds support for HELE coal plants, poorer countries will seek funding elsewhere, perhaps leading to unintended consequences (Kutani and Anbumozhi, 2015). There is a risk that project finance companies could seek funding from financial institutions with less stringent design, environmental and welfare criteria. For example, the 300 MW Stanari power plant in Bosnia was backed by a US$391 million loan from the China Development Bank, using UK financial expertise from a company called EFT Investments. The EBRD was associated with the project before it withdrew. The project commissioned China's Dongfang Electric Corporation as a key equipment supplier. The lignite-fired station was originally designed as a supercritical 410 MWe plant, but it was later redesigned as a 300 MWe subcritical plant, resulting in a drop in the design efficiency from 43% to 34.1%.

Despite the redesign of the Stanari plant to a smaller and less efficient unit than the original proposal, it is possible that the design was scaled down to a smaller atmospheric fluidised bed combustion unit due to plant economics and the need to handle difficult fuels. As plants scale down, the benefits of SC or USC plants

become marginal. Nevertheless, the plant was equipped with FGD and PM controls, as well as being dry air cooled. It was inaugurated in September 2016 (EFT, 2016; Sourcewatch, 2016b).

The overall combined spending on coal projects by multilateral development banks has dropped considerably in recent years to just US$0.25 billion per year and it is unclear at present what future funding could be made available.

7.3 Other public financial institutions

7.3.1 India

The government of India supports many national coal-based initiatives via various sector leaders such as Coal India Limited (CIL) and the National Thermal Power Corporation (NTPC). India's state-owned enterprises invested a total US$14.7 billion in 2013-14 in fossil fuels, of which some US$4 billion went to power generation for CIL and the NTPC for domestic projects (Gard and Bossong, 2015). However, India does not supply many funds for overseas coal power plants.

A number of banks provide public finance led by the State Bank of India, followed by SBI Capital Markets (a subsidiary of the Bank of India), Bank of Baroda, Corporation Bank, Central Bank of India, and other state-owned banks. In 2013-14, the coal-fired power sector received US$2156 million of funding, out of a total fossil fuel fund of US$3131 million. The mining sector and power generation sector each received around US$70 million in funding from international sources. The largest lenders were the Bank of India and SBI Capital Markets which lent US$1.4 billion and US$830 million respectively, accounting for more than half the total funding identified. Indian participation in overseas projects has shown that some 13 public finance institutions and state owned banks lent US$776 million in 2013-14. The two key recipient countries were Nigeria and Australia, the latter being for the Gujurat NRE coking coal mine capex facility, now called Wollongong Coal (James and McLaren, 2014). India also contributes US$149 million to fossil fuel projects through its small number of shares in the AfDB, the ADB and the World Bank Group (ranging from 0.2–5.3%).

Successful investment in India appears to be difficult as there are regulated low power tariffs which means the full investment is not always recovered. There are also problems in power purchasing from financially-strained distribution companies and fuel delivery challenges. Nevertheless, coal power is the cheapest form of generation and ongoing investment to replace inefficient and highly polluting plants with HELE will provide funding opportunities for Indian and overseas development banks (IEA, 2016b). Out of 53 GWe of new coal-fired plant that is under construction, 34 GWe are supercritical, and 4 GWe are USC. The potential to fund refurbishments of the old existing fleet is also a huge market for both Indian and foreign companies.

In terms of commercial banking in India, the ICICI Bank is the country's largest private sector bank with total assets of Rs 7206.95 billion, (US$109 billion as of 31 March, 2016). Project Finance is one of the key focus areas for ICICI Bank (ICICI, 2016).

Coal power projects have been financed by the ICICI Bank with the help of export credits from JBIC. They include the 2 x 660 MWe Nigrie Power Plant developed by Jai Prakash Power in Madhya Pradesh (ICICI, 2009). In 2009, JBIC provided US$100 million of export credit to India's ICICI Bank. The loan formed a strategic partnership between the two banks and facilitated the procurement of Japanese machinery, equipment and services in India and neighbouring countries that ICICI were investing in (ICICI, 2009).

Overseas loans from Indian banks to foreign projects is less common. India is not a major player in the international market although the Export Import Bank of India, or Indian EXIM is embarking on funding the Rampal coal plant, or Maitree project, in a joint venture of the Bangladesh Power Development Board (BPDB) and India's NTPC.

The joint venture called the Bangladesh-India Friendship Power Company, would invest 30% equity (US$546 million) and the Indian government would facilitate 70% debt amounting to US$1.6 billion through the Indian Exim bank (Mukul, 2016). The project has drawn criticism from analysts claiming the electricity would cost 32% more than the current tariffs, much of which is based on gas-fired power. What is not clear from the analysis is whether the economists considered a scenario where Bangladesh's cheap domestic gas supplies could peak in a decade and would require replacing with higher cost LNG (Rogers, 2016), which could make it an immensely costly option compared to the current coal project.

In November 2016, the Indian government overhauled the domestic currency market by abolishing existing 500 and 1000 rupee notes. This drastic action was intended to reduce the flow of counterfeit notes, fraud and tax avoidance removing 80% of the cash in circulation. (Anand and Kumar, 2016). The Central Electricity Authority reported that several power plants had been halted due to the 'financial crunch' (CEA, 2016). It is possible the lack of cash in the banking system has led to the halting of some large-scale projects such as power stations. In a country where labour is often paid in cash, there may have been an impact on the ability to continue construction and procure materials and equipment.

7.3.2 Germany

The German bank KfW is one of the most interesting institutions with a history of lending to coal-related projects. It is a German state-owned development bank founded in 1948. KfW provides direct loans for export credits, co-finances with commercial banks and administers the CIRR for the government. In the past, KfW has financed the construction and modernisation of coal plants worth €2.9 billion, equivalent to 0.4% of its new financial commitments in the period 2006-14. Priority is given to HELE technology and the modernisation of existing plant to leverage a reduction in CO_2 emissions without compromising security.

The current KfW Group policy on coal-fired power investments is strict and is outlined in the KfW Group guidelines on the financing of coal-fired power plants (March 2015). The guidelines state that KfW has reviewed and strengthened the financing criteria where:

- Projects will only be pursued in countries which have a national climate mitigation policy and strategy which is supported by a targeted policy to expand renewables and/or enhance energy efficiency. The projects must be compatible with this climate change mitigation policy.

- BAT must be deployed in line with the current version of the EU Industrial Emissions Directive (IED-RL 2010/75/EU).
- Financing for new coal-fired plants is only possible in the case of unit sizes larger than 500 MWe (fitted with FGD and wet cooling) with a planned electrical efficiency of 43% for lignite and 44% for hard coal; the criteria are based on lignite stations fitted with FGD; if plants are smaller than 500 MWe they should achieve a relative improvement in efficiency compared with the regional average and rank amongst the best 25% of the regional plant portfolio in this category.
- Technical and spatial preconditions are examined with the view to install CCS when possible.
- In the case of new coal-fired facilities, which cogenerate heat and power, or generate heat, a planned fuel efficiency of at least 75% must be attained.
- In the case of improvements or modernisation of existing coal power plants, the measures funded must result in substantial improvement in the environmental footprint of the power plant.
- All projects must be in strict compliance with the national rules on preventing and minimising any negative environmental and social effects and risks.
- Financing in countries which are not EU or OECD members must also be subject to an environmental and social impact assessment which, in addition to the relevant national rules, must be based on internationally recognised standards at least (for example the World Bank Group or the EU) (KfW, 2015). For development financing, in terms of climate mitigation policy, the emphasis should be on expanding renewables and boosting energy efficiency.

7.3.3 Russia

The 'Bank for Development and Foreign Economic Affairs' or Vnesheconombank (VEB) is a Russian state-owned bank. VEB extends government credits and guarantees for projects inside Russia and abroad with payback periods exceeding five years and total value exceeding 2 billion roubles (approximately US$58 million). In addition, CJSC Roseximbank and the Export Insurance Agency of Russia (EXIAR) are responsible for extending government guarantees to support exports. VEB is Roseximbank's majority shareholder and EXIAR's sole shareholder (NRDC, 2015).

In the period 2007-14, the VEB provided around US$2.5 billion of funding for coal projects (*see* Figure 9 on page 48). The Bank provided as much finance as Germany's KfW and Japan's JICA. VEB tends to lend to mining projects. There is little analysis and information available on the Russian finance sector.

7.4 Summary

- Funding for coal projects from multilateral development banks peaked in 2009. MDB funding for coal projects has averaged little more than US$0.25 billion per year since 2007.
- The role of the MDB (or any public finance institution) is wider than the direct financial support that is shown here. An MDB attracts private sector finance which can be important for capital-intensive projects, but quantifying this is difficult due to a lack of available data. Multilateral development banks based in Europe and North America now have minimal interest in participating in new coal projects, even for HELE plants.

- The AIIB and NDB are new institutions with huge funding potential of US$15 billion per year. Early collaborations with other western multilateral development banks are on non-coal-based projects, notably hydro- and gas-fired plants. The medium-to-long-term prospects of funding from the AIIB as it gains experience is uncertain for coal. The AIIB will however target only large-scale infrastructure funding and despite adopting nascent environmental guidelines, HELE coal or clean coal technology funding is not excluded.
- With respect to power generation, development criteria could now be secondary to environmental and climate criteria for multilateral development banks.
- A withdrawal of MDB funding from coal projects in low and middle income countries lacking cost-effective renewable and gas resources could slow the development of reliable sources of low cost electricity. Lack of electricity is a major obstacle to economic development, especially in industrialising economies.

8 Discussion and conclusions

8.1 The role of energy in industrial development

Few countries have achieved high levels of income per capita without relatively high levels of electricity production. Electricity production of 100 kWh per person is associated with an average income of about US$800 per year per person. At 1000 kWh per person, average income is about US$3200 per year and at 10,000 kWh, the average income is US$31,000 per year (Morris and Pizer, 2013). However, correlation is not causation, and per capita GDP ignores the distribution of income, and a cross-section is not as informative as the history of individual country experiences. It may well be possible to create outcomes with lower electricity use at higher incomes, but there are no examples to date. The AfDB estimated the economic cost of a lack of access to reliable energy at 1–4% of GDP in African countries. This is determined by the cost of running backup generation and the production foregone from power outages (Foster, 2010; Morris and Pizer, 2013). The World Bank's Enterprise Survey cites the availability of electricity as the leading problem facing businesses in low income countries, with nearly one in four businesses identifying it as their largest obstacle (*see* Figure 16). The two critical goals of the Bank's development mandate are: to eliminate extreme poverty and to increase the incomes of the poorest 40% worldwide.

World Bank's Enterprise Survey states electricity is the leading obstacle facing businesses in low income countries, with 25% of businesses identifying electricity as a key issue, ahead of access to finance, political instability, taxation and corruption. Where hydro and geothermal are limited, fossil fuels are necessary for firm capacity. The proportion of generation that comes from non-intermittent power, such as thermal generation, has been associated with overall economic development in the past century (Morris and Pizer, 2013).

A majority of the World Bank's client countries borrow using low-cost concessional lending from the International Development Association (IDA). The nations that use the IDA are usually economically and energy poor. They do not have the means to self-finance large scale infrastructure projects and therefore depend on the expertise and competence provided by foreign lenders. In 2013, 82 countries were home to 1.8 billion of the world's poorest people living on less than US$2 per day; two-thirds of this population lack access to electricity. Many millions more will be existing on little more than this threshold. Energy poverty has direct effects on health and leads to 3.5 million premature deaths every year. Up to 91% of the population lack access to electricity in the poorest countries such as Malawi and Uganda (Morris and Pizer, 2013).

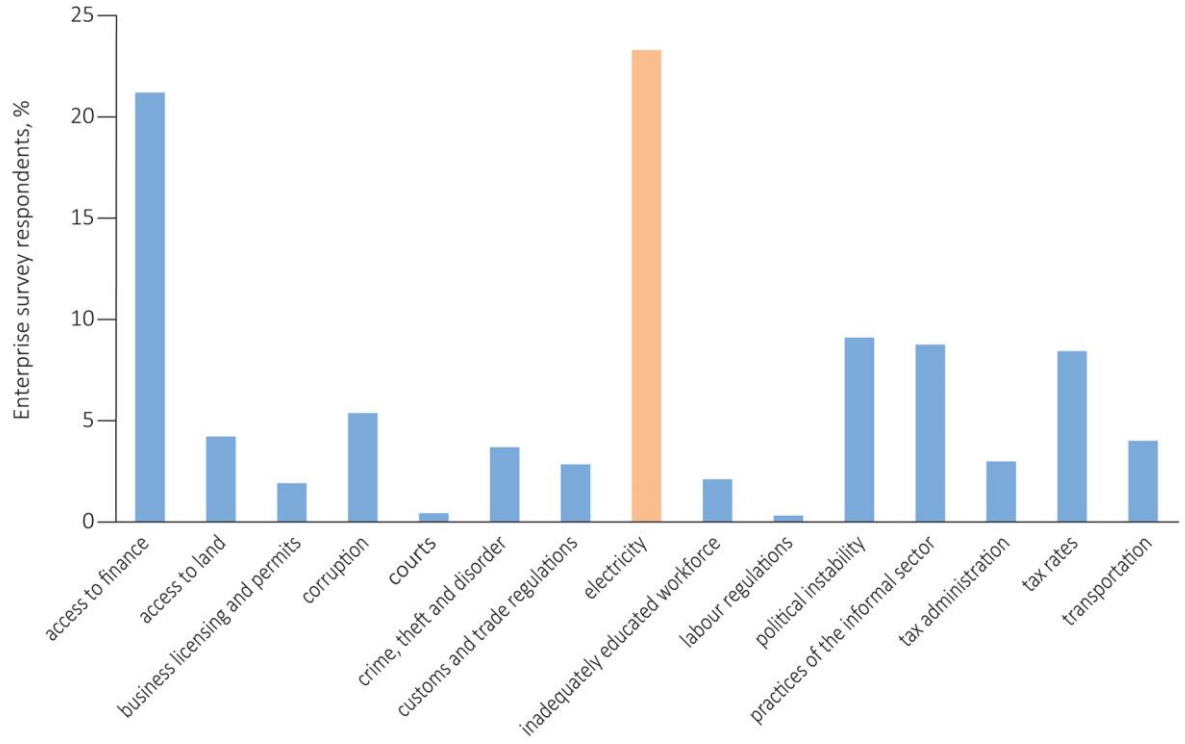

Figure 16 Obstacles to business in low-income countries (Morris and Pizer, 2013)

In many regions of the world, coal-fired power remains a cost-effective means of electricity generation. In March 2015, the AfDB's president Donald Kaberuka, announced that the region "*did not have the luxury*" of ruling out polluting fuels in favour of costlier renewables such as wind and solar. "*It is hypocritical for western governments who have funded their industrialisation using fossil fuels, providing their citizens with enough power, to say to African countries you cannot develop dams, you cannot develop coal, just rely on these very expensive renewables…*" (Landberg, 2015).

Furthering the development of the poorest countries is a strong motivation for the typical MDB. The AfDB mobilised lending of US$1.8 billion for energy-related infrastructure in 2014, including US$350 million for renewables. It has been argued that Europe must not be too hasty to adopt 'ideological' policies on funding low carbon intensity projects without consideration of all the factors. For example, out of 200 projects funded by the EBRD between 2006-12, only two were coal plant refurbishment to increase efficiency. Some 80 of the 200 schemes were renewables. The emphasis on renewable energy remains strong for the EBRD, and the threat of criticism of a small number of coal projects may be obstructive (Macalister, 2013).

Striking the balance between sustainability and economic development goals may lead to compromises. The withdrawal of funding from low income countries developing a coal sector due to a lack of cost-effective alternatives could exacerbate slow economic and welfare development. No country has yet demonstrated a development approach that excludes fossil fuels or nuclear power unless they have abundant geothermal or hydroelectric energy for the bulk of their generation. As Kim Yong Kim, President of the World Bank stated "*…there's never been a country that has developed with intermittent power.*" (Glinski, 2014).

Thus, in many poor countries where electricity supply is a constraint to growth, fossil fuels are necessary for firm capacity and coal-fired power generation remains essential in many cases. For this reason, seminal reports such as MIT's Future of Coal report published back in 2007 argue that coal will remain indispensable for the medium term (MIT, 2007). Among the 191 countries in the UN energy statistics database in 2009, all but five had power sectors that depended on a combination of fossil fuels, nuclear, hydroelectric dams, or geothermal energy for more than 90% of their power generation (Morris and Pizer, 2013).

8.2 Conclusions

In 2013, a number of high-profile multilateral development banks announced an apparent end to the financing of new coal-fired power stations. The detail of the policy however showed that financial support for greenfield coal plants was not banned, but could be supported in certain exceptional circumstances. Similar guidelines were adopted by OECD members with respect to export credit agencies when supporting overseas coal power projects. However, published data suggest multilateral development banks are not the main sources of funding for coal projects worldwide. In 2014, the commercial banking sector provided approximately US$140 billion of funding and services such as underwriting for coal power and mining companies, while multilateral development banks provided less than US$1 billion. Other funding institutions such as export credit agencies and bilateral development banks funded around US$6–10 billion. While public finance institutions provide relatively little direct financial support, their participation in projects can still be important for attracting private sector funding. Due to a lack of available data this influence on the commercial sector is difficult to quantify and is outside the scope of this report.

Furthermore, western multilateral development banks can still act as guidance for financial institutions in other sectors such as for some commercial banks and export credit agencies. However, in reality, lending policies for coal-related investments vary from sector to sector. A growing number of Western commercial banks appear to have a strict stance on investing in coal mining, such as mountaintop removal. In terms of lending to power projects, most international commercial banks do not explicitly exclude lending to new or existing coal power projects as a policy, although there are a small number of exceptions. All banks carry out environmental impact assessments (EIA) as well as detailed due diligence, and there is a growing trend to adopt voluntary environmental guidelines such as the Equator Principles. Under these circumstances, power projects are still subject to local issues such as EIA and community stakeholder engagement which will still prove challenging for all fossil fuel investments.

Bilateral finance institutions in Asia, such as export credit agencies and development banks, have the willingness and resources to provide funding for coal power, and show little sign of retreating from these investment opportunities. Ninety per cent of new coal plants will be in Asia, and 70% of them will be in China and India. The larger Asian economies will use mainly domestic finance while smaller economies seeking large scale debt will turn to overseas funding. Funding is rarely sourced from a single bank, and instead developers will use a combination of debt from a syndicate. Debt generally forms a bulk of the funding for any infrastructure development project, typically exceeding 80% of the total project fund.

Equity generally accounts for the balance of the funding, but financial institutions in China are showing a greater appetite for equity in future funding plans.

In terms of future funding, the IEA (2015c) estimates that coal power projects will require US$1.6 trillion of investment worldwide between 2013 and 2040. This is equivalent to an annual funding of US$59 billion per year. This projected figure for investment is less than that seen in past years, but it is nonetheless significant and indicates an ongoing and considerable opportunity for HELE investments by the international financial community.

It seems clear from the data provided in this report that Asian banks are willing and able to finance greenfield coal power projects in low and middle income economies. Financial institutions based in China, Japan and Korea are well-placed both geographically and economically to offer competitively priced power plants by benefiting from ready access to both finance and heavy engineering manufacturers. Occasionally, Asian banks and development agencies offer low cost affordable loans with long repayment terms, and payment can be deferred for anywhere up to five years. However, the notion that these banks can severely undercut western banks is not entirely accurate and finance terms and conditions vary depending on the bank and the particular project. Asian banks may not always demand sovereign guarantees or market restructuring as conditions of lending in a way multilateral development banks like the World Bank may require.

However, debt finance from Asian banks may have other commercial conditions attached, and many contracts associated with an overseas power project are agreed on the lender's terms. For example, large EPC contracts to supply or maintain boilers, turbines or generators might be awarded to a list of preferred companies from the country that is offering the finance. Finance agreements to build infrastructure might simultaneously secure rights to natural resources in the country where the project is located, such as oil and gas. This arrangement can be especially important for Asian economies like China, Japan and Korea which are keen to lend, but lack natural resources themselves.

A positive consequence is that much of this funding is linked to HELE coal plants. The majority of coal-fired capacity being funded by Chinese, Japanese, and Korean banks is for supercritical plants or better. Japan and Korea will still be governed by OECD rules that mandate HELE designs, and China is driven to promote similar designs based on the country's own domestic market goals to develop HELE coal technologies. It appears that Asian support for HELE technology is generally consistent with western multilateral development banks and credit agencies.

The choice of technology depends on the affordability and needs of the market in developing Asia. Western equipment manufacturers are global companies and continue to have a role in Asia, and also participate in projects funded by Asian banks and so new opportunities are still being created in a post-COP21 era. While poorer nations are in various states of industrialisation, all are on a challenging path to balance energy security, energy equity (accessibility and affordability), and environmental sustainability. To help build secure energy supplies, the development of new coal-fired power plants in emerging economies is ongoing

and it is clear that funding is being made available from Asian export credit agencies and development banks with the backing of large-scale industrial manufacturing.

Despite multilateral development banks seeing their share of funding to coal-related projects diminish, the World Bank and ADB are still involved in projects in lower income countries such as Kosovo, India and Pakistan. Improving economic development and social empowerment for the world's poorest regions is an important goal for these organisations. Elsewhere, the funding gap left by multilateral development banks is not colossal, and the scale of finance being provided by Asian export credit agencies and development banks more than offsets any losses resulting from the withdrawal of the multilateral development banks. The weight of expectation on the newly formed AIIB to lend to coal-power projects could intensify as the needs of the bank's members from low and middle income countries in Asia continue to develop HELE coal-based electricity into the future. HELE technology investments boosted by Asian financial institutions will help economies in many parts of the world avoid installing less efficient designs and pave a way to a lower carbon economy. Moreover, Asian banks could build a fleet of HELE coal stations in non-OECD countries rarely seen in OECD North America and Europe while simultaneously achieving development goals, energy security and affordability for the world's poor.

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