Still Undermining Our Future?!

A Case Study for Fair Finance Guide International

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RESEARCH & ADVICE

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Methodology

1.1 Introduction

This chapter provides an overview of the methodology used for this research project. First section 1.2 discusses the objective and scope of the research project. Section 1.3 then presents the selection of French banks, while section 1.4 discusses which energy sectors are included in this research project as well as the companies selected within these sectors. Section 1.5 describes the types of financing and investments analysed in this research project, and section 1.6 is explaining how specific financing and investment amounts are assigned to each financial institution. Finally, section 1.7 discusses the data sources used and the currency used to report on the research findings.

1.2 Objective and scope

The objective of this research project is to quantify how the main banks in France are dealing with their responsibility to mitigate climate change, by analysing their loans to, and investments in, companies active in various ways of energy generation. These loans and investments are grouped in four categories:

- Loans;
- Underwritings;
- Shareholdings; and
- Bondholdings.

The research project focuses on all global economic sectors involved in energy generation, categorised in three categories:

- Climate change mitigating sectors;
- Climate change inducing sectors; and
- Other energy sectors.

For the two-year period 2016-2017 the research project calculates, for each financial institution and for each category of loans and investments, the proportion of financing geared towards *Climate change mitigating sectors* and the proportion geared towards *Climate change inducing sectors*. For ease of communication, these two groups of sectors are indicated as "Fossil fuels" and "Renewable energy" in the analyses in this report.

All credits and underwritings provided by the selected financial institutions to the selected energy companies from January 2016 to the end of December 2017 are taken into account. For shareholdings and bondholdings the available quarterly data in this time period were used, which also allows for a trend analysis within the two year-period.

The financial institutions are ranked on the basis of their *Fossil fuels* proportions and the consolidated financing proportions for the full group are calculated for each loan and investment category. And where possible a comparison is made with the findings of the Fair Finance Guide International study *Undermining our Future*, published in November 2015, to assess if financial institutions have changed their financing and investment patterns after the Paris Agreement on climate change (concluded in December 2015).

While this study focuses on the way in which the main banks in France are dealing with their responsibility to mitigate climate change, for practical reasons the scope of the research project does not include all aspects which could be of relevance. The study is clearly focused on direct loans to, and investments in, energy generating companies and their direct equipment suppliers. This means that, inter alia, the following aspects are not included in the scope of this research project:

- Indirect financing of energy companies, for instance through investments in bonds issued by other financial institutions (including multilateral development banks);
- The financing of companies engaged in research and development directed towards reducing the impact of existing energy sources or developing new sustainable energy sources;
- The GHG emissions caused by financial institutions through their own operations (offices, travel, etc.), as these are limited compared to financed emissions;
- Loans to, and investments in, other economic sectors which also might have an important impact on global GHG emissions;
- (Mortgage) loans to private customers and advisory services linked to these.

1.3 Selection of financial institutions

The *Fair Finance Guide International* consists of coalitions of civil society organizations from nine countries. Three coalitions participated in this research project: France, the Netherlands and Sweden. Each coalition focuses their study on several financial institutions with local operations in the coalitions' respective countries. All financial institutions selected by the participating coalitions were included in the research project – see Appendix 1 for an overview. The following financial institutions were selected by the French Fair Finance Guide coalition for this research project:

- Banque Postale
- BNP Paribas
- BPCE Group
- Crédit Agricole
- Crédit Coopératif
- Crédit Mutuel – CIC Group
- La Nef
- Société Générale

The findings on these financial institutions are discussed in this report. The loans and investments of all subsidiaries, inside and outside France, of these banks were included in the research.

All selected financial institutions were given the opportunity to provide feedback on the draft findings of the research project. The collected financial data identified for each of the selected financial institutions was sent to these institutions for verification. In addition, financial institutions were requested to provide details on their additional investments in renewable energy projects.

1.4 Selection of sectors and companies

This section provides an overview of the approach behind the selection of the companies included in this study. Section 1.4.1 explains which sectors - and within these sectors: which energy sources - are included in this study. It also explains which sectors and energy sources are considered as *Climate change mitigating sectors* and which sectors and energy sources are considered as *Climate change inducing sectors*. Section 1.4.2 details which energy sources and sectors are seen as *Other energy sectors*, which means that loans to and investments to companies operating in these sectors are not taken into account in this research project.

1.4.1 Selected sectors and energy sources

According to the United Nations Framework Convention on Climate Change (UNFCCC), in 2016 81% of all GHG emissions (excluding land-use, land use change and forestry, LULUCF) [i] were attributable to the use of energy. Within this sector, 36% of GHG emissions originated from power generation, 26% from transport, 14% from manufacturing industries and construction, 12% from other sectors, 10% from fugitive emissions from the production of fuels and 2% from other sources not specified.[1]

As of 2016, electricity and heat generation accounted for 36% of total GHG emissions in the energy sector, and 29% of total GHG emissions (excluding LULUCF) for countries party to the UNFCCC. As such, power generation constitutes the core sector of this research. This study further focuses on sectors that can be considered as inputs for power generation and/or for energy used in transport, manufacturing industries and construction, and fugitive emissions from the production of fuels. Together these sectors are relevant for more than 60% of GHG emissions attributable to energy use and 49% of total global GHG emissions.[2]

The following paragraphs further explain which sectors and energy sources were selected and whether they are considered as *Climate change inducing sectors* or as *Climate change mitigating sectors*. Furthermore, for each sector the scope of company selection within those sectors and the selection strategy is explained.

- **Power generation**

  Power (also called electricity) can be generated through various sources. Not all sources of power generation emit GHGs. Power generation sources include, but are not limited to, the following:

  - Biomass
  - Coal
  - Gas
  - Geothermal energy
  - Hydro power
  - Nuclear energy
  - Ocean energy
  - Oil
  - Solar

[i] LULUCF refers to GHG emissions from land-use, land use change and forestry. More information on the definition and inclusion of LULUCF in GHG emission calculations can be found here: https://unfccc.int/land_use_and_climate_change/lulucf/items/1084.php.

- Wind

A growing number of power generation companies are diversifying the composition of their generating capacities across different energy sources. This is partly stimulated by awareness of climate change issues, partly through consumer and shareholder pressure and partly through government incentives.

From the sourcing of materials or fuels, to construction, to operation and waste management, different electricity generation technologies emit different levels of GHG. When emissions of all these processes are taken together, they are known as the life-cycle emissions of a certain electricity generation technology. In the context of its fifth assessment report on climate change mitigation, Working Group III of the IPCC assessed different electricity generation technologies and developed an overview of the life-cycle emissions, as shown in Table 1. The GHG emissions are expressed in grams of CO_2-equivalent, comparing their climate change impact per gram to that of CO_2. The grams of CO_2-equivalent emitted per kilo Watthour produced are then calculated (gCO_2eq/kWh).

There has been some debate regarding steps in the life-cycles of some technologies not being included, and that technological advances that occurred while IPCC was conducting its study have also not been included. Alternative evaluations of life-cycle emissions also exist. However, the IPCC assessment is currently the most comprehensive. It is therefore the basis for our assessment of different sectors and energy sources in this research project.

Table 1 Life-cycle emissions of electricity generation technologies (gCO_2eq/kWh)

Current commercially available technology	Minimum	Median	Maximum
Coal – pulverized coal	740	820	910
Gas – combined cycle	410	490	650
Biomass – co-firing	620	740	890
Biomass – dedicated	130	230	420
Geothermal	6	38	79
Hydropower	1	24	2,200
Nuclear	3.7	12	110
Concentrated Solar Power (CSP)	8.8	27	63
Solar PV – rooftop	26	41	60
Solar PV – power generation	18	48	180
Wind onshore	7	11	56
Wind offshore	8	12	35

Source: Intergovernmental Panel on Climate Change (2015, February), Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, New York: Cambridge University Press, p. 1,335.

Table 2 provides an overview of the electricity generation technologies that this research considers as Climate change mitigating sectors, because of median life-cycle emissions of below 50 grams of CO_2 equivalent per kilowatt hour, and which are considered as Climate change inducing sectors. It further provides an overview of other electricity generation technologies, which are not included of either of these two categories (explained further in section 1.4.2).

Table 2 Climate change inducing and mitigating electricity generation technologies

Climate change mitigating	Climate change inducing	Other
Geothermal	Coal – pulverized coal	Biomass – co-firing
Concentrated solar power (CSP)	Gas – combined cycle	Biomass – dedicated
Solar PV – rooftop	Oil	Hydropower
Solar PV – power generation		Nuclear power
Wind onshore		
Wind offshore		
Ocean and tidal energy		

For the company selection for this research project, a list of the 25 largest power generation companies worldwide was developed based on their total installed capacity as of 2016 and 2017. This selection was developed based on previous research and annual reporting from the companies.

Additionally, this research developed a selection of power generation companies accounting for 75% of the domestic market of each of the FFG coalition countries participating in this study. This list was selected based on company reports, industry reports and Thomson Reuters Eikon.

As most power generation company make use of different power generation technologies, the loans to and investments is these companies need to be distributed over the three sectors we distinguish: *Climate change mitigating sectors*, *Climate change inducing sectors* and *Other energy sectors*.

- **Coal mining**

  Coal is used as an input for power generation, which accounts for 36% of all GHG emissions in the energy sector, and 29% of total GHG emissions in 2016 for countries party to the UNFCCC.[3] Coal is also used as input for other industrial processes. The most significant other uses of coal are in steel production, cement manufacturing and liquid fuel. As such its impact on GHG emissions is far greater than simply as an input in power generation.

  As Table 1 shows, coal used for electricity has a median life-cycle GHG emission of 820 grams of CO_2 equivalent per kilowatt hour. It is therefore considered a Climate change inducing source of electricity. Coal mining can also have negative impact on the environment through damage to ecosystems, deforestation, and pollution. Additionally, coal mining can also have negative impacts on communities, including land grabs, loss of livelihoods, and forced displacement.

  For the company selection of this research, a list of companies accounting for an average of 75% of the global coal mining industry by revenues and assets was developed using Bloomberg, Thomson Reuters Eikon and the Platts Top 250 Global Energy Company Rankings.

- **Oil and gas production and refining**

  Oil and gas are used in both the transport and the power generation sectors. Together, these sectors accounted for 62% of GHG emissions in the energy sector, and 51% of total GHG emissions.[4] Oil and gas are also used as energy sources in many other sectors and as inputs for other chemical processes.

As shown in Table 1, gas as an input for electricity generation has a median life-cycle GHG emission of 490 grams of CO_2 equivalent per kilowatt hour. While this is lower than coal, it is still well above the threshold of this study of 50 grams of CO_2 equivalent per kilowatt hour. It is therefore considered a Climate change inducing source of electricity. Furthermore, oil and gas extraction can have negative impacts on the environment through damage to ecosystems, deforestation, and pollution. Additionally, oil and gas extraction can also have negative impacts on communities including land grabs, loss of livelihoods, earthquakes, and forced displacement.

For the company selection of this research, a list of companies accounting for an average of 75% of the global oil and gas exploration and production industry by revenues and assets was developed using Thomson Reuters Eikon and the Platts Top 250 Global Energy Company Rankings.

- **Solar power equipment manufacturers**

  Solar power is a renewable source of energy. Solar power can be derived from solar photovoltaic panels and from concentrating solar thermal power. Different sources of solar electricity have different levels of GHG emissions (see Table 1). Concentrated solar power has a median life-cycle GHG emission of 27 grams of CO_2 equivalent per kilowatt hour. Solar PV used by power generation companies has a median life-cycle GHG emission of 48 grams of CO_2 equivalent per kilowatt hour. Rooftop solar PV have a median life-cycle GHG emission of 41 grams of CO_2 equivalent per kilowatt hour. Manufacturing solar power equipment is thus considered a Climate change mitigating sector.

  The process of manufacturing photovoltaic cells can include the use of toxic chemicals. In addition, the production process is linked to potential issues identified generally in the production of most electronic goods. Given that the assumption that the potential impact is less than the overall benefit produced, and that solar power equipment manufacturing has low life-cycle emissions, this sector is included in this study.

  For the company selection of this research, a list of companies considered the leading producers of solar PVs was developed using REN21 publications and Thomson Reuters Eikon. A list was similarly developed of the leading producers of concentrated solar thermal power (CSP) using REN21 publications.

- **Wind turbine manufacturers**

  Wind power is a renewable source of energy. Different sources of wind generated electricity have different levels of GHG emissions (see Table 1). Onshore wind power has a median life-cycle GHG emission of 11 grams of CO_2 equivalent per kilowatt hour. While offshore wind power has a median life-cycle GHG emission of 12 grams of CO_2 equivalent per kilowatt hour. Manufacturing wind turbines is thus considered a Climate change mitigating sector.

  For the company selection of this research, a list of companies considered leading producers of wind turbines was developed using REN21 publications.

- **Geothermal energy equipment manufacturers**

  Geothermal energy is renewable source of energy. As demonstrated in Table 1, geothermal energy has a median life-cycle GHG emission of 38 grams of CO_2 equivalent per kilowatt hour. Manufacturing geothermal equipment is thus considered a Climate change mitigating sector.

  For the company selection of this research, a list of major geothermal energy engineering companies and geothermal power plant operators was developed using REN21 publications and industry reports.

- **Ocean energy engineering**

  Ocean energy is an emerging energy sector. Both tidal stream generators and barrage tidal energy are methods to capture ocean energy. Tidal stream generators function similarly to wind turbines as they capture the incoming and outgoing stream of energy from tides. Barrage tidal energy is similar to hydroelectric dams, as structures are built across bays and estuaries to force tidal energy through turbines situated in the barrage.

  As with hydro power, the impact on the environment, particularly on natural ecosystems, is potentially significant. Nevertheless, a review on studies on the life-cycle GHG emissions of ocean energy estimates that the median is around 17 grams of CO_2 equivalent per kilowatt hour (gCO_2/kWh) and could be as low as 8 gCO_2/kWh.[5] Given these results and the technical potential of this energy source as an alternative source of energy, ocean energy has been included in this study as a Climate change mitigating sector.

  For the company selection of this research, a list of major ocean energy engineering companies was developed using REN21 publications.

1.4.2 Other energy sectors

Apart from the *Climate change inducing sectors* and the *Climate change mitigating sectors* defined in section 1.4.1, three sources of energy are not taken in consideration in this research project: nuclear energy, hydropower and bio energy. These sources of energy are not considered viable alternatives to fossil fuels for energy used in power generation and transport as they are considered to have a high impact on the environment or because there is limited consensus on the impact level of these energy sources. This section further discusses these three other energy sources and the rationale not to include them in this research project.

- **Nuclear energy**

  Nuclear power is seen by some as a sustainable source of energy because its energy generation is climate-neutral. It produces relatively insignificant amounts of GHGs, is comparatively cheap to run, and is a stable source of energy. However, many controversies surround nuclear power.

  Recent studies suggest that as uranium ore grades decrease, fossil fuel inputs in the nuclear fuel cycle will increase. As such, within a few decades, the GHG emissions in the nuclear fuel cycle will be similar to that of traditional coal-fired or gas-fired power plants.

  Further risks include the risks and environmental damage from uranium mining, processing and transport, the risk of nuclear weapons proliferation, the unsolved problem of nuclear waste and, although many countries have a good track record, the potential hazard of a serious accident.

  As shown in Table 1, current estimations suggest that nuclear energy has a median life-cycle GHG emission of 12 grams of CO_2 equivalent per kilowatt hour. However, due to the potential negative impacts, and the consensus among FFG coalition partners that nuclear power is not a viable alternative to traditional fossil fuels, nuclear energy is not included in this study.

- **Hydropower**

  Hydropower is often considered a sustainable source of energy, because as a renewable source, it has less GHG emissions from energy generation than traditional fossil fuels. However, hydro power is often controversial. Hydropower projects, both large and small, have a significant impact on the environment, altering habitats, as well as having a potentially great impact on communities and their socioeconomic conditions. Communities are often displaced without (or with inadequate) compensation, and livelihoods are lost. It is therefore not sustainable in the social and economic sense of the word, and does not respect human rights, in all contexts.

  As Table 1 demonstrates, hydropower has a median life-cycle GHG emission of 24 grams of CO_2 equivalent per kilowatt hour, which is quite low. However, hydropower also has a maximum life-cycle GHG emission of 2,200 grams of CO_2 equivalent per kilowatt hour. This is more than double the maximum life-cycle GHG emission of pulverized coal. Such high levels of life-cycle GHG emission per kilowatt hour are generally reached by large-scale hydropower. Few countries are still constructing such large-scale hydropower projects.

  Small-scale run-of-the-river hydro power is seen as having fewer negative social and environmental impacts than large-scale hydropower. However, different countries and organizations use different minimum thresholds to differentiate between small-scale and large-scale hydropower. Table 4 provides an overview of the different definitions of small-scale hydropower.

Table 3 Definitions of small-scale hydropower

Country	Threshold (MW)
Brazil	≤ 30
Canada	< 50
China	≤ 50
European Union	≤ 20
India	≤ 25
Norway	≤ 10
Sweden	≤ 1.5
United States	5-100
WWF	< 15

Source: Kumar, A., T. Schei, A. Ahenkorah, et al. (2011), "Hydropower", in O. Edenhofer, R. Pichs-Madruga, et al. (eds), *IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation*, Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, p. 450; WWF (2003), *Hydropower in a Changing World*, p.3.

Many other factors influence the amounts emitted, depending on the geographical location, the age of the reservoir, external inputs of carbon and nutrients, and characteristics of the reservoir such as water flow, turnover time, area, depth, water level fluctuations and the positioning of the turbines and spillways. Dams in tropical areas for example emit more methane than do those in temperate or boreal areas.[6] Experts also suggest that the environmental impact per megawatt (MW) is dependent on the measures taken to mitigate the negative impact. It is beyond the scope of this research to investigate the impact per MW of each hydropower plant in the power generation portfolios of all selected power generation companies for the period under study. Moreover, as there is no consensus on the definition of small-scale hydropower, it was decided that hydropower would not be included in this study.

- **Bio energy**

  Biomass energy and biofuels are derived from various sources. The term refers to biological matter that can be used as fuel for electricity generation and for transport. This can range from wood and plants to alcohol. Biomass is turned into energy through burning.

  Biomass is regarded by some as a renewable energy source because the carbon in biomass is considered as part of the natural carbon cycle. This is because trees take in carbon dioxide from the atmosphere and convert it into biomass and when they die it is released back into the atmosphere. Whether trees are burned or whether they decompose naturally, the same amount of carbon dioxide is released. The idea is that if trees harvested as biomass are replanted as fast as the wood is burned, new trees take up the carbon produced by the combustion, the carbon cycle theoretically remains in balance, and no extra carbon is added to the atmospheric balance sheet. Therefore, biomass is considered "carbon neutral." Replacing fossil fuels with biomass is thought to result in reduced carbon emissions.

  However, whether or not biomass is truly carbon neutral depends on a number of factors:

  - what type of biomass is used,
  - the combustion technology,
  - which fossil fuel is being replaced, and
  - what forest management techniques are employed where the biomass is harvested.

  Combustion of biomass and fossil fuels both produce carbon dioxide. When annual crops and other short-term biomass are burned, the carbon generated can generally be absorbed by the growing of new plants. However, when the biomass comes from wood and trees, the re-growing and thus the recapture of carbon take years or decades, and the carbon equation would need to take into consideration the carbon that the trees would have naturally stored if left untouched. This is particularly problematic as the majority of existing biomass power plants currently use wood residue.

  Furthermore, as with biofuels, described below, biomass is affected by a number of social and environmental issues. As described above, biomass can include agricultural waste, production forest wood chips, and wood pellets, among other things. Issues generally tend to arise when wood is being cultivated in order to produce wood pellets. There are numerous reports of forest destruction (also leading to CO_2 emissions) for eucalyptus monoculture development, land grab, and loss of livelihoods.

  Another form of bio energy is biofuels. Biofuels can come in different forms, including ethanol and biodiesel. They are derived from different feed stocks including sugar beets, sugar cane, soy, palm oil, wheat, corn, and jatropha. However, the biofuels sector is afflicted by numerous controversies. Again, there are significant concerns including issues regarding food security, deforestation, legality of operations, human rights and labour issues, community displacement and land grabs, loss of livelihoods, the impact of monoculture on ecosystems, and soil degradation.

  Due to these controversial issues regarding biomass and biofuels, and the consensus among FFG coalition partners that bio energy is not a clear-cut viable alternative to traditional fossil fuels it is not included in this research project.

1.4.3 Final selection of sectors and companies

Table 4 presents the final categorisation of energy sources and sectors for the purpose of this study. The *Climate change inducing sectors* are referred to as "Fossil fuels" in the financing analysis, while *Climate change mitigation sectors* are referred to as "Renewable energy". Based on the discussion in section 1.4.2, three sources of energy are defined as *Other energy sectors* and are not taken into account in the financing analysis.

Table 4 Categorisation of Climate change mitigating and Climate change inducing sectors

Climate change mitigating sectors	Climate change inducing sectors	Other energy sectors
Geothermal energy equipment manufacturing	Coal mining	Bioenergy
Solar panel manufacturing (PV and CSP)	Oil (production and refining)	Hydropower
Wind turbine manufacturing	Gas (production and refining)	Nuclear power
Ocean energy engineering	Coal-fired power generation	
Geothermal energy generation	Gas-fired power generation	
Solar energy generation	Oil-fired power generation	
Wind power generation		
Ocean energy generation		

Representing the sectors identified in Table 4, a large number of companies was selected for this research project, based on the selection criteria explained in section 1.4.1. Several of the selected companies have significant activities in multiple sectors and are therefore repeated for each of the sectors relevant to this study in which they are active. The full overview of the 292 selected companies is provided in Table 7 in Appendix 1 .

1.4.4 Renewable energy projects

In several countries, the most significant drivers of a shift to renewable energy are not the established power generation companies which account for the dominant share of the national power generating capacity. Rather, renewable energy generation is developed by small and medium sized enterprises, and special purpose vehicles focussing specifically on developing renewable energy projects.

Given the relevance of these renewable energy projects to this study on the trends of financing to renewable energy and fossil fuels, a separate selection of renewable energy projects was made for this research project. Only renewable energy projects based on geothermal, solar and wind energy sources were included.

The top-10 projects by value were included per coalition country - France, the Netherlands and Sweden - per year between 2016 and 2017. Additionally, the top-25 projects globally per year between 2016 and 2017 that meet the above specified criteria were also included. Financial institutions in each coalition country were given the opportunity to add relevant renewable energy projects to the list. Overlap occurred sometimes for two reasons:

- Some projects selected for a coalition country also figured in the global top 25 of projects; and
- Some projects were developed by a (subsidiary of) a power generation company already included in the company selection.

In cases of overlap, the next project on the list was included. Table 8 in Appendix 1 provides an overview of the 85 selected renewable energy projects. This list does not include additional projects that were taken into account after being provided directly by financial institutions.

Information available from the commercial database IJGlobal was used to identify relevant projects, the involved financial institutions, and their financial commitments. Only deals that have been finalised were included. The analysis of the loans provided by financial institutions to these renewable energy projects is integrated in the analysis of loans provided to the selected energy companies (Table 7) and is not discussed separately. Although syndicated equity can be a significant source of financing for such projects, this could not be included as the participants are often not disclosed. Due to lack of data availability, this type of financing was not included.

1.5 Types of investments and financing

Financial institutions such as banks can be involved in financing the selected companies through providing them loans and other credits, discussed in section 1.5.1. They can also help companies raising capital by underwriting share issuances (section 1.5.2) or bond issuances (section 1.5.3). Financial institutions can also invest - on their own behalf or on behalf of their clients - in the equity and debt of a company by holding shares (section 1.5.4) or bonds (section 1.5.5). The following sub-sections outline the different types of financing and investments, how data were collected and how trends are analysed in this report.

1.5.1 Loans and other credits

Companies can borrow money from a bank, through a loan or other form of credit. Loans can be either short-term or long-term in nature. Short-term loans (e.g. trade credits, current accounts, leasing agreements) have a maturity of less than a year. They are mostly used as working capital for day-to-day operations. Short-term loans are often provided by a single commercial bank.

A long-term loan has a maturity of at least one year, but more often of three to ten years. Long-term corporate loans are particularly useful to finance expansion plans, which only generate rewards after a certain period. The proceeds of corporate loans can be used for all activities of the company. Long-term loans are frequently extended by a loan syndicate, which is a group of banks brought together by one or more arranging banks. The loan syndicate will only undersign the loan agreement if the company can provide certain guarantees that interest and repayments on the loan will be fulfilled.

- **Project finance**

  One specific form of corporate loans is project finance. This is a loan that is earmarked for a specific project and often is tied to specific conditions. In this research, the purpose of each project finance provided to the selected companies is investigated to determine to which of the three energy sectors it can be attributed (see Table 4).

  Additionally to project finance loans extended to the companies in Table 7, in this research project also the project finance loans to the renewable energy projects included in Table 8. All data on project financing for the renewable energy projects in Table 8 is analysed in combination with other relevant loans to *Climate change mitigating sectors*.

- **Loan for general corporate purposes / working capital**

Long-term loans to companies are often not earmarked for specific projects. In that case, the loan will be reported as being used for "general corporate purposes" or for "working capital". In this research project, for companies which are active in different sectors a method is used to distribute this type of financing over the three energy sectors listed in Table 4. How this is done is discussed in section 1.6.

- **Revolving credit facility**

  Another type of loan is a revolving credit facility. A revolving credit facility provides a company with an option to take up a loan from a bank (or more often a banking syndicate) when it has an urgent financing need. Its function resembles a credit card. Companies can use the revolving facility up to a certain limit, but don't have to. When a company is issuing bonds, investors see the fact that the company has concluded a revolving credit facility with a banking syndicate as a kind of insurance which guarantees that the company can meet its obligations in terms of interest payments and bond repayments.

  The syndicate of banks providing the facility do have the obligation to provide the entire amount of money when the company asks for it. Therefore, even if the company ends up never using the facility, the banks were still involved with the company during the period of the revolving credit facility and would have provided the company with the money when they asked for it. Therefore revolving credits agreed during the research period are considered in the same way as other corporate loans in this research project.

1.5.2 Share issuances

Issuing shares on the stock exchange gives a company the opportunity to increase its equity, by selling the shares to new or existing shareholders. This doesn't only bring more risk-taking capital to the company, but also opens the possibility to attract more loans - as banks usually require a certain minimum equity-debt ratio.

When a company offers its shares on the stock exchange for the first time, this is called an Initial Public Offering (IPO). When a company's shares are already traded on the stock exchange, this is called a secondary offering of additional shares. To arrange an IPO or a secondary offering, a company needs the assistance of one or more investment banks, which will price the shares, write a prospectus and use their network to find buyers.

The most important part of the role of the investment bank in share issuances is the so-called underwriting. This means that the investment bank guarantees to the company that it will buy all issued shares for a guaranteed price at the issuing date. On the same day or in the following days, the investment bank sells the shares for a higher price to private and institutional investors which it has approached in the preceding weeks. The role of the investment bank therefore is only temporary. Nevertheless, its assistance to companies in share issuances is crucial. The investment bank provides the company with access to capital markets (private and institutional investors) and a guarantee that the company can sell its shares at a pre-determined minimum price.

1.5.3 Bond issuances

Issuing bonds can best be described as cutting a large loan into small pieces and selling each piece separately. Bonds are issued on a large scale by governments, but also by companies. Like shares, bonds are traded on the stock exchange. The process of issuing bonds is similar to that of issuing shares. The company needs the assistance of one or more (investment) banks which underwrite a certain number of bonds and sell them to investors.

1.5.4 Shareholdings

Institutional investors, such as insurance companies, pension funds, private banks and asset managers (which sometimes are subsidiaries of a bank), can buy shares of companies listed on the stock exchange, making them part-owners of the company. They can do they this with money on their balance sheet, or by external funds managed by them on behalf of their clients. Both options give the institutional investor a certain level of influence over the company's strategy. The magnitude of this influence depends on the size of the shareholding and the question whether the funds are managed on behalf of a third party.

Shares traded on the stock exchange can easily be bought and sold, which means that (the investment and asset management subsidiaries of) some banks are continuously changing their shareholdings. And even when the financial institution does not buy or sell, the value of their shareholdings can fluctuate because of changes in the share prices. This makes it difficult to analyse if a financial institution is increasing or decreasing its shareholdings in *Climate change mitigating sectors* as well as in *Climate change inducing sectors*.

Therefore, in this research project the development trend of the shareholding values is researched for each bank by looking at the values reported at the end of each quarter in the two-year period 2016-2017. Then the *baseline* value development during the two-year period is calculated for the exact number of shares managed by the bank at the beginning of the period. The baseline will show an increase or decrease of the shareholding values, purely based on changes in the shareprices.

Comparing the actual development trend of shareholding values with the baseline trend, therefore shows if the value of the shareholdings of the bank are increasing or decreasing more than can be explained by share price developments. If this is the case, this points to additional investments or to disinvestments made by the bank. This research project compares these trends separately for the shareholdings of each bank in *Climate change mitigating sectors* and his shareholdings in *Climate change inducing sectors*.

The number of shares owned or managed by a certain bank were preferably retrieved from financial databases on the fund level, after which the shareholdings for the different funds under control of the financial institution were combined. The funds researched include the following three fund categories:

- In-house managed own funds;
- Funds managed on behalf of clients;
- Externally managed own funds.

This may mean that the shareholdings in a specific fund are counted twice, both with the financial institution managing the fund (as a "fund managed on behalf of clients") and with the financial institution owning and marketing the fund (as an "externally managed own fund").

For banks who do not manage funds, data were retrieved at the subsidiary level for all subsidiaries of the financial institution owning or managing shares (such as private banks).

1.5.5 Bondholdings

Institutional investors can also buy bonds of a certain company. The main difference between owning shares and bonds is that owner of a bond is not a co-owner of the issuing company; the owner is a creditor of the company. The buyer of each bond is entitled to repayment after a certain number of years, and to a certain interest during each of these years.

Similar to shares, bonds can be bought and sold from one moment to the next. In financial databases only data on the most recent bondholdings are available, which means that for this research project no analysis of the value development over the two-year period 2016-2017 could be made. The value of bondholdings is therefore only analysed at the end of 2017 date.

The number of bonds owned or managed by a certain bank were preferably retrieved from financial database on the fund level, after which the bondholdings for the different funds under control of the financial institution were combined. The funds researched include the following three fund categories:

- In-house managed own funds;
- Funds managed on behalf of clients;
- Externally managed own funds.

This may mean that the bondholdings in a specific fund are counted twice, both with the financial institution managing the fund (as a "fund managed on behalf of clients") and with the financial institution owning and marketing the fund (as an "externally managed own fund").

For banks who do not manage funds, data were retrieved at the subsidiary level for all subsidiaries of the financial institution owning or managing bonds (such as private banks).

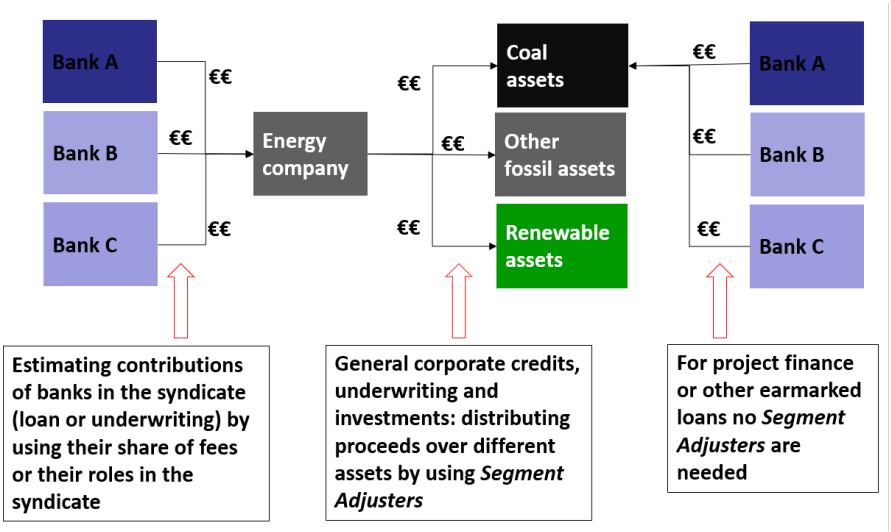
1.6 Assigning loans and investments to the different sectors

This research projects aims to determine which proportion of the energy sector loans and investments of the researched banks as geared towards *Climate change mitigating sectors* and which proportion was geared towards *Climate change inducing sectors* in the research period 2016-2017. To make this analysis, the data collected on loans to, and investments in, the selected companies (Table 7) and projects (Table 8) need to be adjusted in two ways:

- in case of syndicated loans and underwritings, the contribution of each individual bank needs to be assessed: this is discussed in section 1.6.1;
- for companies and projects active in more than one (energy sector), the loan or investment value needs to be distributed across the different sectors in which the company is active: this is discussed in section 1.6.2.

Schematically, these two adjustment steps are clarified in Figure 1.

Figure 1 Assigning loans and investments to the different sectors



1.6.1 Contributions of individual banks in a syndicate

For some syndicate loans and underwritings, the financial databases detail the contributions of all individual banks involved to the total value of the deal. When these contributions are not known, an estimate needs to be made. Usually, the total value of a loan or issuance (the principal amount) is known, as well as the names and roles of all banks that participate in the deal. Sometimes, the feed received per bank are also known. In that case, the ratio of a bank's management fee tis used to estimate its financial contribution to the loan or issuance. This is calculated as follows:

$$\text{Bank's contribution: } \left(\frac{individual\ bank's\ fee}{sum\ of\ all\ banks'\ fees} * deal\ value\right)$$

When the fee is unknown for one or more participants in a deal, the *bookratio* is used first to determine the distribution between the number of bookrunners (the banks arranging the deal) and the other banks participating more passively in the syndicate. The *bookratio* is calculated as follows:

$$\textit{Bookratio: } \frac{number\ of\ banks - number\ of\ bookrunners}{number\ of\ bookrunners}$$

0 shows which part of the total deal value is assigned to the bookrunners, depending on the bookratio calculated. It shows that for loan syndicates, the share that is attributed to the bookrunners decreases when the number of total banks in the syndicate increases. For issuance syndicates this is not the case. The percentages included in 0 are based on experience gained by Profundo over the years with analysing thousands of loan and issuance syndicates for which the contribution of individual banks were known.

Table 5 Contributions assigned to the bookrunners in loan and issuance syndicates

Bookratio	Loans	Issuances
> 1/3	75%	75%
> 2/3	60%	75%
> 1.5	40%	75%
> 3.0	< 40%*	< 75%*

For loan and issuance syndicates with a bookratio of more than 3.0, we use a formula which gradually lowers the commitment assigned to the bookrunners as the bookratio increases. The formula used for this:

$$\frac{1}{\frac{\sqrt{bookratio}}{1.443375673}}$$

The number in the denominator is used to let the formula start at 40% in case of a bookratio of 3.0. As the bookratio increases the formula will go down from 40%. In case of issuances the figure in the denominator is 0.769800358.

1.6.2 Distribution across the different activities of a company

As explained in section 1.4, the companies in Table 7 in Appendix 1 were selected as a result of their activities in the relevant sectors for this study. However, a number of the selected companies are active in both *Climate change mitigating sectors* and in *Climate change inducing sectors*, and sometimes also in sectors outside the energy industry. For example: many power generation companies operate both fossil fuel-fired power plants and wind farms. Some power generation companies were also active in coal mining, oil and gas, and other sectors. A few oil and gas companies were also engaged in renewable energy. Numerous of the selected mining companies mine for other minerals in addition to coal. Solar equipment manufacturers sometimes also make other, non-energy products.

In the case of project finance this does not require any adjustments. When project finance was identified, this research investigated the purpose of the identified project finance to determine whether it fell within the scope of this research and how to attribute it, to *Climate change mitigating sectors* to *Climate change inducing sectors* or to another sector which is not further researched. If, for example, an oil and gas company attracted project finance for a wind farm, then this financing was attributed to *Climate change mitigating sectors*.

But for other types of financing and investments, *segment adjusters* were used as a way to represent financial institutions' financing of fossil fuels or renewable energy. A general corporate loan to a power company, or an investment in the shares of that same company, can be used by the power company to finance all types of activities it is active. In financial reporting, companies are often required the *segments* they are active in and report their income, costs and investments separately for each segment.

For general corporate loans and investments provided to companies active in more than one segment, this research therefore aimed to estimate which part of the loan or investment was used for *Climate change mitigating sectors,* which part for *Climate change inducing sectors* and which part for other sectors which are not further researched int his research project. To estimate this, this research project calculates *segment adjusters* for each company active in more than one sector.

Due to a lack of data availability, segment adjusters were not calculated in the same way for each company. Preferably, data on the annual capital expenditure (capex) per sector or segment in which the company is active were used. These data are also referred to as the annual addition to non-current assets per sector/segment.

For some companies, capex-data per segment were not available, or the segment classification used by the company was too rough to distinguish between *Climate change mitigating sectors* and *Climate change inducing sectors*. In these cases, the following proxies were used in order of preference:

- for power companies: the installed power generation capacity broken down by energy source;
- segment distribution of assets;
- segment distribution of costs;
- segment distribution of profits;
- an estimate based on the description of the company's activities.

The segment distribution of capex, assets, costs and/or revenues were primarily identified through company filings or investor presentations. Segment adjusters were calculated annually for the period of study, 2016-2017.

After identifying the segment adjusters, these were then multiplied by the financing and shareholding values for the relevant periods. For example, Oil Company A receives a loan from Bank A for USD 100 million in 2017. During this financial year, 95% of Oil Company A's assets were in oil, 3% in wind power, and 2% in not relevant sectors. USD 95 million was therefore attributed to fossil fuels, USD 3 million to renewable energy, and USD 2 million was not included in the analysis.

As the example shows, this research project primarily looks at the proportion of financing attributable to *Climate change inducing sectors* (Fossil fuels) and financing attributable to *Climate change mitigating sectors* (Renewable energy). As all financing attributable to *Other energy sectors* as well as to other non-energy sectors is ignored, the total financing analysed will usually be lower than the actual financing provided to the selected companies.

1.7 Data sources and currencies

1.7.1 Data sources

Information sources used to select companies for this project were annual reports published by the selected companies and industry rankings from Platts and REN21. Renewable energy projects were selected from the IJGlobal database.

Loans, issuances, shareholdings and bondholdings were researched using the financial databases Thomson Reuters Eikon and Bloomberg. Project finance of renewable energy projects was researched using the IJGlobal database.

1.7.2 Currencies

Within this research, all financing identified is discussed in United States dollars (USD). This is the primary currency used by Thomson Reuters Eikon, Bloomberg and IJGlobal databases. Additionally, given the global selection of companies that report in various currencies, for consistency purposes this research project presents the data in United States dollars.

References

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3 United Nations Framework Convention on Climate Change (n.d.), "GHG Profiles – Annex I", online: http://di.unfccc.int/ghg_profile_annex1, viewed in September 2018

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5 Intergovernmental Panel on Climate Change (2015, February), *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, New York: Cambridge University Press, p. 539-540; Lewis, S. Estefen, et al. (2011). "Ocean Energy," in: *IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation*. Prepared by Working Group III of the Intergovernmental Panel on Climate Change [O. Edenhofer, R. Pichs-Madruga, et al. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, p. 518.

6 Fearnside, P.M. (2016, April), "Greenhouse gas emissions from hydroelectric dams in tropical forests". in: *Alternative Energy and Shale Gas Encyclopedia,* [J. Lehr & J. Keeley (eds.)], John Wiley & Sons Publishers, New York, USA, pp. 428-438.

Appendix 1 Selections of financial institutions, companies and projects

Table 6 provides an overview of the selected financial institutions for all three national Fair Finance Guide coalitions participating in this research project.

Table 6 Selected financial institutions

Financial institution	Coalition country
ABN Amro	Netherlands
Achmea	Netherlands
Aegon	Netherlands
Allianz	Netherlands
APG	Netherlands
ASR	Netherlands
Banque Postale	France
BNP Paribas	France
BPCE Group	France
Crédit Agricole	France
Crédit Coopératif	France
Crédit Mutuel – CIC Group	France
Danske Bank	Sweden
De Volksbank	Netherlands
Ekobanken	Sweden
Handelsbanken	Sweden
ING Bank	Netherlands
JAK Medlemsbank	Sweden
La Nef	France
Länsförsäkringar	Sweden
NIBC	Netherlands
NN Group	Netherlands
Nordea	Sweden
Rabobank	Netherlands
SEB	Sweden
Skandia	Sweden
Société Générale	France
Swedbank	Sweden
Triodos Bank	Netherlands
Van Lanschot Kempen	Netherlands
Vivat	Netherlands

Table 7 lists per energy sector the 292 companies selected for this research project.

Table 7 Selected companies for each energy sector

Energy sector	Company name	Country
Coal mining	Adani	India
Coal mining	Adaro Energy	Indonesia
Coal mining	African Rainbow Minerals	South Africa
Coal mining	Agritrade International	Singapore
Coal mining	Alliance Resource	United States
Coal mining	Alpha Natural Resources	United States
Coal mining	Anglo American	United States
Coal mining	Arch Coal	United States
Coal mining	Banpu	Thailand
Coal mining	Baotailong New Materials	China
Coal mining	Bayan Resources	Indonesia
Coal mining	Beijing Energy Investment Group	China
Coal mining	BHP Billiton	Australia
Coal mining	Bukit Asam	Indonesia
Coal mining	Bumi Resources	Indonesia
Coal mining	China Energy Investment Corporation*	China
Coal mining	China Huadian Corporation	China
Coal mining	China Huaneng Group	China
Coal mining	China Kingho Energy Group	China
Coal mining	China National Coal Group (ChinaCoal)	China
Coal mining	China Pingmei Shenma Energy	China
Coal mining	Cloud Peak Energy	United States
Coal mining	Coal India	India
Coal mining	Consol Energy	United States
Coal mining	Contura Energy	United States
Coal mining	Datong Coal Mine Group	China
Coal mining	Drummond	United States
Coal mining	Energetický a Průmyslový Holding (EPH)	Czech Republic
Coal mining	Energy Earth	Thailand
Coal mining	Essar Energy	India
Coal mining	Eurasian Natural Resources	Luxembourg
Coal mining	Exxaro Resources	South Africa
Coal mining	Foresight Energy	United States

Energy sector	Company name	Country
Coal mining	Fujian Energy Group	China
Coal mining	Fuxin Mining Industry	China
Coal mining	Gansu Jingyuan Coal Industry and Electricity Power	China
Coal mining	Glencore	Switzerland
Coal mining	Guizhou Panjiang Investment Holding	China
Coal mining	Heilongjiang Longmei Mining Holding Group	China
Coal mining	Henan Energy and Chemical Industry Group	China
Coal mining	Henan Shenhuo Group	China
Coal mining	Huaibei Mining Group	China
Coal mining	Huainan Mining Industry Group	China
Coal mining	Hunan Coal Industry Group	China
Coal mining	Indika Energy	Indonesia
Coal mining	Inner Mongolia Yitai Group	China
Coal mining	Jardine Matheson	Indonesia
Coal mining	Jastrzebska Spolka Weglowa (JSW)	Poland
Coal mining	Jiangxi Energy Group	China
Coal mining	Jiangxi Provincial Investment Group	China
Coal mining	Jilin Provincial Coal Industry Group	China
Coal mining	Jindal Steel & Power	India
Coal mining	Jining Mining Group	China
Coal mining	Jizhong Energy Group	China
Coal mining	Kailuan Group	China
Coal mining	LuAn Mining Industry Group	China
Coal mining	Mechel	Russia
Coal mining	Meijin Energy Group	China
Coal mining	Mongolian Mining Corporation	Mongolia
Coal mining	Murray Energy	United States
Coal mining	Natural Resource Partners	United States
Coal mining	New Wei	United States
Coal mining	NLC India	India
Coal mining	Ordos Wulan Coal Group	China
Coal mining	Peabody Energy Corporation	United States
Coal mining	Polska Grupa Energetyczna (PGE)	Poland
Coal mining	RAG	Germany
Coal mining	Reliance Power	India
Coal mining	Rio Tinto	United Kingdom

Energy sector	Company name	Country
Coal mining	RWE	Germany
Coal mining	Samruk-Energo	Kazakhstan
Coal mining	Sasol	South Africa
Coal mining	Shaanxi Coal & Chemical Industry Group	China
Coal mining	Shandong Energy Group	China
Coal mining	Shandong Taifeng Mining Group	China
Coal mining	Shanxi Coal Import & Export Group	China
Coal mining	Shanxi Coking Coal Group	China
Coal mining	Shanxi Jincheng Anthracite Mining Group	China
Coal mining	Shanxi Lanhua Coal Industry Group	China
Coal mining	Shenyang Coal Trade Group	China
Coal mining	Shougang Fushan Resources Group	China
Coal mining	Sichuan Coal Industry Group	China
Coal mining	Singareni Collieries Company (SCC)	India
Coal mining	State Development Investment Corporation (SDIC)	China
Coal mining	State Power Investment Corporation (SPIC)	China
Coal mining	Suek	Russia
Coal mining	Up Energy Development Group	China
Coal mining	Ural Mining Metallurgical Company (UMMC)	Russia
Coal mining	Vale	Brazil
Coal mining	Wanbei Coal-Electricity Group	China
Coal mining	Weishanhu Mining Group	China
Coal mining	Westmoreland Coal	United States
Coal mining	Whitehaven Coal	Australia
Coal mining	Wintime Holding Group	China
Coal mining	Xuzhou Coal Mining Group	China
Coal mining	Yankuang Group	China
Coal mining	Yanquan Coal Industry Group	China
Coal mining	Yunnan Coal Chemical Industry Group	China
Coal mining	Zespol Elektrowni Patnow Adamow Konin (Ze Pak)	Poland
Coal mining	Zhengzhou Coal Industry Group	China
CSP	Abengoa	Spain
CSP	Acciona	Spain
CSP	ACS Cobra	Spain
CSP	ACWA Power	Saudi Arabia
CSP	BrightSource	United States

Energy sector	Company name	Country
CSP	General Electric	United States
CSP	Rioglass Solar	Belgium
CSP	Sener	Spain
CSP	Solar Reserve	United States
CSP	Supcon	China
CSP	TSK	Spain
Power generation - France	Direct Energie	France
Power generation - France	Électricité de France (EDF)	France
Power generation - France	Engie	France
Power generation - France	EOn France Power	France
Power generation - Global	Centrais Eletricas Brasileiras	Brazil
Power generation - Global	China Datang Corporation	China
Power generation - Global	China Energy Investment Corporation*	China
Power generation - Global	China Huadian Corporation	China
Power generation - Global	China Huaneng Group	China
Power generation - Global	Duke Energy	United States
Power generation - Global	Électricité de France (EDF)	France
Power generation - Global	Enel	Italy
Power generation - Global	Engie	France
Power generation - Global	Eskom Holdings	South Africa
Power generation - Global	Federal Electricity Commission (CFE)	Mexico
Power generation - Global	Gazprom	Russia
Power generation - Global	Iberdrola	Spain
Power generation - Global	Korea Electric Power Company (KEPCO)	South Korea
Power generation - Global	Nextera Energy	United States
Power generation - Global	NRG Energy	United States
Power generation - Global	NTPC	India
Power generation - Global	Perusahaan Listrik Negara (PLN Persero)	Indonesia
Power generation - Global	RWE	Germany
Power generation - Global	Saudi Electricity Company	Saudi Arabia
Power generation - Global	Southern Company	United States
Power generation - Global	State Power Investment Corporation (SPIC)	China
Power generation - Global	Tennessee Valley Authority	United States
Power generation - Global	Tokyo Electric Power Company (TEPCO)	Japan
Power generation - Global	Uniper	Germany
Power generation - Global	Vistra Energy	United States

Energy sector	Company name	Country
Power generation - Netherlands	Eneco	Netherlands
Power generation - Netherlands	Essent	Netherlands
Power generation - Netherlands	Greenchoice	Netherlands
Power generation - Netherlands	Nuon	Netherlands
Power generation - Norway	Agder Energi	Norway
Power generation - Norway	BKK	Norway
Power generation - Norway	Eidsiva Energi	Norway
Power generation - Norway	Fjordkraft	Norway
Power generation - Norway	Statkraft	Norway
Power generation - Sweden	Fortum Power and Heat	Sweden
Power generation - Sweden	Statkraft	Norway
Power generation - Sweden	Sydkraft	Sweden
Power generation - Sweden	Vattenfall	Sweden
Geothermal power	Alterra Power Corporation	Canada
Geothermal power	Ansaldo-Tosi	Italy
Geothermal power	Atlas Copco	Sweden
Geothermal power	Ayala Corporation	Philippines
Geothermal power	Calpine	United States
Geothermal power	Chevron	United States
Geothermal power	Enel	Italy
Geothermal power	Exergy	Italy
Geothermal power	Fuji Energy	Japan
Geothermal power	Mitsubishi Corporation	Japan
Geothermal power	Orkuveita Reykjavikur	Iceland
Geothermal power	Ormat Technologies	United States
Geothermal power	Ram Power Corporation	Canada
Geothermal power	Reykjavik Geothermal	Iceland
Geothermal power	Toshiba Corporation	Japan
Ocean energy	Columbia Power Technologies	United States
Ocean energy	Eco Wave Power	Israel
Ocean energy	Électricité de France (EDF)	France
Ocean energy	ELSA	Belgium
Ocean energy	Emera	Canada

Energy sector	Company name	Country
Ocean energy	Fred Olsen Energy	Norway
Ocean energy	K-Water	South Korea
Ocean energy	Northwest Energy Innovations	United States
Ocean energy	Nova Innovation	United Kingdom
Ocean energy	Oceantec	Spain
Ocean energy	OpenHydro	France
Ocean energy	Sabella	France
Ocean energy	Scotrenewables Tidal Power	United Kingdom
Ocean energy	Seabased	Norway
Ocean energy	Tidal Power Scotland	United Kingdom
Ocean energy	Waves4Power	Sweden
Oil & gas	Anadarko Petroleum	United States
Oil & gas	Apache Corporation	United States
Oil & gas	Bashneft	Russia
Oil & gas	Bharat Petroleum Corporation	India
Oil & gas	BP	United Kingdom
Oil & gas	California Resources	United States
Oil & gas	Canadian Natural Resources	Canada
Oil & gas	Cenovus Energy	Canada
Oil & gas	Chevron	United States
Oil & gas	China National Offshore Oil Corporation (CNOOC)	China
Oil & gas	China National Petroleum Corporation (CNPC)	China
Oil & gas	China Petroleum & Chemical Corporation (Sinopec)	China
Oil & gas	ConocoPhillips	United States
Oil & gas	Cosmo Energy Holdings	Japan
Oil & gas	CPC Corporation	Taiwan
Oil & gas	Delek Group	Israel
Oil & gas	Devon Energy	United States
Oil & gas	Ecopetrol	Colombia
Oil & gas	Eni	Italy
Oil & gas	EOG Resources	United States
Oil & gas	EQT Corporation	United States
Oil & gas	ExxonMobil	United States
Oil & gas	Galp Energia	Portugal
Oil & gas	Gazprom	Russia
Oil & gas	Hellenic Petroleum	Greece

Energy sector	Company name	Country
Oil & gas	Hess Corp	United States
Oil & gas	Hindustan Petroleum	India
Oil & gas	Husky Energy	Canada
Oil & gas	Idemitsu Kosan	Japan
Oil & gas	Imperial Oil	Canada
Oil & gas	Indian Oil	India
Oil & gas	Inpex Corp	Japan
Oil & gas	International Petroleum Investment	UAE
Oil & gas	JXTG Holdings	Japan
Oil & gas	KazMunayGaz	Kazakhstan
Oil & gas	Kuwait Petroleum	Kuwait
Oil & gas	Lukoil	Russia
Oil & gas	Marathon Oil Corporation	United States
Oil & gas	MOL	Hungary
Oil & gas	Novatek PAO	Russia
Oil & gas	Occidental Petroleum	United States
Oil & gas	Oil and Gas Development	Pakistan
Oil & gas	Oil and Natural Gas Corporation (ONGC)	India
Oil & gas	Oil India	India
Oil & gas	OMV	Austria
Oil & gas	Origin Energy	Australia
Oil & gas	Petroleo Brasileiro (Petrobras)	Brazil
Oil & gas	Polskie Gornictwo Naftowe i Gazownictwo	Poland
Oil & gas	PTT PCL	Thailand
Oil & gas	Qatar Petroleum	Qatar
Oil & gas	Reliance Industries	India
Oil & gas	Repsol	Spain
Oil & gas	Rosneft	Russia
Oil & gas	Royal Dutch Shell	Netherlands
Oil & gas	Sasol	South Africa
Oil & gas	Shaanxi Yanchang Petroleum Group	China
Oil & gas	SK Holdings	South Korea
Oil & gas	S-Oil Corp	South Korea
Oil & gas	Sonatrach SPA	Algeria
Oil & gas	Statoil	Norway
Oil & gas	Suncor Energy	Canada

Energy sector	Company name	Country
Oil & gas	Surgutneftegaz	Russia
Oil & gas	Tatneft	Russia
Oil & gas	Total SA	France
Oil & gas	Trafigura	Netherlands
Oil & gas	Vitol	Netherlands
Oil & gas	Williams Partners	United States
Oil & gas	Woodside Petroleum	Australia
Oil & gas	YPF	Argentina
PV module manufacturing	BYD	China
PV module manufacturing	Canadian Solar	Canada
PV module manufacturing	China Singyes Solar Technologies Holdings	Bermuda
PV module manufacturing	EGing Photovoltaic Technology	China
PV module manufacturing	ET Solar	China
PV module manufacturing	First Solar	United States
PV module manufacturing	GCL	China
PV module manufacturing	Hanwha Q CELLS	South Korea
PV module manufacturing	JA Solar	China
PV module manufacturing	JinkoSolar	China
PV module manufacturing	Kyocera	Japan
PV module manufacturing	Motech	China
PV module manufacturing	Phono Solar	China
PV module manufacturing	REC Solar	United States
PV module manufacturing	ReneSola	China
PV module manufacturing	Risen Energy	China
PV module manufacturing	Shanghai Aerospace Automobile Electromechanical	China
PV module manufacturing	SHARP	Japan
PV module manufacturing	Shinsung E&G	South Korea
PV module manufacturing	Shunfeng	China
PV module manufacturing	Solar Frontier KK	Japan
PV module manufacturing	SolarWorld	Germany
PV module manufacturing	Sungrow Power Supply	China
PV module manufacturing	SunPower Corporation	United States
PV module manufacturing	Tongwei Solar	China
PV module manufacturing	Trina Solar	China
PV module manufacturing	Vikram Solar	India
PV module manufacturing	Xinyi Solar	China

Energy sector	Company name	Country
PV module manufacturing	Yingli Green	China
Wind turbine manufacturing	Enercon	Germany
Wind turbine manufacturing	Envision	China
Wind turbine manufacturing	Gamesa	Spain
Wind turbine manufacturing	GE Wind	United States
Wind turbine manufacturing	Goldwind	China
Wind turbine manufacturing	Ming Yang	China
Wind turbine manufacturing	Nordex Acciona	Germany
Wind turbine manufacturing	Siemens	Germany
Wind turbine manufacturing	United Power	China

* At the end of 2017, China Guodian Corporation and China Shenhua Group merged into China Energy Investment Group. The selection of the new group for the coal mining sector is based on both groups' activities, and for Power generation, on China Guodian Corporation's total installed capacity.

Table 8 lists the 85 renewable energy projects which are selected for this research project.

Table 8 Selected renewable energy projects

Project name	Project country	Year
Acquisition of Markbygden ETT Wind Farm (650MW) 2017	Sweden	2017
Africana Energia Thermal Solar Plant (50MW) Refinancing	Spain	2017
Agriport Geohermie Plant (20MW)	Netherlands	2017
Balko Wind Farm (300MW) Refinancing 2017	United States	2017
Belwind Offshore Wind Farm II (165MW) Refinancing	Belgium	2017
Boralex French Wind Portfolio (111.5MW)	France	2017
Boralex Niaga Region Wind Farm (230MW) Refinancing	Canada	2017
Borkum West II Offshore Wind Farm (Phase 1) (200MW) Refinancing	Germany	2017
Brotorp Wind Farm (46.2MW) Refinancing	Sweden	2017
Butendiek Offshore Wind Farm (288MW) Refinancing	Germany	2017
Cestas Solar Park (300MW) Refinancing	France	2017
Chemin de Gres Wind Farm (29.7MW)	France	2017
Coopers Gap Wind Farm (453MW)	Australia	2017
Decouverte Solar PV Plant (12MW)	France	2017
Deutsche Bucht Offshore Wind Farm (252MW)	Germany	2017
Durance Solar PV Portfolio (34MW) Refinancing	France	2017
Epine Marie Madeleine Wind Farm (36MW)	France	2017
Grimsas Wind Farm (46.8MW)	Sweden	2017
Imperial Solar Energy Center West (ISE West) (150MW) Refinancing 2017	United States	2017

Project name	Project country	Year
Innovent Wind Portfolio (33MW) Financing	France	2017
Krammer Wind Farm (102MW)	Netherlands	2017
Mohammed bin Rashid Al Maktoum Solar PV Phase III (800MW) PPP	United Arab Emirates	2017
Mount Signal 3 Solar Facility (328MW) Additional Facility 2 2017	United States	2017
Obton French Solar PV Portfolio (30.3MW) Refinancing	France	2017
Orejana (158MW) and Santa Maria PV Solar Parks (179MW)	Mexico	2017
Oudcamp Geothermal Plant (18MW)	Netherlands	2017
Ras Ghareb Wind Farm (262.5MW)	Egypt	2017
Refinancing of Macquarie's Stake in Lincs Offshore Wind Farm (270MW)	United Kingdom	2017
Renvico's French Wind Portfolio (187MW) Refinancing	France	2017
Reynosa Wind Farm (424MW)	Mexico	2017
Santa Vitoria do Palmar Wind Complex (207MW)	Brazil	2017
Serra da Babilonia Wind Complex (223.25MW)	Brazil	2017
Silverton Wind Farm (200MW)	Australia	2017
Solarpark de Kie (10.15MW)	Netherlands	2017
Solem Solar PV Complex (290MW)	Mexico	2017
sPower US Wind & Solar Portfolio (567.3MW) Refinancing 2017	United States	2017
Stockyard Hill Wind Farm (530MW)	Australia	2017
Sunrun Scorpio Residential Solar Portfolio Financing 2017	United States	2017
Sweihan Solar PV Plant (1177MW) PPP	United Arab Emirates	2017
Trias Westland Geothermal Plant (25MW)	Netherlands	2017
Vasco Energies French Wind Portfolio (145MW) Refinancing	France	2017
Ventient Energy's UK Wind Portfolio (711MW) Refinancing	United Kingdom	2017
Walney Extension Offshore Wind Farm (659MW)	United Kingdom	2017
Zon op Ymere Social Housing Solar PV (20MW) and LED Lighting	Netherlands	2017
Aardwarmte Vogelaer Geothermal Doublet System (16MW)	Netherlands	2016
Andasol 1&2 Thermal Solar Plants Refinancing 2016	Spain	2016
Beacon Solar Portfolio (183.4MW)	United States	2016
Beatrice Offshore Wind Farm (588MW)	United Kingdom	2016
Blythe Solar PV Complex (235MW)	United States	2016
Boralex French Wind Portfolio (57.1MW)	France	2016
Cedar Creek II Wind Farm (250.8MW) Refinancing	United States	2016
Dermott Wind Farm (253MW)	United States	2016
Dominion US Solar PV Portfolio (423MW)	United States	2016
Dudgeon Offshore Wind Farm (402MW)	United Kingdom	2016
Electra Wind Farm (230MW)	United States	2016

Project name	Project country	Year
Eurowatt Wind Portfolio (97MW) Financing	France	2016
Grand Renewable Solar (GRS) Plant (100MW) Refinancing	Canada	2016
Grande Prairie Wind Farm (400MW) Bond Facility	United States	2016
Imperial Solar Energy Center West (ISE West) (150MW) Refinancing 2016	United States	2016
Kathu CSP Power Plant (100MW)	South Africa	2016
Langa's French PV Portfolio (49MW) Refinancing	France	2016
Luchterduinen Offshore Wind Farm (130MW) Refinancing	Netherlands	2016
Magnetar Solar PV Portfolio (344MW) Refinancing	United Kingdom	2016
Merkur Offshore Wind Farm (396MW)	Germany	2016
Neoen's KfW Facility 2016	France	2016
Niagara Region Wind Farm (230MW)	Canada	2016
Photosol PV Solar Plants Refinancing	France	2016
Project Skywalker Onshore Wind Farm (1GW) 40% Investment Facility	Norway	2016
Rentel Offshore Wind Farm (309MW)	Belgium	2016
Seigneurie de Beaupre Wind Farms II and III (272MW) Refinancing	Canada	2016
Solar Star I and II PV Solar Plants (579MW) Refinancing 2016	United States	2016
Sol-Luce Kingston PV Solar Farm Refinancing (100MW)	Canada	2016
Sonnedix's French Solar PV Portfolio (23.6MW) Refinancing	France	2016
Southern France Rooftop Solar Portfolio (31.2MW) Refinancing 2016	France	2016
SPower Solar PV Portfolio (339.4MW)	United States	2016
SunPort Delfzijl Solar Park (30.8MW)	Netherlands	2016
Tellenes Wind Farm (160MW)	Norway	2016
Tenergie Solar PV Portfolio (41.4MW) Financing 2016	France	2016
Thor Wind Farm (147.6MW)	Sweden	2016
Toul-Rosières 2 PV Solar Plant (36MW) Refinancing 2016	France	2016
Valeco Solar PV and Wind Portfolio (180MW) Financing	France	2016
Vela Energy Solar PV Portfolio (98.5MW) Refinancing	Spain	2016
Vivint Solar PV Solar Portfolio Financing (307MW)	United States	2016
Wake Wind Farm (257MW)	United States	2016
Western Interconnect Transmission Line and Broadview Wind Farms (324.3MW)	United States	2016

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