Risk mitigation in low-carbon investments and the role of the World Bank Group

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Anno Accademico
2012 / 2013
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INTRODUCTION

With respect to environmental policies, it looks as if the destiny of mankind has never been so dependent on decisions from humans themselves. Since the dawn of the industrial age inestimable amounts of pollutants have been poured into the environment, ecosystems have been drastically modified in every corner of the world, thousands of species have disappeared, natural cycles of elements have been altered. And all of this is almost certainly ascribable to human activities.

Ignored at the beginning, studied for years and now unanimously accepted, the change of climatic conditions is a global concern and needs to be faced by every country in the world to avoid, or at least mitigate, nearly apocalyptic consequences that may endanger our future and that of our children. Complex international agreements and extraordinary financial efforts are needed to achieve significant results in the world’s biggest challenge of the 21th century.

The purpose of this thesis is that of presenting, to the maximum extent possible, the concept of Climate Finance, with a particular focus on risks specific for investments in this sector.

The various chapters of this thesis aim to offer a comprehensive treatment of this topic. The first chapter introduces the concept of global warming, explaining its causes and consequences, what is needed and what is already in place to tackle the problem globally. Chapter 2 gives an overview of the Climate Finance architecture as at 2011, while in Chapter 3 the attention is placed on all the risks that typically impact low-carbon and climate resilient investments. The analysis is complemented with a mapping of all the existing instruments directed to the mitigation of the mentioned risks. Finally, we conclude the thesis with an extensive description of the biggest provider of risk mitigation instruments in the world, the World Bank Group.
Most of this research has been written based on the publications of Climate Policy Initiative (CPI), one of the most influential organizations in the world in climate finance analysis and advisory for which I have worked since February 2013.


The fourth publication, “World Bank Risk Mitigation Instruments for Climate Change”, was released in September 2013.
CHAPTER 1

1.1 ABOUT CLIMATE CHANGE

Stating that the Earth is getting warmer may be seen as absolutely acceptable if we consider the geological life of the planet, which witnessed many cyclical alternations of warmer and colder periods, ice ages and subsequent thaws. The average temperature had constantly oscillated up and down following periods of thousand years. On the other hand, what raises the biggest concerns among the international community is the speed at which the current warming is happening.

Observed average temperatures of the earth’s surface and oceans show evident discrepancies in the last three decades from their historical values, meaning that global warming is now happening much faster than 30 years ago.

![Global Land–Ocean Temperature Index](image)

**Fig. 1:** this figure shows how the global mean land-ocean temperature has evolved, from 1880 to present, with the base period 1951-1980. The black line represents the annual mean and the red line is the five-year mean. The green bars show uncertainty estimates. Source: NASA’s Goddard Institute for Space Studies (GISS).
The most complete and reliable study presently available on climate change is the Assessment Report of the Intergovernmental Panel on Climate Change, which represents the essential backbone for every work in the sector. The fifth\(^1\) and last edition of the report has only been released in September 2013 and will need considerable time to be fully received. This chapter is mainly based on statements included in the Fourth Assessment Report of the IPCC\(^2\), released in 2007.

The report defines climate change as “\textit{a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use}”\(^3\). IPCC collected evidences of global changes from different indicators, concluding that climate change is undeniable and very likely attributable to human intervention in the second half of the 20\(^{\text{th}}\) century. Yet, defining with certainty which effects have to be attributed to global warming, with which magnitude and which are the future expectations is a matter of great controversy.

According to AR4, the large majority of scientists agree that anomalies in the climb of temperatures arise from an increase in greenhouse gases (GHGs) concentration into the environment, attributable to intensified human polluting activities across the world. “Global warming” is often used to identify the phenomenon of rising temperatures due to anthropogenic intervention.

Greenhouse gases\(^4\) contribute to keeping the planet warm by absorbing and reflecting solar radiations - this natural process is called greenhouse effect. However, higher

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\(^1\) IPCC, 2013.
\(^2\) IPCC, 2007.
\(^3\) The UNFCCC uses a different notation and attributes the evolution of climate change to human direct and indirect influence, in addiction to normal natural processes.
\(^4\) The main greenhouse gases by presence in the atmosphere are: carbon dioxide (CO\(_2\)), water vapor (H\(_2\)O), methane (CH\(_4\)), nitrous oxide (N\(_2\)O), ozone (O\(_3\)) and other gases in smaller percentages.
concentrations of gases mean stronger radiation retention within the atmosphere and, by consequence, rising temperatures.

It is plausible to state that the main contribution to global warming comes from carbon dioxide (CO₂) concentration in the atmosphere, risen from a pre-industrialization level of about 280 ppm to 379 ppm in 2005, setting to a current level of 397 ppm⁵. The primary source of CO₂ is the consumption of fossil fuels (together with land use change in smaller percentage) that in 2012 reached its highest, ever-recorded peak of 34 billion emitted tons, 3% higher than the previous years’ amount⁶.

Same conclusions arose from the observation of methane and nitrous oxide concentration in the atmosphere, respectively increased by more than 140% and 20% in comparison with pre-industrialized periods, mainly due to the agriculture sector usage.

Considerations about the concentration of pollutants in the atmosphere are crucial to contain future temperatures rise. In accordance with the scenarios on future emission patterns (SRES) elaborated by IPCC⁷, temperatures are destined to rise during the next century in both the optimistic and the pessimistic predictions. A rise of 0.2°C per decade is expected for the next 20 years for a consistent number of scenarios, while a 0.1°C increase is expected even if pollution levels is kept constant at year 2000 level. If the concentration of greenhouse gases increases in the future, which is a very plausible assumption, temperature would rise by a range of 1.1°C (in the lowest emissions scenario) to 6.4°C (highest emissions scenario). Nevertheless, it must be taken into consideration that the latest report from IPCC is dated 2007, SRES have been issued in 2000 and the next assessment report will only be released in September 2013. Meanwhile, many other reports and projections have been elaborated by several research institutes, whose estimates on future climate scenarios widened the fork on possible temperatures escalation.

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⁵ From the website of the Earth System Research Laboratory of the US Department of Commerce.
⁶ Olivier et al., 2012.
It has been calculated that CO₂ concentration must be kept below 450-550 ppm to achieve the target of a maximum temperature increase of 2°C by 2050. This value is considered, by policy-makers and scientists, as an unexceedable threshold beyond which climate change would deliver catastrophic consequences, and thus must be considered a vital target to achieve. However, there is a significant probability that this 2°C threshold is largely optimistic. Indeed, according to projections, even if all the current policies are successfully implemented there is still 20% likelihood that global temperature will reach 4°C by 2100, which reflects even more severe consequences. Moreover, due to slow feedback of the Planet to climate impacts in the long term and the partial understanding of these phenomena by the scientific environment, the exact quantification of future global warming is impossible. Which means that even higher levels can happen.

Evidences alterations of natural equilibria influenced by global warming have been collected by IPCC and are reported below.

Weather extremes are becoming more frequent and happen more often than the long-term average. The World Meteorological Organization observed⁹ that the decade 2000-2009 has been the warmest ever recorded since 1850, and 16 of the last 17 years¹⁰ ranked among the warmest year. Moreover, the year 2012 was the warmest in the history for the United States¹¹, as very likely for many other countries. Hottest periods are connected with extreme meteorological events such as hurricanes, flash floods, snowstorms, heat waves and severe drought periods. Measured temperatures include both land surface and oceans observations, showing a similar warming pattern.

Ocean warming is of particular concern because it induces water dilatation, which is one of the main causes of sea level rise. The other cause, very likely predominant according to the IPCC, is the diffuse loss of polar ices, glaciers and snows emerging from both

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⁸ WB, 2012b.
⁹ Datasets are collected from three different institutions: National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA) and HadCRUT.
¹⁰ Years from 1995 to 2011.
¹¹ From the website of National Climatic Data Center of the NOAA: State of the Climate National Overview, November 2012.
hemispheres observations. Sea level rise is almost certainly considered the major climatic threat and its impact should affect the life of hundreds of million people and radically alter the morphology of many low-lying areas. Estimates included in the Fourth Assessment Report of the IPCC foresee a sea level rise of 0.18 meters minimum to 0.59 meters within the end on 21\textsuperscript{th} century. However, the projection does not consider important drivers\textsuperscript{12} and it is largely underestimated, as confirmed by recent studies\textsuperscript{13}. Such studies demonstrated that a more correct rate of growth will be 60\% faster, and the expected sea level at the end of the century could be even more than 2 meters higher than today's levels.

Moreover, several other problems are very likely expected to emerge as future consequences of global warming. Poor countries, in particular, will face severe scarcity of food and potable water, along with social conflicts, riots and wars for land ownership. Extensive loss of biodiversity will be caused by the alteration, or even the total disappearance, of ground and marine habitats, induced by climatic modifications and oceanic acidification.

In accordance with research institutions there is high uncertainty about future scenarios and expected impact, but what is unanimously accepted is that every country of the world will be affected by climate change, in different and peculiar ways. Not only the SIDS communities (Small Islands Developing Countries), that are predicted to disappear into the ocean waves within few decades, but also the industrialized powers will be deeply hit. Hurricanes Irene in 2011, and Sandy in 2012 with their unusual violence brought a clear evidence of what is the entity of the danger.

These seem enough valid reasons for an immediate and resolute intervention on emissions abatement.

\textsuperscript{12} The IPCC model does not consider many variables that may potentially amplify the results: carbon-cycle is subject to many uncertainties and the effect of polar ice loss is not fully considered.

\textsuperscript{13} Researches from Potsdam Institute for Climate Impact Research, Tempo Analytics and Laboratoire d'Etudes en Géophysique et Océanographie Spatiales.
1.2 OVERVIEW OF INTERNATIONAL CLIMATE NEGOTIATIONS

It is undoubted that massive interventions must be undertaken to achieve significant results on the road for a low carbon development. The crusade against climate change is complicated and requires significant efforts from every country and international institutions. Policies and investments are the key factors that must drive the process of change.

Early discussions about the human impact on the planet’s stability arose in the ‘70s as a consequence of the rising concerns on the projected availability of natural resources to support the global growth. In 1972 the United Nations Environment Programme (UNEP) was established in Stockholm, while in 1974 the Club of Rome meeting witnessed the first attempt to discuss environmental issues at an international level.

In the following decade, the refining of simulation modeling and the accumulation of empirical data reinforced the concept that global warming was real and was likely induced by anthropogenic emissions of greenhouse gases. With the aim of reconciling all the scientific knowledge about climate change, in 1988 the WMO and the UNEP jointly established the Intergovernmental Panel on Climate Change (IPCC). The IPCC collects the work of thousands of scientists to provide the world a coherent opinion on the growing concerns on climate change through its reports, of which the last one has been released in September 2013.

In 1992 the United Nations Conference of Environment and Development (UNCED) was held in Rio de Janeiro, also known as the Earth Summit, marking a fundamental step for the political decisions of the next twenty years. The meeting delivered the Framework Convention on Climate Change (UNFCCC), an agreement open for signature to States, which encourages signing countries to develop policies to limit greenhouse gases emissions. The framework was not legally binding, but gave the possibility to ratify future treaties called “protocols”, that make the treaty effectively operational.
The Kyoto Protocol, issued by the third meeting of UNFCCC member countries\textsuperscript{14} in December 1997, was the first international environmental agreement with the explicit objective of limiting countries emissions of GHGs through enforcing mechanisms. The Protocol came into effect in 2005, targeting an average 5.2% reduction in the emissions of 37 industrialized countries, compared to year 1990 as base level, over a first application period set for 2008-2012. Post 1997 Conferences of the Parties have pursued the expansion of the Kyoto Protocol’s action by including other countries in voluntary agreement and focusing on the development of a post 2012 treaty. The latest years’ Conferences of the Parties (since “Bali 2007 COP13” in particular) were expected to solve the issue, but all ended with very few successes and considerable failures. At the 15\textsuperscript{th} Conference of the Parties, held in Copenhagen, the Copenhagen Accord was signed with the purpose of raising “new and additional\textsuperscript{15}” USD 100 billion a year by 2020 of public and private finance from developed countries to support developing countries in their path towards a low-carbon future. To channel part of this finance, the Green Climate Fund (GCF) has been established as the financial mechanism of the UNFCCC, at the conference of Cancun in 2012. The GCF is currently in the implementation phase and is projected to start its operations in 2014.

The last step was the Conference of Doha in 2012, where, after intense negotiations, member countries approved the extension of the Kyoto Protocol for a second application period from 2012 and endorsed the creation of a future binding agreement by 2015, which will enter into force in 2020.

Despite the large quantity of meetings, treaties and task forces listed above, it is commonly accepted that an internationally endorsed effective solution to the climate change issue is far from being achieved. The more the time passes without intervention,

\textsuperscript{14} Called “Conference of the Parties” (COP), taking place every year since 1995.

\textsuperscript{15} “New” refers to increased financial resources than historical or existing commitments. “Additional” means that funds must not be deducted from other focal objectives, like development purposes.
the more it will cost acting later, provided that inverting the global warming trend would be still possible.
CHAPTER 2

2.1 CLIMATE FINANCE: DEFINITION AND NEEDS

The impact of international agreements on climate change will be limited if they are not supported by significant financial commitments. Massive changes must be undertaken in every productive sector to create an environmentally sustainable future that will not inhibit the economic growth.

These investments must be directed to reduce dependency from fossil fuels for instance, or decarbonize the production of power, enhance countries energy autonomy and abate pollution arising from industrial processes, transportation, constructions and agriculture.

According to the estimate of the International Energy Agency (IEA), USD 36 trillion need to be invested from now to 2050 to convert solely the energy sector, in order to limit the future temperature rise to $2^\circ$C maximum.

In a broad view, every amount of money spent to financially support low carbon policies lies in the context of the finance for climate, or “climate finance”. This support is usually divided into two primary categories: the “mitigation” of climate change or the “adaptation” to future consequences of it.

Unfortunately, climate finance is a relatively new topic that still lacks of a clear definition that is unanimously accepted by international institutions. Thus, it is often complicated to determine exactly which investments and projects are important to tackle climate change.

As a consequence, different institutions use their own definitions of climate-relevant projects, technologies, methodologies, and evaluation criteria that often reflect their specific needs and expertise.

A first attempt to harmonize these different approaches and provide a detailed description of the topic is given by Climate Policy Initiative (CPI)\(^\text{16}\) in the first edition of its

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\(^{16}\) From CPI’s website: “Climate Policy Initiative is a team of analysts and advisors that works to improve the most important energy and land use policies around the world, with a particular focus on finance. We answer pressing questions posed by decision makers through in-depth analysis on
dedicated work called “The Landscape of Climate Finance”\textsuperscript{17} (2011), then subsequently improved in the second edition “The Landscape of Climate Finance 2012”\textsuperscript{18}. A third edition, of which I am a co-author, is currently under development and will be released in October 2013. In this chapter of the thesis I will describe the climate finance in the year 2011, following the structure of the “Landscape of Climate Finance 2012”.

In accordance with the views of many experts and stakeholders, CPI defines climate finance as \textit{the “financial support for mitigation and adaptation activities, including capacity building and R&D, as well as broader efforts to enable the transition towards a low-carbon, climate resilient development”(CPI, 2011).}

Financial flows that constitute the climate finance can be classified in several subclasses according to their specific characteristics. In particular, they may differ by:

- Source;
- Intermediary;
- Type of instruments;
- Disbursement channel;
- Geographical allocation;
- Recipients and use.

The absence of an internationally-endorsed definition of climate finance and the consequent lack of a standardized system to account and monitor the flows\textsuperscript{19} interfere with the precise description of the topic and may be source of uncertainty and discrepancies. In order to overcome these issues, the analysis of climate finance

\textit{what works and what does not. We work in places that provide the most potential for policy impact, including Brazil, China, Europe, India, Indonesia, and the United States. Our work helps nations grow while addressing increasingly scarce resources and climate risk. This is a complex challenge in which national policy plays a crucial role.”}

More information about the company can be found in the official website: \url{http://climatepolicyinitiative.org/about-cpi/general-info/}

\textsuperscript{17} CPI, 2011.
\textsuperscript{18} CPI, 2012.
\textsuperscript{19} Technically called “MRV” system, to measure, report and verify the effectiveness of the financial flow committed to climate purposes.
conducted by CPI in the Landscapes is based of few assumptions, essential to define a pertinence range in which to identify the appropriate flows:

− In order to present the most recent and complete description, the “Landscape of Climate Finance 2012” mixes data coming from different institutions, that may use different commercial calendars (and so different dates for the end of their financial years) or have data more or less updated. For these reasons the data displayed in the Landscape 2012 refer mostly to the year 2011, but in some case can also belong to the previous year. Moreover, the figures exposed are referred to commitment values, not the disbursement.

− Figures contained in CPI’s works refer only to projects and technologies that are solely “climate-specific”. This means that only certain investments are considered, namely capital flows in projects that have emissions reduction, climate resiliency and other environmental purposes as their main and explicit target. They can be classified as mitigation or adaptation projects.

Financial flows directed to “climate-relevant” investments are not considered in this chapter, but instead are counted in chapters 3 and 4. They describe a broader category that includes every financing to crucial sectors for the economic growth of developing countries, that directly or indirectly, in a positive or negative manner, influences the production of greenhouse gases (i.e. power production plants, as well as projects that may influence a country’s exposition to climate change’s impact, such as access to water or agriculture reinforcement).

− Investments considered are only those employed in the effective installment of tangible infrastructures. Resources committed for the implementation climate policies are not considered, neither revenues nor financial streams potentially generated by instruments of risk management. The scope of both reports is that of tracking the

20 Chapter 3 and 4 provide additional insights on the magnitude of risk mitigation instrument’s market.
amount of investments effectively circulating every year in the context of climate finance.

− Flows can be expressed in either their “gross” or their “net” value. The first approach is the one adopted in the Landscape and means that every flow is accounted in its full nominal value, comprehensive of all the forms of capital involved that may require or not the future repayments to their providers (like debt instruments, that are paid back to lenders). Net values instead, reflect the effective contribution of the investors, deducted of all the amounts to be paid back.

− The research distinguishes between incremental flows and capital investments. The former term indicates the additional cost needed to offset the trade-off between the adoption of a more expensive, less polluting technology and a cheaper but more polluting alternative. Usually, incremental costs are provided by public institutions to implement specific environmental policies (i.e. investments for an innovative, environmentally-friendly, public transport systems instead of a traditional “cheap and dirty” alternative). The latter term describes the investments effectively addressed to develop concrete green projects, usually paid back to stakeholders.

Given the assumptions above, CPI estimates that the climate finance flows in the year 2011 amounted to approximately USD 364 billion on average. These flows are displayed in the “spaghetti diagram” below.
Despite this number is significantly larger than the previous year\textsuperscript{21} (in 2010 climate finance totalled USD 97 billion and presented in the Landscape 2011\textsuperscript{22}) it is still highly insufficient to meet the required size estimated by the IEA of nearly USD 1 trillion per year (only in the energy sector).

In the following part we will analyse the different nature of climate finance flows, through some of their different aspects.

\subsection*{2.1.1 Sources}

In this part I describe which are the various players around the world that provide resources for climate finance and how they contribute to the overall picture.

\textsuperscript{21} This is partially explained by an increased data scoping of CPI, that allowed to track more flows but also by a general increase in commitments in 2011, certified by many other studies and reports.

\textsuperscript{22} CPI, 2011.
The major part of climate finance originates from private sources, for approximately USD 250-285 billion\(^{23}\), while the public sector’s share accounts for USD 92.7-99.3 billion. The public quota of climate finance that is tracked in the Landscape consists of three important categories: government’s direct contributions, Development Finance Institutions (DFIs) and Climate Funds.

Under the first group are all the financial flows originated from ministries, governmental agencies, sub-national authorities, and export credit agencies that provide a direct support to the balance sheet of projects (without other intermediary institutions) and account for 16-22 billion (around 5-6% of total climate finance).

Support from countries’ budgets can be also indirect, through state-owned enterprises (SOEs) and through contributions towards DFIs of Funds for climate. SOEs in particular, are publicly owned companies that apparently look like private businesses; their complex ownership structures make them challenging to analyze without a specific deep investigation and for this reason, they fall under the private part of climate finance even if, in reality they are not.

Development Finance Institutions (DFIs) and Climate Funds, both financed mainly through the donations of countries, mobilized a significant amount of capital for climate in 2011, approximately USD 77 billion. These institutions have also an important intermediate role in channelling public funds to unlock additional capitals from private companies. DFIs are able to lower the total risk of the investment and enhance the quality of supported projects that in many cases would have not been adequately solid without the backing of these institutions. More details on development finance institutions and climate funds will be provided later in the analysis.

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\(^{23}\) Due to uncertainties, it is not always possible to provide an exact number. To overcome this issue, the two numbers given represent a lower and an upper bound, both based on the most realistic assumptions.
There is a strong interconnection between public and private climate finance and often it is hard to operate rigorous distinctions. However, it is possible to describe indicatively how these amounts are originated and what kind of flows are involved.

Capitals committed and disbursed at the governmental level belong to the generic budget of a country, which mostly stems from revenues of the fiscal imposition on specific carbon intensive activities and from general taxation. The taxation of specific polluting sectors or activities, such as fossil fuels and energy consumption by households and industries, is estimated in USD 7.3 billion. In addition, public budgets can also include revenues transactions originated in the carbon market, like the sale of emissions permits in regulated cap-and-trade systems, quantified in USD 2 billion.

As all the taxes are pooled into national budgets, the amount of general tributes that do not explicitly support climate policies, are much more complicated to be tracked and lack a precise estimate.\textsuperscript{24}

Climate finance of private players comprehends several more types of sources than the public, interconnected with each other in a much-variegated scheme and representing 74% of the whole climate finance total.

Project developers (meaning those private entities responsible for the implementation and operation of green projects) are the main contributors with their financial support ranging from USD 115 to 129.3 billion. This category encompasses energy utilities and independent power producers and sellers, along with EPC companies\textsuperscript{25} and services providers. They mainly operate in domestic investments and make their profits by producing and selling clean energy.

Corporations that invest in similar projects but do not sell the energy they produce represent the second main category of private climate finance contributors, with their participation estimated between USD 69.3 billion and USD 80.5 billion. These subjects

\textsuperscript{24} It could be roughly asserted that the remaining part of climate finance provided by governments’ budgets not deriving from carbon specific taxes, comes from general taxation. Yet, such a statement would be incorrect and misleading.

\textsuperscript{25} Engineering, procurement and construction (EPC).
develop low carbon projects for many reasons: they might be companies that want to lower their energy bills by installing clean energy production systems for their factories (like photovoltaic systems of the rooftop of buildings), or simply they aim at improving the corporate visibility through low-carbon-oriented marketing strategies. Encompassed in this category are also manufacturing businesses that build components for clean technologies systems, like solar panels, turbines or also specific intangible solutions like dedicated software.

With an estimated contribution of USD 32.3 billion, households play a primary role in the scenery of climate finance and form the third category of private players. Households primarily include families investing their savings in small scale, clean energy systems for their own consumption and high worth individuals or foundations, which may be involved in philanthropy or in private funding activities of low carbon projects. It is worth noting that households alone contribute to almost 10% of total climate finance in 2011. These investments are mostly driven by public subsidies and incentives that can differ substantially between countries.

Finally, institutional investors represent the last actors of the private climate finance world. This category includes insurance companies, pension funds, mutual funds and other asset management companies with extraordinary financial capacities and resources availability. Their strict mandates force them to invest in certain projects only, characterised by specific risk-return combinations, technologies and geographical position.

Moreover, these players are particularly challenging to analyze as often their financial operations lack sufficient transparency and for this reason their contribution to climate projects in 2011 is limited to USD 0.6 billion. This is just a lower bound but certainly a value significantly underestimated.

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26 This value includes debt and equity investments, referred to just a few countries in the world and focused only on new investments, not projects already running.


2.1.2 Intermediaries

The category of financial intermediaries plays a very important role in the economic life cycle of climate finance flows. These institutions are mostly public international financial institutions (IFIs) but also commercial companies that generally channel the financial contributions of different sources towards their final users, in order to pursue specific targets (often development goals.) With their characteristics they are able to expand the total amount of investments and lower the overall risk level of many low carbon projects by supporting the final users with their institutional assistance. Public sector intermediaries are commonly identified in the Development Financial Institutions (DFIs) while also Climate Funds are encompassed in the category.

DFIs are financial institutions owned and funded by governments (and in smaller part by other international institutions) that specifically pursue the development of low-income countries by supporting investments in key sectors for the economic growth and social improvement (like health, infrastructures, energy, education, transports and climate change among others). Given the close interconnection between development and climate change\(^\text{27}\), DFIs are taking green projects into increasing consideration and give them support in order to make them more attractive to private investors, that otherwise would be concerned by the higher risk of the developing countries in which they are located.

These institutions principally gather their financial resources directly from governments in the form of commitments from national budget but not only. Some DFIs usually issue bonds on capital markets (i.e. IBRD issue bonds sold on member countries financial markets to feed the operation of The World Bank) and are guaranteed by the usually high credit rating of these institutions. Moreover, an important source of funding derives from

\(^{27}\) Recently highlighted by the President of the World Bank Group (Kim, J. 2013).
the revenues of internal investments that are implemented through a wide range of financial instruments including loans, concessional loans and insurances\(^28\).

The universe of DFIs encompasses different types of institutions, depending on their ownership structure and the geographies in which they operate. The first group of international development actors is represented by the Multilateral Financial Institutions (MFIs). Worldwide oriented actors like The World Bank Group and the European Investment Bank (EIB) fall under this definition, as well as institutions operating with regional focus like the African Development Bank (AfDB) and the Asian Development Bank (ADB). These institutions are governed and funded by several member countries and undertake projects located in these specific countries. This class includes also similar institutions that have economic development as primary outcome but do not have the structure of a bank, such as the European Commission.

Contributions of MFIs in 2011 reached about USD 21.2 billion and are predominantly constituted of market-rate loans, concessional loans, grants and instruments of risk management. Additional information on Multilateral Development Institutions will be presented in chapter 4, with a deeper analysis of the most representative entity of this category, namely The World Bank Group.

Although less renowned than MFIs, the lion’s share of contributions within the category of development institutions belongs to National Finance Institutions (NFIs), that are responsible for providing approximately USD 42.7 billion to the climate finance picture, more than half of all the money channelled by all the DFIs. This category is mainly formed by National Development Banks (NDBs), organisms owned and funded by a single country and dedicated to the promotion of domestic economic policies and projects. NDBs in the world have different size and structure, different operational schemes and provide a wide range of financial instruments to achieve their outcome of development. The main strengths of these institutions lie in the radicated knowledge of local market and the high level of interaction that they can establish with domestic companies. Moreover, NDBs (like

\(^28\) Detailed information on the financial instruments of DFIs will be provided in chapter 2 and 3.
all the DFIs) can play an important role in bearing part of the risk of supported projects, in order to make them more interesting for sponsors and lenders that otherwise would have not accepted to participate. Under this category are institutions like the Brazilian Development Bank (BNDES) and the China Development Bank (CDB) that emerged in the last few years as giants in the promotion of local low-carbon initiatives.

Also parts of NFIs context are the Sub-Regional Finance Institutions, which follow similar objectives of NDBs, but are managed by a group of countries (instead of a single one) and are committed to pursuing the economic and social development of a specific geographical region. Under this group fall organisms like the Development Bank of Latin America (CAF), the Development Bank of Southern Africa (DBSA) and the Caribbean Development Bank (CDB).

Bilateral Financial Institutions (BFIs) is the third big group of entities constituting DFIs. These are organizations owned and funded by a single country and committed to invest in projects for the economic and social progress of multiple specific developing countries. The peculiar requisite of “bilaterality” of BFIs’ operations is identified by the fact that beneficiaries of the financial flows of these institutions must not be direct shareholders of the institutions themselves. The Landscape 2012 reviewed 4 of these institutions: Agence Française de Développement and Proparco (AFD), KfW Entwicklungsbank and DEG (KfW), Japan International Cooperation Agency (JICA), and Overseas Private Investment Corporation (OPIC). AFD, JICA and KfW are agencies owned and managed respectively by France, Japan and Germany that implement activities for the development of poor countries. OPIC instead, provide assistance to United States investors, for the implementation of commercial projects in developing countries that can also benefit the economy of the host countries.

Together these organizations have mobilized USD 11.3 billion, mainly constituted by Official Development Assistance (ODA)\(^29\) of their managing countries and other

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\(^{29}\) The OECD defines ODA as “those flows to countries and territories on the DAC List of ODA Recipients and to Multilateral Institutions which are: 1) provided by official agencies, including...
contributions identified as Fast Start Finance³⁰. BFIs also play a fundamental role in the negotiations of carbon credits, simplifying the meeting of demand and supply by serving as intermediation platform for investors.

The last category of institutions acting as intermediaries for climate finance is constituted by the Climate Funds. USD 1.5 billion³¹ have been channelled in 2011 under the management of these funds to projects for mitigation of and adaptation to climate change usually in the form of grants or concessional loans. Climate funds can be classified following the same framework used for DFIs: thus, there are multilateral climate funds, which receive inflows from different international donor countries and institutions and channel them to projects located in different recipient countries. Then, bilateral funds are basically fed by one single country and manage their assets to promote projects in several recipient countries, while national and sub-regional funds pool together the financial contributions from one or many donors of a same region to implement domestic or geographically circumscribed investments for climate targets. Many funds of these types have been recently established as they represent a particularly appropriate instrument to expand and enhance the quality of contributions granted by countries to climate change. Climate funds indeed have a large capacity in leveraging their funds by attracting capitals from organizations that promote their same objectives. A significant example in this way is given by the Climate Investment Funds (CIFs), namely the Clean Technology Fund (CTF) and the Strategic Climate Fund (SCF). These funds are implemented by multiple MDBs and administered by the World Bank, acting as the Trustee and projects implementing agency, and overall manage assets for USD 7.2 billion. The former fund (CTF) is committed to the

³⁰ FSF refers to one of the outcome of the Copenhagen Accord. Developed countries committed themselves to contribute approximately USD 30 billion over the period 2010-2012 for mitigation and adaptation projects in developing countries.

³¹ The real value is USD 2.5 billion, but 1 billion has already been counted under the BFIs, because some of them use funds as instruments to pool contributions and deploy towards project.
promotion of clean energy, energy efficiency and sustainable transport projects in developing countries. In particular, it aims to incentivize certain innovative initiatives and technologies that can permit the long-term reduction of GHGs. The latter (SCF) serves for the promotion of programs based in developing countries that generally have adaptation purposes.

Moreover, the forthcoming Green Climate Fund (GCF) represents another example within this category that potentially has the characteristics to become a determining actor in the universe of climate finance, but it is still not active. The GCF aims to support and fund mitigation and adaptation projects in developing countries, by managing part of the financial resources contributed by various other players to reach the demanded USD 100 billion per year by 2020, defined by the Copenhagen Accords.

In total, the aggregate capitals mobilized by public sector financial intermediaries (namely DFIs and Climate Funds) amount to approximately USD 76.8 billion. Also private companies act as intermediaries, with their portion ranging from USD 33.1 to 42.8 billion. These intermediaries are basically commercial financial organizations and investment funds. The former includes profit-seeking actors like commercial banks, investment banks, insurance companies and other categories such as carbon traders. Capitals involved in their operations range from USD 30.7 to 40.4 billion and mainly consist of market-rate loans. The latter category, corresponding to an overall direct annual flow of approximately USD 2.4 billion, includes private equity, venture capital and infrastructure funds.

2.1.3 Type of instruments

More than 80%\textsuperscript{32} of climate finance comes in the form of investments effectively directed to the creation of tangible infrastructures (like clean power plants), rather than costs spent to support “intangible” activities (like for instance R&D or future liabilities for risk management). This larger segment includes capital investments owned by private and

\textsuperscript{32} Approximately USD 293-347 billion over a total of USD 343-385 billion.
public companies and directed to finance projects to generate profits. Investors contribute through different types of instruments that entitle to different degrees of ownership in the project and allow benefiting from different returns. For example, lenders provide debt capital to projects in order to receive its interests plus their investment repaid at maturity; shareholders instead provide equity that is much riskier but entitle them to benefit from the revenues generated by the project.

The other 20% (approximately) of instruments for climate finance represents solutions to cover the incremental costs that are connected to the choice of a more expensive clean solution rather than a more polluting and cheaper alternative. Usually, these instruments are not designed to generate substantial profits but instead are adopted for the fulfilment of major public interests, such as adaptation targets.

Different types of financial instruments and policies are involved in the deployment of climate finance, whose total and exhaustive description is challenging. A financial scenario that is continuously evolving, the large number of commercial financial institutions offering tailored products to investors, the complex interconnections between flows and institutions represent significant barriers. Although, according to the analysis of CPI and to the sectorial literature, it is possible to identify six categories of instruments (some of them will be expanded in the next chapter) that are usually involved in supporting low-carbon and climate resilient investments.

**Capital market instruments**

This category identifies instruments that are normally used to raise money for financing of projects and that normally are recognized as “financial instruments” by definition. Providers of these contributions have specific investment targets, usually seeking for profits and/or industrially strategic advantages achieved with the investment. Actors involved have different levels of ownership in the project in relation to the specific
characteristics of their participation: the wide distinction at this stage is between equity, debt and hybrid products.

Possessors of equity, called shareholders participate in the division of the profits and losses generated by the project and, in most cases, own also the voting right in the company’s decisions. Periodically they obtain dividends and their contribution has the lower degree of repayment entitlement in case the company defaults.

Debt providers can benefit from the flow of interests and from a privileged repayment (compared to shareholders) of their asset from the borrowing company at the end of the maturity period.

Hybrid (or mezzanine) instruments have mixed characteristics of both equity and debt. This is the case, for example, of subordinated debt that gives the lender the opportunity of transforming its debt contribution into equity if some trigger event occurs (like the belated repayment of its debt).

Every entity sourcing climate finance can contribute capital investments, which in the Landscape of Climate Finance are classified in three groups: project-level debt, project-level equity and balance sheet financing. The first class contains all the commercial debt instruments involved in the financing of climate-resilient, low-carbon projects that are developed off the balance sheet of a company. This practice, called project financing, is widely used in the financing of long-term infrastructures and often adopted in the climate finance context. With this technique the “mother company” (usually called the “sponsor”) creates a new company separately from its balance sheet and called Special Purpose Vehicle (SPV), which relies exclusively on the future incomes that is able to generate, without burdening the balance sheet of the sponsor with its liabilities. In fact, loans and bonds issued by this new company, allow their purchasers to claim repayments only from the SPV itself, affecting only its assets and not those of the sponsor (for this reason this is also called “non-recourse debt”). Project-level debt accounted for USD 52.7 to 62.1 billion in 2011, more than half of which was provided by commercial banks at market rates. In
the project-financing context, the equity part of SPVs is called “project-level equity” and originated a flow of capital that is worth almost USD 23.5 billion.

Finally, the biggest part of the capital resources involved in climate-related projects in 2011 belonged to the balance sheet of companies (project developers, corporations and households among others) and totalling between USD 203.1 billion and USD 224.8 billion. Financing on balance sheet is a more classical and less elaborate approach adopted by companies for the implementation of their projects. Under this technique the resources employed belong to the company itself and the liabilities originated by the project affect the total assets of the company (rather than project-level financing).

Policies support

This section refers to all the actions of national and international authorities that aim to enhance the transition to a decarbonized world, through public resources and through the involvement of private investments in low-carbon, climate resilient initiatives. Several financial and economic mechanisms are employed and they can be grouped in two broad categories: instruments for revenues enhancement and fiscal subsidies. The former group usually includes national policies whose purpose is that of closing the so-called “financing gap” between the investments needed and those already in place, by making the clean energy sector more attractive to investors. In fact, this is often perceived as a riskier field for investments, and consequently the returns required by investors to embark in such projects need to be higher too. Enhancing the quality and the quantity of revenues that the projects may generate is the primary tool that governments adopt to expand private investments for clean projects. Usually, governments commit national resources in the form of subsidies to provide a complementary source of cash flow for project’s participants; they can also transform uncertain and variable future incomes in
certain and fixed for long-term periods (using feed-in tariffs, tradable certificates\textsuperscript{33} and various others incentives).

The latter category of low-carbon energy policies regards all the public sector’s interventions happening at the fiscal level, like tax reductions\textsuperscript{34} or similar subsidies\textsuperscript{35} of which developers of clean energy infrastructures may benefit. Usually policies support refers to domestic markets and have the potential of achieving two important advantages for the country: boosting the activity of local entrepreneurs and the economy in general; attracting foreign capitals through local more favourable conditions (capitals that will contribute to the country’s economic growth too).

As anticipated before in the assumptions, the exact amount of policies incentives is not accounted in the “Landscape 2012” because their nature of future and uncertain\textsuperscript{36} commitments make them impossible to quantify in advance, before their occurrence. However, national and international policies in support of emissions reduction targets play an essential role in expanding the flows of climate finance.

**Risk management instruments**

These products aim to abate specific financial barriers in order to create a “bridge” that allows investors to undertake projects that otherwise would be not viable, due to unacceptable level of risk or costs. With these premises, risk mitigation instruments play a pivotal role for the expansion of a project’s financing, by carrying on board the contribution of investors with lower tolerance to risks, such as institutional investors or

\begin{footnotesize}
\begin{itemize}
\item Like the Certified Emission Reductions (CERs), also called carbon credits.
\item Fiscal incentives can occur at any stage of the economic life cycle of a project and can be applied to all the types of taxes.
\item Clean energy subsidies are various measures to lower the costs for producers or the prices for customers, in order to support the stimulate the sector.
\item The uncertainty in this case refers to the power that governments have to modify or also cancel the policies they have set and controlled, originating the “regulatory (or policy) risk”, described in details later.
\end{itemize}
\end{footnotesize}
sovereign funds\textsuperscript{37}. Instruments for risk management are provided by a large group of both private companies (such as insurance companies and investment banks) and government agencies or international organisms that potentially can provide risk coverage solutions from a wide number of financial and non-financial risks\textsuperscript{38}.

Instruments like insurances, loan guarantees derivatives and other types of contract fall under this category, as well as measures already mentioned like revenues support policies and capital investments. A closer viewpoint on risk mitigation instrument will be given in the appropriate chapter of this thesis.

\textbf{Carbon market flows}

This category encompasses all the financial flows of public and private organizations committed to the reduction of carbon dioxide emissions. Under this definition fall companies operating in sectors or countries subject to specific greenhouse gases emission limits imposed by certain international policies and agreements, such as the Kyoto Protocol, or market schemes such as the EU Emissions Trading Scheme (EU-ETS)\textsuperscript{39}. These companies are legally obliged to comply with certain pollution caps, either by reducing their emissions or by purchasing special permits for emitting more.

A residual part of this market belongs to companies that voluntarily commit themselves to emissions reduction targets, even if they are not subject to any explicit restriction. Organizations operating in these premises purchase carbon offsets on the market that are

\begin{itemize}
\item These institutions are mandated to invest in accordance with strict rules. Mostly, their investment targets are companies considered safe, those less risky and with the highest credit rating.
\item Risks inside green investments will be described in Chapter 3. Briefly, they are:
  \begin{enumerate}
  \item Political and country risks;
  \item Operational and technical risks;
  \item Market and financial risks;
  \item Outcome risks.
  \end{enumerate}
\item The EU-ETS is the biggest “cap and trade” market in the world for the reduction of greenhouse gases emission. It regulates over 11,000 European companies operating in the sectors of the energy production, buildings, aviation, refineries and metal factories.
\end{itemize}
generated by low-carbon projects usually located in developing countries and channelled by the Clean Development Mechanism (CDM) or the Joint Implementation (JI) scheme. The financial resources accumulated in 2011 for payments related to carbon offsets have been estimated in approximately USD 4.75 billion.

Grants

Approximately USD 13 billion has been disbursed in the form of grants in 2011 that is almost 3.5% of total public finance. Grants identify those monetary contributions that do not require to be repaid back from beneficiaries to the provider institution (called “grantor”). For this reason, grants are almost entirely disbursed by public nature institutions, while just a residual part of these instruments sources from private player, mostly acting like philanthropic foundations and individuals with major net worth (their contribution is valued approximately between USD 211 and 268 million).

Even if the total amount of grants in the climate finance panorama is not particularly large, they play a very crucial role for unlocking additional capital. Grants flow into the invested finance of supported projects and in this way they are either able to reduce the weighted cost of capital or to bear the cost of specific phases of the project (grants, in fact, are often used to finance the appraisal phase or the technical assistance for specific projects, especially those promoted by DFIs or other public authorities).

Low-cost debt

It refers to all the debt instruments provided at conditions that are more appealing for borrowers than those typically obtainable on financial markets. Lower interest rate, longer terms for repaying the debt united to long grace periods, extended time coverage, larger notional value and personalized embedded options are the main differences from traditional debt products. The biggest issuers of low-cost debt are DFIs and government-
owned institutions, which provide up to USD 54.2 billion (14.6% of all climate finance). The largest part of these resources is delivered under the form of concessional loans (also called “soft loans”). Concessional loans are issued by official institutions for development, they target developing countries and contain a high level of “concessionality”, referred to a part of the total value of the loan that does not need to be repaid\footnote{If the loan is provided by official organizations for the support of activities that improve the economic and social development of developing countries, and the concessionality reach at least 25% of the entire value of the loan, this loan can be marked as Official Development Assistance (ODA).}.

Financial instruments for economic development will be discussed again in the chapter focused on the World Bank, while other instruments to achieve climate targets will be analysed deeper in Chapter 3, in the section about the supply of risk mitigation instruments.

2.1.4 Disbursement and channels

When dealing with money that flows through different entities and through various phases of projects, the “disbursed amounts” offer a more realistic picture of the size of financings that effectively reach recipients and that is effectively employed in the context of climate finance, rather than the amounts that are only “committed” or “pledged” to various initiatives. Indeed, many factors can obstacle the regular cycle of capital from its source to the final projects, such as the lack of an adequate demand, legal hurdles and difficulty in obtaining the permits needed, technical or physical problems in the implementation of a project and many other reasons that will be deeper analysed in the next chapter regarding the various risks of climate-related projects. For these reasons, focusing specifically on disbursed money represents the correct perspective to analyse these flows.

In this context, disbursement vehicles are entities that directly disburse financial flows originated from various sources, to low-carbon investments. They can have different legal
structures and they can be public organizations (like governmental agencies and ministries), private entities (like commercial banks or smaller institutions like microfinance providers or local banks) and private public collaborations (also called private-public partnerships, PPPs).

In many cases, in particular when funds flow from developed to developing countries, multilateral international institutions (MFIs) and non-governmental institutions are preferred in leading the process of disbursing resources. This is mainly due to the higher perceived efficiency and reliability that these institutions can guarantee when they provide assistance to their projects. Moreover, the support of MFIs and other supranational institutions is often complemented with strict environmental, social and financial requirements that investors must respect to collaborate with them and ensure the best conditions for a safe investment.

Furthermore, DFIs collaborate closely with climate funds and local companies for the implementation of funds’ approved projects in target countries. The World Bank Group, for example, acts as one of the implementing agencies of the Global Environment Facility (GEF)\(^41\).

Unfortunately, even if is more correct to use data about the disbursed resources, timely information at this level is often more challenging to find than information on commitments.

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\(^41\) The GEF is a financial organization, formerly established by the World Bank in 1991 but now independent that provides grants, concessional finance and risk mitigation instruments to develop projects for the environment and sustainable development in the areas of climate change, biodiversity, agriculture, water quality, phase out of chemicals and ozone depleting substance, forest management. Additional information about GEF can be retrieved here: [http://www.thegef.org/gef/](http://www.thegef.org/gef/)
2.1.5 Recipients and uses

Financial contributions are used to implement several kinds of initiatives to achieve results in the reduction of climate change. They can generally be grouped into two categories: mitigation and adaptation.

The largest part of climate investments goes to private projects of climate change mitigation, mainly renewable energy technologies. Of the USD 364 billion marked as green finance in 2011, USD 350 billion went to mitigation projects while just the remaining USD 16 billion went to projects with adaptation purposes.

To identify what kind of activities can be labelled as mitigation the definition of the IPCC can be useful. Mitigation to climate change is “an anthropogenic intervention to reduce the anthropogenic forcing of the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks” (IPCC, 2007a).

Given this background, the mitigation activities considered in the Landscape 2012 are basically new instalments of energy production from renewable sources and initiatives for energy efficiency. The first group includes power production plants on large and small scale from clean sources, like wind, solar, geothermal, marine (tidal), small hydro, biofuels and biomass (wastes). Investments for energy efficiency include improvements of energy transmission and distribution infrastructures, emission reductions from industries and sustainable transports.

The biggest share of funds employed in mitigation projects is in the hand of private owners, while almost the entire adaptation part belongs to public institutions.

The reason behind this clear separation is simple: mitigation technologies, renewable energies in particular, are developed by private entities to achieve profits that often are supported by ad-hoc governmental incentives or subsidies (with mechanisms such as income enhancing policies and tax incentives) or national programs to promote the

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42 Energy generation nuclear power is not considered.
transition to a decarbonized environment. In this light, many developers and project sponsors find in clean technologies a profitable investment, at a level adequate to compensate the higher risk perceived for these technologies compared to fossil fuels. In addition, the climate change mitigation is considered of primary importance also by the public institutions (which own more than one quarter of all investments in this field, precisely USD82 billion out of USD350 billion) for achieving a vast range of benefits connected to a greener economy, such as economic growth or the diversified electricity production mix and related higher power independence from foreign producers. Also other factors less easily subject to economic valuation, like the enhanced health of the population and its life quality, as well as the air quality and many aspects associated to a better environment are considered by policy-makers and public institutions in general.

On the other hand, the support to adaptation initiatives relies on different reasons that make this category almost entirely suitable for public actors. Adaptation activities, for their particular nature can be viewed as a sort of insurance, or an ex-ante action to limit the magnitude of uncertain future harmful events. Policy-makers consider these activities as a cost that is not associated with future revenues (but eventually with future savings) and this is the reason why only governmental entities can consider their implementation. However, it is complicated to identify exactly what kind of activities can be classified as “adaptation finance” as an agreed consensus on this topic does not yet exist. The IPCC, in its fourth assessment report, provides this definition: “adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change” (IPCC, 2007a).

Adaptation measures aim to reduce the future impact of climate change on several sectors (like agriculture productivity, infrastructures and buildings, quality and availability of water and food, health sector, disaster risk preparedness and others).

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CPI estimated that the adaptation finance in 2011 accounted for approximately USD 16 billion, almost entirely from public institutions, but the figure is subject to substantial uncertainties. In fact, there is no consensus yet on what activities can be defined as “adaptation”, thus estimates in this sector are particularly challenging.

Another important destination of climate finance is represented by activities and projects for the protection of forests and their sustainable management\textsuperscript{44}, better known under the acronym “REDD+” (Reducing Emissions from Deforestation and forest Degradation). The REDD+ Programme aims to generate a financial value for the carbon stored in forests, offering incentives for developing countries to manage their forests in a sustainable way and to reduce deforestation. Financial flows attributable to REDD+ supported initiatives amounted to around USD 1.3 billion in 2011.

\textbf{2.1.6 Geographical allocation}

Commitments for the reduction of climate change and its future impacts on human lives and the environment differ widely between nations. Few have undertaken important initiatives in this field and are currently on the way to becoming green economies (like the case of Nordic Europe) while many others, such as the least developed countries, lack the elementary resources or technical capabilities to do so. Super powers like USA and China, the biggest emitters and for a long time the biggest opponents to every binding agreement on emissions reduction, have now implemented policies for their domestic regulation\textsuperscript{45}, different but successful. Certain countries instead, like those forming the SIDS (Small Island Developing States) are already facing the first dramatic effects of climate change in first person. These countries are doomed to disappear within the next

\textsuperscript{44} It is estimated that 20% of global emissions derive from deforestation and land deterioration due to various causes.

\textsuperscript{45} Detailed information about the most important policies for climate change around the world can be found here: http://www.thepolicyclimate.org/
two decades due to oceans rising and their people will be forced to relocate elsewhere, losing their homeland because of global warming induced by developed countries. According to the *Landscape of Climate Finance 2012*, more than half of the volume of climate finance flows towards low-carbon projects located in developed countries, accounting for approximately USD 193 billion, which is 53% of the total amount of climate finance in 2011. The outstanding 47%, which corresponds to USD 171 billion emerges from investments that operate in developing countries. As already highlighted, the private sector plays the biggest part in the climate scenario, with commercial entities and households contributing 57% of low-carbon/green investments in developing countries, while in developed countries the share touches an impressive 89% of the total. The figure below (elaborated by Bloomberg New Energy Finance) shows these investments split by country and by technology. It is worth noting the impressive contribution of Italy in the climate finance scenario in 2011, thanks to a national policy of massive incentives for solar PV installation.

![Geographical distribution of private investments in 2011](image)

*Fig.3: geographical distribution of private investments in 2011. Source: BNEF, 2012.*
CHAPTER 3

3.1 RISKS INSIDE LOW CARBON INVESTMENTS

The portrait of climate finance status elaborated by Climate Policy Initiative is a complex and structured universe, in which impressive amounts of money flow. The exact description and quantification of the finance for climate change is still a relatively new topic and historical records with such a high level of details do not exist. Governments and public institutions lack unanimous ways of reporting and verifying their climate-related expenditures (MRV systems\textsuperscript{46}, coherent between countries) and often lack reporting at all. The magnitude of investments has risen significantly since the first edition of the \textit{Landscape of Climate Finance}. In its research, released in 2011, CPI identified USD 97 billion spent in the year 2010 in low carbon-climate resilient initiatives. The considerable gap between the 2010 and 2011 findings was generated mostly by a modified and improved methodology adopted in the second report. In the latest version in fact, many more investments have been captured that were not accounted in the Landscape 2011\textsuperscript{47}. However, the increase in investments for climate finance is undeniable despite the differences in the adopted methodologies. Commitments in this field have risen rapidly in the last years, even if they have not been precisely quantified in a common way.

Unfortunately, even if investments for climate purposes are constantly rising, they are still significantly below the levels needed to prevent catastrophic climatic impacts on our future. According to the projections of the IEA, at least USD 600-700 billion per year are still needed to achieve the minimum target of limiting the global temperature rise to 2

\textsuperscript{46} Measurement, reporting and verification.

\textsuperscript{47} In particular, more development financial institutions have been analyzed, with a greater level of details. The geographical coverage has been enlarged too, including additional flows of capitals from different developing countries. Moreover, CPI posed particular attention on the ownership structure of the investments, in order to capture if a project can be effectively categorized as publicly or privately owned.
40 degrees Celsius\textsuperscript{48}, if compared to USD 364 billion invested in 2011\textsuperscript{49}. Several other research studies show instead that the gap is even wider and that further additional investments are needed. Furthermore, anticipations from the forthcoming IPCC 5\textsuperscript{th} report\textsuperscript{50} reveal future scenarios of global warming that are significantly worse than those elaborated in the 4\textsuperscript{th} report. In this way, the financial effort needed to limit the future temperature increase is very likely underestimated.

It is clear that what has been done is not sufficient to tackle climate change globally. Additional concrete actions must be undertaken both by single individuals and at the governmental level. In particular the focus of policymakers must be directed to find possible solutions to fill the underlined gap in investments.

Public and private capitals are required, but several factors limit the effective involvement of both kind of finance. For what concerns public investments for climate change, they are subject to many constraints mostly deriving from tight and suffering national budgets, especially in the aftermath of recent years’ financial crisis. Additional contributions on this side appear hard to obtain, as they will be reflected in new levies on taxpayers, already severely affected by the impact of the crisis in many countries. Moreover, climate scepticism instigated by economic lobbies and lack of awareness on these topics can affect the introduction of new taxes.

On the other side, private investors operate in accordance with their specific “risk-returns” profile and always seek the best possible trade-off between the two drivers. The lack of investments from private actors in most cases is attributable to an inadequate balance between these two factors.

Returns and risks are the key drivers of investment attractiveness and represent the core of every financial theory and behavior. “Return”, in the financial context, refers to the amount of profits or losses realized compared to an initial investment, usually expressed

\footnotesize{\textsuperscript{48} IEA, 2012.} 
\footnotesize{\textsuperscript{49} The financial gap is likely even higher, as IEA’s calculation refers to the energy sector only.} 
\footnotesize{\textsuperscript{50} IPCC, 2013.}
in percentage. On the other hand “risk” refers to the uncertainty associated with the eventuality of obtaining different returns from the expected, which can be higher or lower. Generally the two terms are inversely related: investments characterized by a higher level of risk are associated to higher returns (or losses) and when uncertainties are lower, returns required by investors are lower too.

In a survey conducted by Climate Policy Initiative\textsuperscript{51} with several investors in green and non-green sectors, it emerged that risk is the element that mostly influences the potential of a project to find the appropriate funders or its capability to generate the proper level of returns that investors require.

Project financers are aware of the importance of managing risk, whether real or perceived, as risk is the factor that is mainly responsible for the repayment or non-repayment of the financial liabilities of their projects. Indeed project’s debt must be reimbursed with timely interest to the lenders, as well as the equity contributions must be adequately remunerated with dividends and returned at the occurrence to shareholders. For these reasons, the analysis, prediction and mitigation of risks assume a crucial role for the viability of an investment. If not implemented correctly, cash shortages may occur and if lenders are not adequately repaid, the project will technically default.

It has been agreed that risk mitigation has the highest potential to make low-carbon projects more appealing to investors, in order to attract their capitals and reach the level of USD 1 trillion per year of additional investments as required by the Copenhagen Accord.

The most effective way to deal with risks begins with the correct and complete identification of all the circumstances that may impact on the correct development of an initiative.

Unfortunately, while returns can be easily identified and calculated, the precise definition of all the risk situations is much more complicated. Risk varies significantly across technologies, industries, and countries and specific sources of uncertainty are present at

\textsuperscript{51} CPI, 2013.
every stage of the economic life of projects. For these reasons, providing an overview of all the risks impacting on investments is complex and, given the continuous evolution of certain financial and industrial sectors, often incomplete. Moreover, the way in which risks are categorized differs between different sources, leading to inconsistencies and disputes over their definition ⁵².

To address issues about the description of risks, in this thesis I adopt the structure presented in the report *Risk Gaps: a Map of Risk Mitigation Instruments for Clean Investments* published by Climate Policy Initiative in 2013 ⁵³, to which I personally contributed. In some cases few integrations have been deemed necessary to offer a more realistic description of the state of the art.

According to *Risk Gaps* (and in general, with the sectorial literature), risks can be pooled into four broad categories depending on their source:

- **Political, policy and social risks**
- **Technical and physical risks**
- **Market and commercial risks**
- **Outcome risks**

These broad categories can be applied to several types of investments and may relate to a specific phase of the economic life of a project ⁵⁴, or can also be encountered at multiple stages. Usually, there is a large difference between risks belonging to the designing and construction phase (pre-completion), in which the project is not yet generating revenues and risks emerging in the operational phase (post-completion).

Clean energy investments and low carbon projects in general, require particular attention, as they are widely perceived as riskier than other businesses. Investors may be concerned by specific factors such as their diffused reliance on public sector policies, or because

⁵² “Identifying the different types of risks is a varied art that differs between practitioners” (OECD 2008).
⁵³ CPI, 2013.
⁵⁴ Usually the life cycle of a project is the following: 1) designing phase; 2) construction; 3) financing; 4) operation; 5) decommissioning; 6) outcome (only for public sector).
clean technologies, markets, and industries are often innovative solutions with a limited historical record. These dynamics influence investors that, by consequence, require higher returns and a relative higher cost required for financing higher-risk/green projects than lower-risk/polluting alternatives. Risk mitigation instruments, described further in the analysis, may address these concerns and enable, at least theoretically, green investments.

![Image of Fig. 4: summary table of risks. (Personal elaboration).](image)

### 3.1.1 Political and country risks

The first group of risks affecting low-carbon and climate resilient investments is the one that creates most concern for investors. The Multilateral Investment Guarantee Agency (MIGA), member of the World Bank Group and biggest provider of political risk insurances in the world, define these risks as situations “associated with government actions which deny or restrict the right of an investor/owner (i) to use or benefit from his/her assets; or (ii) which reduce the value of the firm” (MIGA, 2013). In other words, political risks may
have various forms and include every source of instabilities and complications that may arise from the action of governments, public entities and social contexts that can affect the activity of a certain company or the performance of an investment. Examples of political risks include the illegitimate use of government’s power, bribery and corruption, war, terrorism, riots and social violence, limits to the transferability of capitals, expropriation of assets, non-payment of governmental obligations and several other typologies that will be described further in this section. The impact of these dangers can vary largely, from small damages to the equipment of the company due to sabotages or thefts, to the complete expropriation of the property and kidnapping. Usually political risks are associated with developing countries, as investments in these regions, especially trans-national investments from foreign countries (called Foreign Direct Investments, FDI), are perceived as more uncertain. However, developed countries are not excluded from political risks and in some cases can represent even more dangerous investments if risk managers underestimate the real level of risk in the local environment. The case of the retroactive reduction to feed-in tariffs occurred in Spain in 2010. This is a clear example of how a developed country’s government can undertake an illegitimate and unpredictable action towards investors.

Investors concerned by economic losses or denied justice caused by political factors usually find protection with applicable political risk insurance (PRI) or also loan guarantees, both issued by public institutions and private companies. Public providers, in particular, can be export credit agencies or supra-national organizations (like MIGA for instance, or DFIs) that play an important role in the intermediation between the investor and the government of the country where the investment is located. These institutions have a

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remarkable power in enforcing countries to collaborate and comply with the needs of investors. In this way, both parties avoid international legal battles that can be very long and expensive.

However, despite the support the best way of mitigating political risks is certainly an accurate and regular investigation of the geopolitical situation of the country that host the project, in order to identify and anticipate all the potential sources of trouble.\textsuperscript{56}

Below are listed and analysed all the sub-categories of political, policy and social risks that have been identified in the analysis for the \textit{Risk Gaps Series}.

**Public governance and corruption.**

The first sub-class encompassed in the category of political risks refers to the illicit or incorrect behaviors of public authorities in exercising their power that can damage or obstacle the economic cycle of a company. Actions of bribery, corruption and extortion occurring at the government level, along with institutional unreliability in respecting contracts are a meaningful example of these circumstances. The level of corruption in different countries is a matter of many studies aiming to map what places are of greater or lesser concerns for investors to comply with. Indices like the International Country Risk Guide\textsuperscript{57} are a valid support for decision makers to deal with corruption risk.

The factor that clearly identifies this typology of risky situations is represented by the abuse of power perpetrated by public authorities for their personal advantage (or that of a third party, such as a competitor may be).

Since risks of this kind are perceived as higher in developing countries, the decision of project sponsors and developers to start a project in these regions can be affected, which creates a significant barrier to foreign investments flowing to these regions.

\textsuperscript{56} PwC, 2013.

\textsuperscript{57} Additional information on this index can be found in the website of Political Risk Services Group: [www.prsgroup.com](http://www.prsgroup.com)
Legal and ownership rights

Similar to the previous category but potentially more harmful for the company, these risks refer to the illegitimate actions of host countries’ governments that may affect, in a discriminatory way, foreign companies and investors by depriving them from their ownership rights on the asset and the connected economic profits. Investors feel even more threatened when they perceive there are no legal remedies that prevent governments from passing harmful laws. Expropriatory acts, nationalization, confiscation and other forms of illegitimate intervention like the creeping expropriation\(^ {58}\) are included in this category. Ownership reduction interferences can have as target the entire property or specific assets or funds of the company. This category is also called “sovereign risk”\(^ {59}\).

Regulatory and policy risk

This category refers to losses and complications occurred to the company due to unexpected changes in law perpetrated by the host country’s government, under the ordinary power of promulgating, modifying and cancelling laws. Actions of this kind belong to the legitimate authority of all nations, which, if performed, affect indiscriminately all the entities in the sectors and markets targeted by the new policy. Events like the reduction of national subsidies for clean energy production or repeated changes in the amount of supporting tariffs have the effect of destabilizing the energy sector of a country. The instability of the public sector may discourage investors from starting new investments in these countries, especially if returns do not adequately reflect the risk.

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\(^{58}\) The creeping expropriation refers to a series of repeated public administration’s actions to take advantage of the target company (increasing taxes, protracted interference, controls…) that in the end has the effect of an expropriation.

\(^{59}\) MIGA, 2013a.
Similarly, a second type of regulatory risk, identified with the name of “retroactive policy change”, is a reduction in the amount of financial support granted by a policy that is already active and contractually agreed by the investors and the government. This circumstance (like the retroactive reduction of feed-in tariffs occurred in Spain) is of particular concern to investors as it destabilizes the operations of a company and forces the management to comply with lower level of expected incomes. The unpredictability of future policy changes makes it impossible for project owners to calculate how much and what consequences can impact the future incomes and costs.

**Breach of contract**

Another form of illicit behavior of governments is represented by the violation of obligations under contracts stipulated with investors. MIGA defines it as the “risk of losses arising from the host government’s breach or repudiation of a contractual agreement with the investor, including non-honoring of arbitral awards” (MIGA, 2013a). This violation means that governments refuse to honor the obligation contained in a contract set with the investor, which can consist of late payments or refusal to pay at all (in the case of a power purchase agreement for instance), or the failure to supply an asset or many other triggering situations differing from contract to contract.

Though this appears as a risk group similar to the policy/regulatory risk, the difference is that while policy risks originate from actions of governments applying their power legitimately, breach of contract refers to a voluntary and illicit action in the context of a legal agreement.

Breach of contract and policy changes are perceived as the highest risk by investors operating in developing countries. In fact, most of the losses they suffered in recent years were in fact originated by these situations\(^{60}\).

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\(^{60}\) MIGA, 2013b.
Approvals and siting

This sub-class encompasses all the delays and missed profits that the project company may suffer caused by complications associated with the required authorizations and the availability of the production site.

The first source of risks originates from difficulties in obtaining the required authorizations from local authorities, as well as the risk of additional permits being requested during the life of the company. The second refers to issues in finding, obtaining and acceding to the construction site plus the risk of an eventual forced relocation of the production plant to a different position, imposed by host governments for legitimate or illegitimate purposes.

Private governance

This risk can be considered the private counterpart of the public governance risk. It includes all the illicit actions started by the management of the business for their personal benefit that can originate economic damages to the company. Corruption, abuse and unauthorized appropriation of resources, industrial espionage are amongst the dishonest and often illegal activities coming from the core of the company (also referred as “endogenous risk”).

Reputation

Reputational risk for green investments in developing countries can derive from lack of local regulation covering potentially sensitive issues such as ecosystem integrity, local working conditions, and land expropriation. These situations can originate protests, boycotting actions and eventually social violence.

Social unrest
Events like war, riot, terrorism, civil war, interference of extremist movements, revolution, vandalism, sabotages, and other harmful situation caused by politically motivated acts belong to this category\textsuperscript{61}.

It includes all the actions of single individuals or groups of people that can economically hurt the business, by causing tangible damages to the facilities and the infrastructure or also by interrupting the production cycle. In particular strikes, piracy, stealing and other stoppages that negatively affect the project are also referred to as “industrial relations risks”\textsuperscript{62}.

Risk arising from the social environment is taken into great consideration by investors and represents a serious threat for their safety and the safety of their business.

**Force majeure risk**

Force majeure risk is defined by the Partnerships Victoria as “risk that a specified event entirely outside the control of either party will occur and will result in a delay or default by the private party in the performance of its contractual obligation” (Partnerships Victoria, 2001).

Events of this kind (also called “acts of God”) are very unlikely to happen, but if they do, they might have a tremendous impact on the business. Natural calamities (earthquakes, storms, lightning, mudslides, for example), nuclear incidents, wars, revolutions, military revolutions and many others are included.

Force majeure risk is usually classified separately from the four risk categories analyzed, but it is composed of events that are typically considered political (social unrest) or operational risks (environmental impacts) and are often included in the coverage extent of their contracts.

\textsuperscript{61} From the website of MIGA: \url{www.miga.org}

\textsuperscript{62} Partnerships Victoria, 2001.
3.1.2 Operational and technical risks

Risks of a technical and physical nature form the second category of harmful events that can hamper investments in low-carbon sectors. Risks in this class are connected to the specific characteristics of the assets involved in the project and may differ in several factors, endogenous and exogenous to the company. For instance, risk can be originated from the inadequate or unreliable technologies adopted, problems linked to the geographical location, quality and availability of inputs, outputs, and workforce; impediments in the productive process and several other circumstances.

One of the main factors to influence the level of these risks and the resulting availability of risk mitigation instruments in the market is the maturity of a certain technology. If a technology is sufficiently established and adopted worldwide for a period long enough to create an historical record, then it is easier for insurers (or other providers of risk mitigation instruments) to calculate the implicit risk and to price it correctly.

In this way, it is possible to affirm that premia charged for the risk coverage are inversely related to the maturity of the technology endorsed.

Design and construction

The first category of technical risks includes all the uncertainties arising before the project’s infrastructure is built and ready to start the production process, also called the pre-completion phase. This stage consists of many activities: designing the plant (carefully considering what are the technologies, materials and human resources to utilize and the site characteristics); planning the building phase by allocating adequate resources and set a reasonable timing for its conclusion; building the facilities following the plans.

The consequences if the risk occurs may include delays and interruptions in all the pre-completion phases together with resulting greater costs. Moreover, errors in designing or building the project may render the infrastructure inadequate for the production process,
either immediately or over time\textsuperscript{63}. The overall risk in these phases is higher when innovative or less mature technologies are adopted. Appropriate instruments like EPC contracts can help investors hedge in these circumstances.

**Operation and management**

There are different kinds of operational risks, belonging to the post-completion phase of the project’s facilities and impacting on the correct running of the production cycle. Operational risks (also called risks of “production” or “management”) in fact, refer to all the circumstances that can impact on the production chain of businesses, in a way that precludes the correct deliver of services and goods to clients, in the agreed conditions and expected time, cost and quality. These circumstances are specifically related to the supply of inputs, the reliability and performance of final outputs, the presence of an adequate demand from the market. This category includes also all the problems that a specific technology may originate, such as early obsolescence and depreciation of its assets over a short period of time, but also unanticipated costs occurred for extraordinary repairs and operations of maintenance.

Risks belonging to the post-completion phase of the project are not less important than those happening when the infrastructures are not yet built. Complications in this phase can indeed impact the business in a severe way, because they affect the cash flow generated. If the cash flow drops below the projections, it will be challenging for the company to ensure the adequate compensation of shareholders and providers of debt.

**Supply risk**

\textsuperscript{63} Partnerships Victoria, 2001.
The availability of inputs is one of the primary causes that may adversely influence the correct course of the production process. If the company is not capable of finding the resources needed for its purposes, or if they are delivered in lacking quantity and quality, or they are provided at a higher price than projected, supply constraints emerge. When supply shortages happen the consequence is that the plant is forced to produce below its capacity and this impacts on the revenues generated, the economic margins and also may influence the industrial relationships with purchasers and other stakeholders. Businesses can prevent these situations and seek protection using long-term agreements with their suppliers, by fixing in advance the desired characteristics of the inputs. In this case, an indemnity payment is required if the supplier delivers the goods in a way that breaches the agreement.

A particular kind of supply risk that is typical to renewable energies is the “volumetric risk”. Technologies like wind (onshore/offshore) and solar (photovoltaic/concentrated solar power) in particular, rely on energetic sources that are highly variable and, even with the most sophisticated tools, difficult to forecast exactly. In these cases, weather derivatives and insurance does not represent a solution to guarantee the required supply of input, but can compensate the clean energy producer for the loss of income.

Output performance

A second component of the operational risk, which is directly associated with the supply risk, originates from the quantity and quality of the output produced. Customers demand and pay for a certain product, whose quantity and quality are often determined in a contract between the two counterparties. If the output produced shows performances characterized by a lower quality than the expected (which is measured through appropriate testing before the sale; or emerges after the product has been

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delivered to the buyer), the company is forced to undertake alternative unfavorable strategies to place its products on the market (like selling at a lower price).

In the sector of renewable energies such performances are influenced by many factors. For instance, the input/output ratio\textsuperscript{65} of a plant might progressively decline over time, or standards of emissions savings might not be met. Another example is the fuel consumption that could be more expensive than expected (in particular for the fossil fuels power production).

The immediate consequence of underperforming is the lower efficiency of the production and additional costs\textsuperscript{66}. In the case of renewable energy manufacturers instead, whose outcomes are tangible assets like wind turbines or photovoltaic cells, the company might be forced to accept restitutions and concede reimbursements or unwanted costs for technical assistance.

Other economic damages connected to the state of the outputs may emerge when the company operates at a productive regime that is lower than the expectations. In this case the effective revenues will be lower than expected and the matching between output demanded and produced will be hardly met.

**Environmental impacts**

Interactions between projects and their surrounding environments happen in two directions: 1) from the project to the environment and 2) from the environment to the project.

The first encompasses all the potential deleterious impacts that the plant can provoke to the surrounding environment during the various phases of its economic life. The fact that renewable energy production contributes to decarbonizing the energy sector does not mean that plants are not polluting in some way. Large hydroelectric power plants (usually

\textsuperscript{65} The quantity of inputs needed to produce one unity on output.

\textsuperscript{66} Gatti, S., 2008.
larger than 50 MW) for example, have a huge impact on the regions where they are installed. When the land is flooded, the water destroys entire natural habitats with relevant impact on the wildlife and often to the populations established in the area. Moreover (even if there is not yet a strong consensus on this topic) water reservoirs of big dams are important emitters of greenhouse gases, methane in particular, at levels similar to fossil fuels. Such emissions come from the vegetation and soils flooded when the reservoir is first filled, that then decomposed under water creating methane\textsuperscript{67}.

Another example is the presence of wind turbines that may originate “sight and noise pollution”, both considered negative impacts on the environment. Many other negative aspects of renewables are already known and much more uncertainties are connected with new technologies that are still immature.

Completely different are the risks originating in the opposite direction, from the environment to the project. For simplicity, I will consider only losses arising from events of major impact on the project such as earthquakes, floods, severe droughts, hurricanes and other calamities. The entity of damages these events can originate is vast, extending from small productivity interruptions to the complete destruction of the plant.

Investors must be aware of the geological and meteorological characteristics of the region in which the production site is located and carefully examine the most adequate solutions in order to prevent these situations. Insurances are usually the most adopted instrument to mitigate catastrophe risks.

\textbf{Decommissioning}

The final phase a project’s economic life is called “decommissioning phase” and takes place when the operations are terminated. In this phase the plant and all its infrastructures are dismantled or demolished, the site is rehabilitated and the resulting wastes are disposed and decontaminated. Specific laws that ensure the healthiest

\textsuperscript{67} International Rivers, 2013.
conditions for the safeguard of workers, local populations and the environment when the decommissioning phase takes place usually regulate all these operations.

Decommissioning risk may arise from the potential need to dismantle the facilities earlier than planned or at higher costs. Costs can differ substantially from technology to technology and are higher for those that are more engineering-sophisticated, like the massive offshore wind farms. Moreover, companies must carefully evaluate the legal aspects of this phase to ensure the respect of the regulations and the safety of the people involved.

3.1.3 Commercial and financial risks

The risks of the third kind are originated by all those circumstances that can negatively impact the price of economic and financial factors employed in the project, such as the inputs of the production or the outputs. Commercial and financial risks, in a broader meaning, are connected to the concept of unfavourable market volatility that may impact on certain assets, determining their value and their availability.

One of the risks that mainly concerns developers of green technologies is the complexity in accessing to capital for the initial funding of the project and for future needs. Focal drivers influence this capability, like the cost of a company’s capital and the liquidity of an investment. The first is the return that a company must grant to its providers of capital to obtain the financing needed, which is inversely related to the inner level of risk. If a company is considered unsafe, its credit rating is low and such company will suffer difficulties in accessing capital markets for financing. As a direct consequence, its cost of capital (when obtained) will be higher. This situation creates many problems for the financial stability of the company that will suffer from high debt servicing, problems in refinancing and other troubles related to its low credit rating. Liquidity is another important factor that hinders a company’s access to finance.
In this category also belong risks attributable to the reliability of commercial counterparties in repaying their debts and risks originated by currencies ‘value oscillating on markets that can impact the value of cross-borders investments.

**Market risk**

The first class analyzed is the “market risk”, corresponding to any negative variation in the projected cash flow of the company that is due to a reduction in: 1) the demand for the output produced; 2) the price at which the output is sold to buyers.

In both cases, revenues that are actually obtained differ from those that the company expected, forcing the management to modify its production process and its operations strategy to deal with the new, less favourable scenario. In the renewable energy sector, counterparties are usually buyers of the electricity produced, which can be private or public entities. Private entities generally purchase the energy directly from the energy generator for their own purposes, while in the case of infrastructures for public use, revenues comes from the government that in this case, bear the demand risk from its final users (the population).

The risk of insufficient demand of output may originate from several factors, internal and external to the company. If the company, for instance, elaborates a business strategy that is too optimistic, it is likely that effective performances will be lower than the expectations. Or also, in markets where many players operate and their outcomes are interchangeable, particularly successful strategies implemented by competitors can reduce the demand or the price.

A diffuse and powerful mechanism often used to mitigate market risk is the off-take contract (like PPAs in the power sector). These are long-term agreements between a producer and a purchasing company (usually a large utility, in the case of PPAs) in which the first player promises to supply a certain quantity of output at an agreed price, and the second is obliged to pay the agreed price to purchase that product. In this way, the
volatility of the output’s price and its quantity are stabilized and expected cash inflows are known in advance\textsuperscript{68}.

**Currency volatility**

Currency risk originates every time there is a mismatch between the currencies in which the assets and liabilities of a company are denominated. Revenues can be affected by the adverse fluctuation of exchange rates and not only, posing a serious concern to multinational companies and cross-boundaries projects. Under the currency risk category fall:

1) Exchange rate fluctuation (that affect the revenues of projects located in a foreign country);

2) Transfer barriers (imposed by governments of host countries to investors that aim to repatriate their capitals);

3) Inconvertibility (of revenues accounted in the host country’s local currency into the domestic one).

The most effective way adopted by internationally operating companies to mitigate risks of this kind is matching the currencies of the largest amount possible of financial flows, in order to avoid the use of different foreign currencies. In alternative, companies often apply to derivative contracts (standardized and/or OTC) to seek protection.

Also political risk insurances can play an important role in guaranteeing the convertibility of foreign currencies denominated revenues into hard currencies (United Stated dollars, Euro, Japanese Yen,...).

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\textsuperscript{68} Gatti, S., 2008.
The fluctuations of interest rates represent a major risk of financial losses for heavily indebted project companies. Volatility of floating rates can influence significantly the entity of debt service payments of that a company must face to honour its liabilities, especially if they are long-term.

In order to reduce the magnitude of these risks, the company can select long-term financing at fixed rates (that enable to know future costs in advance), or enter into derivative contracts, such as interest rate swaps.

**Market-based environmental instruments volatility**

Projects based on low-carbon and climate resilient technologies often receive the support of dedicated instruments for the deployment of environmental policies, whose value may change over time.

Tradable certificates, fiscal charges on polluting activities and cuts for the cleaner ones, governmental subsidies are all instruments of “command and control” type that public authorities often use to implement their policies.

Private initiatives largely based on the economic support of these instruments must be aware of their potential volatility and should develop alternative strategies, in case the support will be reduced or even removed.

**Access to capital**

All the situations that may hinder the company in finding the capital needed for its establishment are encompassed in this group, as well as capital needed to run the project as planned. Investors need availability of financial resources in many forms and at every stage of the economic life of a project, from the its design to the decommissioning phase. Commercial financial institutions (like banks) are the major providers of debt capital to

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project companies. Before approving the debt (being short-term, long-term or a credit line), banks examine carefully the financial and economic profile of the applicant and evaluate its creditworthiness.

The risk that lenders will not concede the requested funding or approve it but at an excessive cost, is called “access to capital risk” and is mainly due to the weak creditworthiness of the company.

In addition, if the duration of the borrowed capital does not match (usually, because it is lower) the investment horizon of the project, the company will need to replace it with a new and more adequate one. This is a common practice called “debt re-financing” and is subject to the same constraints of the initial access to capital.

**Creditworthiness of counterparties**

Closely related to access to capital is the risk associated to counterparties with a low creditworthiness.

The financial reliability of counterparties (customers, clients, off-takers, suppliers and other entities having commercial relationships with the company) is very important in project finance, especially from a lender’s point of view. In fact project companies are constituted off the balance sheet of their “mother companies”, and their liabilities are characterized by limited recourse to sponsors in case of default. So, if an SPV, specifically created by a company to pursue a specific business, suffers default, its creditors will seek reimbursement against its assets only and, in any case, not from the mother company. For this reason, the quality and reliability of commercial counterparties is vital for project companies.

Counterparty and access to capital risks can be mitigated through: 1) an accurate selection of commercial partners and 2) dedicated instruments provided by public financial institutions like credit enhancers (loan guarantees or letters of credit, for instance).
Investment liquidity

Liquidity is an important factor for investments, it measures “the degree to which an asset or security can be bought or sold in the market without affecting the asset's price” (Investopedia, 2009).

In the project finance context, liquidity or exit risk refers to the uncertainties related to the sale of the investment before the planned time horizon\(^70\) at the best deal possible. Liquid investments are more likely to be sold in less time and at a higher price than illiquid ones. This degree of liquidity plays an important role in influencing investors’ willingness of participating in the project, as the investment activities of many financial categories, like banks and insurance companies, is regulated by strict international standards\(^71\).

Liquidity risk can also refer to temporary lack of cash by the company, needed for the payment of short-term liabilities.

3.1.4 Outcome risks

The fourth and last category of risks analyzed in this thesis is slightly different from the aforementioned as it considers the perspective of the public sector. Outcome risks refer to uncertainties borne by low-carbon public sector’s projects that are required to achieve predetermined objectives of various kinds. These public goals can be the achievement of a certain reduction in the emissions level, the respect of budget limits and the creation of indirect benefits to the area where the project is located and the local population.

The success of public green initiatives and especially respecting the thresholds of an approved budget, assume a higher relevance in this period of diffused crisis. Additional unexpected expenditures mean (roughly) the issuance of new sovereign debt and increase

\(^{70}\) It can coincide with the end of its assets life cycle or the maturity of the debt.

\(^{71}\) The banking industry is regulated by the Basel III Accord, while the European Insurance sector will be soon regulated by the Solvency II directive. Both introduce stringent requirements for the liquidity for investments in the two sectors.
the fiscal pressure on taxpayers. For these reasons, governments must carefully consider the investments they manage to implement and the specific risks involved. In this light, governments often develop their projects in partnership with private actors with the explicit target of limiting costs and improving the quality of the project.

**Emission reduction targets**

The primary target of clean initiatives developed by public institutions (in this case the energy production through renewable sources) is the reduction of greenhouse gases emissions through the displacement of fossil fuel technologies. Missing the expected results is a risk for the governments that marks the inadequacy of the supporting environmental policies.

**Co-impacts**

When public institutions implement green infrastructure projects, their purpose is not simply the abatement of greenhouse gases from fossil fuels. Secondary goals are usually set and their achievement contributes to the success of the initiative. Among these targets is the creation of new jobs, the reduction of unemployment, the improvement of air quality and the host country’s power independence from foreign suppliers. Failure in achieving expected co-impacts is a source of risk.

**Impact on public budgets**

This category covers the possibility that the public finance committed to low-carbon initiatives is not sufficient to achieve the agreed targets. Overcoming the public budgets allocated is a serious concern to governments and, secondarily, to citizens.
Specific contracts (like the EPC, for instance) stipulated with the private sector offer a practical solution to address this risk and respect the planned allocation of time and resources.

3.2 SUPPLY OF RISK MITIGATION INSTRUMENTS

As mentioned in the previous section, risk is the main factor that apparently moves the investments in the financial universe, regardless of whether they involve public or private capital, invested domestically or abroad, for low-carbon or for fossil fuel projects.

A direct consequence of this is that lowering the level of risk characterizing a determined project, using all the strategies available and to the maximum extent possible can stimulate investments. Having listed and described the different kinds of uncertainties in the previous section, the next step is identifying which are the instruments that investors can use to reduce them.

In the Review of Risk Mitigation Instruments for Infrastructure Financing and Recent Trends and Developments, the authors state that: “risk mitigation instruments are financial instruments that transfer certain defined risks from project financiers (lenders and equity investors) to creditworthy third parties (guarantors and insurers) that have a better capacity to accept such risks. The importance of these instruments is also higher in infrastructure sectors in which financing requirements substantially exceed budgetary or internal resources” (Matsukawa, T., and O. Habeck. 2007).

The supply of risk mitigation instruments is wide and includes insurances, derivative contracts, guarantees, risk sharing facilities, subsidies and many other products that create an intricate and constantly evolving scenario. Often many products aim to cover the same risks, sometimes complementing each other and sometimes overlapping. Overlapping occurs because instruments of the same kind are developed by different organizations and aim to address the same set of risks. They only differ by small details, usually the size or the extent of the coverage, the categories of investors and assets they target, or the geographical distribution and coverage of countries. Guarantees offered by
the World Bank Group are a clear example: the Political Risk Insurance (PRI) provided by MIGA is designed to cover political risks in developing countries, which is nearly the same coverage offered by the Partial Risk Guarantee of IBRD and IDA or the insurance for US based businesses offered by OPIC\textsuperscript{72}. Also several national Export Credit Agencies in the world offer the same service as well as some private insurance companies does. What differs in these products is the geographical coverage, the insured amount, the coverage length, the price of the instrument and many other small aspects that altogether create a multi-faced and structured market.

However, despite the large number of risk mitigation instruments available in the public and private markets, not all risks can be fully addressed and eventual coverage gaps can emerge and affect the expansion of investments.

Moreover, from the point of view of public institutions, risk mitigation instruments allow for another important achievement. They represent an efficient mechanism to mobilize private investors’ capital for financing green infrastructures, with a lower amount of money compared to the amount required by traditional solutions such as grants, concessional loans, equity participation or else. This aspect assumes significantly greater relevance in the current economic context, dominated by increasingly tight governmental budgets, and acquires a real vital value in developing countries.

In fact, risk mitigation instruments represent a successful bridge to go beyond the barrier of creditworthiness, providing poor countries’ governments and local infrastructure developers the access to capital markets to raise the financing needed. Normally these entities show a low credit rating, which limits their access to debt financing as provided by lending institutions. The presence of risk mitigation instruments usually enhances their creditworthiness and makes them eligible to attract capital.

Risk mitigation instruments can be grouped into broad categories, described below. In order to present the most complete list of existing risk mitigation tools, I have used the

\textsuperscript{72} The Overseas Private Investment Corporation (OPIC) is a US owned development agency, whose mandate is promoting trans-national investments of private local enterprises by offering financial solutions such as loans, guarantees and insurances.
classification that we, at Climate Policy Initiative, have developed in our recent series of publications titled “Risk Gaps”\textsuperscript{73}.

In order to help the comprehension of the instruments described, some common concepts has to be explained. The “beneficiary” is the company or the investor that receives a direct benefit from the risk mitigation instrument. “Host country” refers to the country in which a certain project is located.

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Fig. 5: summary table of risk mitigation instruments. (Personal elaboration).

3.2.1 Contracts

The first category of risk mitigation instruments is constituted by bilateral contracts to cover non-financial risks, in which one of the two parts is represented by the investor seeking risk coverage and the counterpart is an organization providing a specific service, in this case addressing one or more investment’s risk. Contracts are the most direct way to address risk and in particular are suitable for reallocating it across different stakeholders.

\textsuperscript{73} CPI, 2013.
In the majority of cases, contracts are stipulated by private entities in agreement with other private counterparts, but they are also often used by public entities for the implementation of mutual interests’ projects and policies in partnership with private companies. O&M and PPA are clear examples of these situations.

**Engineering, procurement and construction (EPC) contract**

EPC contracts are designed to address all those uncertainties that can occur in the pre-completion phase of projects, namely engineering, procurement and construction phases. With these contracts the company responsible for developing the project transfers all the risks of the E-P-C phases to a contractor, which, against the payment of a fee, will bear all the eventual impediments in the process, like changes in expected cost of labor and inputs. This solution allows the beneficiary to shift several risks to a third company, transforming them from uncertain future costs into a fixed cost (the fee paid to the EPC contractor). This is now a budget voice that would otherwise potentially suffer variations, and thereby enabling the company to respect timing and costs as initially planned\(^7^4\).

EPC contracts are also known under the name of Turnkey Construction Contracts (TKCC).

**Operation and maintenance (O&M) contract**

This instrument is designed to mitigate risks emerging after the building of the structure is complete, in particular the operational risk. Under the O&M contract the owner of a project commissions another company, called the “operator”, to run the plant and handle its ordinary maintenance. The operator is usually an organization that is highly experienced in the sector and possesses all the requirements needed for addressing operational risks. The management of the project determines precise tasks and directiona

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\(^7^4\) Wikipedia, 2013.
guidelines for the O&M contractor and often includes output and quality requirements, together with other conditions (such as the responsibility in case of replacement of assets). The operating company receives a fee for its service, that usually contains a performance bonus, which can be of two types: 1) a fixed fee that serves to cover all the operational costs or 2) a fee that does not cover these costs and allow the operator to make profits only if the fee received is higher than the costs sustained. Operation and management contracts are usually set for short terms (often 2 to 5 years).

**Power Purchase Agreements (PPA)**

A Power Purchase Agreement (PPA) is a legal solution used in the electricity production market that is often adopted because it generates benefits for private and public actors. Technically, is a legal agreement for the sale of the energy produced, stipulated between a power generating company and a purchasing entity. The former is commonly an “independent power producer” (IPP), which is a private company often organized as a special purpose vehicle (SPV), while the latter is usually a public owned utility, that use the electricity under its jurisdiction.

Under the PPA, the IPP guarantees the supply of an agreed amount of electricity every day and the off-taker is required to purchase the electricity produced for a long-term period of time (usually ranging from a minimum of 5 years to 20 or 25 years).

The price paid may be fixed over time or may be modified (increased or decreased) following an agreed time plan. Price can also be negotiated in any other way as long as both parties agree to the negotiation. The fee level must be sufficient to cover the fixed costs. The replacement of damaged or obsolete assets is usually borne by the project owner, while the operator is only responsible smaller replacements.

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75 The replacement of damaged or obsolete assets is usually borne by the project owner, while the operator is only responsible smaller replacements.
76 PPP-WB, 2013.
77 This is the typical case (called “American” PPA) but other types of PPA exist. For instance, the buyer can be a commercial entity, like a business, a hospital or a school that opted to purchase his electricity from an IPP rather than a public utility. Or also (in the case of “English” PPA) producers can sell their power to energy exchanges, then it will be distributed to final users through the national grid system.
costs of the energy production of the plant (including the return for shareholders and lenders) and contains also a variable part, reflecting those costs that are not constant in time, like the fuel supply.

Power purchase agreements are useful solution used to address many uncertainties of buyers and sellers. With PPAs, producers rely on a certain amount of revenues over a long-term period and buyers have their energy supply ensured for the same period. Both of them knows in advance their future incomes and costs.\textsuperscript{78}

**Stabilization and renegotiation clauses**

These clauses are usually part of contracts signed between the project company and the host country. They are added to contracts for preserving the contractual power of the investors in relation to unexpected governments’ actions that can modify previous agreements or existing laws.

Stabilization clauses cover the investor from contractual terms being modified unilaterally by local authorities in order to maintain the conditions previously agreed. They can also be applied in case of negative modifications to the national tax system, for conserving previous fiscal levels. The host government makes use of different solutions to fulfil its contractual obligations: 1) excluding the foreign investor from the application of laws changed subsequently to the agreement (called “freezing clauses”); 2) compensating the investor for losses occurred after the application of a new law, in breach of the contract or 3) a mix of the two, depending on the specific case.\textsuperscript{79}

The renegotiation clauses instead, oblige the parties to re-determine the contractual terms in the aftermath of a predefined event (the “trigger event”). In this light, investors can anticipate which are the actions of governments implying future losses and stipulate these clauses to prevent them.\textsuperscript{80}

\textsuperscript{78} Wikipedia. 2013g.
\textsuperscript{79} Us.practicallaw.com. 2013.
\textsuperscript{80} Gotanda, J.Y. 2003.
Decommissioning contract

The final phase in the life of a project is called “decommissioning phase” and takes place after the operations are ended. In this phase the plant and all infrastructures are dismantled or demolished, the site is cleared and the resulting wastes are disposed and decontaminated. All these operations are usually subject to specific laws that ensure the healthiest conditions for the safeguard of workers, local populations and the environment when the decommissioning phase takes place.

Decommissioning contracts are signed with companies with expertise in procedures of decommissioning, in order to distribute the risks that may arise in this phase and minimize the potential for disputes caused by actions non-conforming with regulations\(^81\).

Derivative contracts

Derivatives are financial instruments whose values derive from one or more underlying assets, that usually are stocks, bonds, commodities, rates and also natural events (mostly calamities, such as earthquakes or severe drought periods, for instance).

Technically they are contracts signed between two or more counterparties and centred on the oscillations of the underlying asset’s value, that originates positive or negative economic effects on both counterparties (while the intrinsic value of the contract is null)\(^82\).

The primary use of these instruments is hedging its holders from specific financial risks, although they have been widely adopted to realize speculative operations. The financial crisis started in 2007 has bolstered the negative sensitivity of the public opinion against these instruments that are largely perceived as dangerous tools.

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81 IMCA, 2011.
82 Wikipedia, 2013b.
There are two categories of derivative contracts: those traded on exchanges and the OTC. The first are standardized products traded on authorized markets and subject to regulatory terms and conditions. Trades taking place on official exchanges are intermediated by third party institutions called “clearing houses” that reduce the overall risk of these operations by guaranteeing the liability of both parties in honoring their payments. For this reason, the trade of regulated derivatives is considered safer by investors, but is limited by the standardization of these products.

Investors normally use these contracts to hedge risks pending on their assets and operations, making them covered against the risk of output price volatility, currency and interest rate volatility and many other financial uncertainties.

Futures and options (call/put) are typical exchange traded derivatives. In particular, futures are defined by the CME Group\textsuperscript{83}, the largest exchange company of these instruments, as “\textit{standardized contracts for the purchase and sale of financial instruments or physical commodities for future delivery on a regulated commodity futures exchange}” (Cmegroup.com. 2013).

Options instead are “\textit{contracts through which a seller gives a buyer the right, but not the obligation, to buy or sell a specified number of shares at a predetermined price within a set time period}” by the definition of Nasdaq\textsuperscript{84}. In details, “put options” give their owner the right to sell the underlying asset at a pre-determined price, while “call options” allow its holder to purchase a specific asset at a pre-determined price.

Investors seeking for ad-hoc customized instruments can apply to Over-the Counter markets (OTC) that represent the second main type of derivative contracts. These are private contracts signed directly between counterparties and not intermediate by exchanges or other entities. They are more flexible than exchange traded ones and in fact, OTC instruments are specifically tailored to fit the coverage needs of their client.

\textsuperscript{83} Formed in 2007 when two of the most important derivatives exchange companies merged: the Chicago Mercantile Exchange (CME) and the Chicago Board of Trade (CBOT).

\textsuperscript{84} NASDAQ. 2013.
On the other hand, they present a higher risk of incurring in great losses due to the absence of a supervising authority and because this market is largely unregulated.

Forwards, interest rate swaps, currency swaps, forward rate agreements, credit default swaps (CDS) and other types of sophisticated products are normally available in the OTC market.

The coverage length of derivative instruments is usually lower than the life of the entire project, so risk managers must pay particular attention when dealing with these instruments. Matching exactly the life of the assets owned to the coverage maturity of each instrument is extremely important in project finance and can prevent significant future losses.

3.2.2 Credit enhancing instruments

Instruments used to enhance the quality of debt issued to project developers are an important element in project finance. These products are designed to enhance the creditworthiness of borrowers by reducing their risk of non-repaying obligations or by covering a part of such repayment in case of default. Instruments serving for this purpose are available in different forms and from different providers, like the guarantees offered by public institutions for commercial products or based on more sophisticated mechanisms and strategies such as tranching and first loss.

Guarantees

A guarantee is a contractual obligation by which one party (the guarantor) assumes the responsibility for the payment of a debt underwritten by a borrower, in case the borrower defaults. In case the debtor is not able to reimburse its debt, the guarantor will indemnify the beneficiary in the agreed modalities. The most common guarantee is the

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85 WB, 2013f,
“loan guarantee” that refers to a private agreement aimed at ensuring the repayment of a loan, signed with a bank or with a government that figure as the guarantor of the borrower’s obligation. Private and public institutions (like the European Union or the World Bank Group) provide guarantees, against the payment of a fee, for many purposes:

- They enhance the credit worthiness of the borrower, whose debt repayment is ensured to the lender (totally or partially) even in case of default. In many case this improvement is able to make projects financially viable.

- Unlock long-term debt for private and public businesses that otherwise would not be able to obtain it. This is particularly relevant in the context of development financial institutions, where private capitals are needed to finance infrastructures in key sectors of developing countries’. Guarantees are crucial elements in the creation of public private partnerships.

- Help governments in developing their policies and programs, by supporting their creditworthiness making them capable of accessing capital markets.

There are different types of guarantee available in the market; the most important are Partial Risk Guarantee (PRG), Partial Credit Guarantee (PCG), the Policy Based Guarantee (PBG), Full Credit Guarantee and Export Credit Guarantee.

The first three types of guarantee can be issued by many institutions, but the most famous and analyzed are those issued by the World Bank Group, that will be deeply discussed in Chapter 4, to describe all their small but meaningful differences.

Briefly, the PRGs offer their beneficiaries (usually commercial banks) a protection against the risk that the borrower defaults as a result of some specific events (usually political risks).

The PCGs guarantee a similar coverage but for a certain part of the loan (“partial” guarantee), which is ensured against any default, unrelated to the triggering event that originated it. The mechanism of World Bank’s PCGs is represented in the figure below.
PBGs assist the governments of very poor countries in raise the finance they need for implementing their policies and national programs.

Export credit guarantees are instruments designed to cover the losses of exporters and commercial institutions that have lent to exporting companies (“supplier’s credit”) or importers (“buyer’s credit”). They ensure the correct payment of services and goods delivered against political and commercial risks that can provoke the default or nonpayment of the importer. These guarantees are usually provided by the Export Credit Agency (ECA) of a country to domestic business to promote international trades and economic growth.\footnote{Matsukawa, T., and O. Habeck. 2007.}

Often is challenging for guarantee providers to distinguish between the types of risk that originated the default of the borrower, so they provide comprehensive coverage against all the risks and for the entire value of the loan. They are known as full credit guarantees. It is true that guarantees fall under the category of credit enhancement instruments (as the loans they are attached too are considered safer than without) but they can also fit

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\textbf{Fig. 6:} \textit{Mechanism of the Partial Credit Guarantee (PCG). Source CPI 2013a.}
other categories of risk mitigation instruments, such as contracts (they can be considered as derivatives as their value is linked to the underlying debt) or insurances, as they shift the financial risk to another entity that will bear it.

Interest rate subsidies (IRS)

Interest Rate Subsidies (IRS) are concessional instruments provided by Development Financial Institutions (DFIs) to beneficiaries for the explicit target of lowering the cost of their borrowing. In this way, the cost of capital becomes more affordable and projects are facilitated to reach their financial viability.

Target beneficiaries are usually infrastructure projects located in developing countries and characterized by certain aspects of social, economic and environmental relevance. IRS can be provided in different forms: if they are “capitalized” they impact on the loan service by reducing the amount of each interest payment; otherwise, they can be used in the form of grants. In this case, there are able to decrease the face value of the loan.

Usually DFIs tend to provide subsidized loans whose rates are not too different from the rates available on the market, basing their calculations on internal risk models that often lack of transparency (an exception to this rule is the European Investment Bank that can approve interest rate subsidies of 3%, under certain circumstances)87.

Letter of credit

Financial institutions issue these documents as a payment guarantee in the trade of goods and services. After the supply of the agreed good or service, the seller receives a letter of credit by the buyer’s bank as a guarantee that it will be paid by the bank. The payment happens in any case, regardless the fact that the buyer will pay or not. In this way, the risk of non-payment of the buyer is transferred to the issuing bank.

Letters of credit are mostly used for international transactions (between counterparties located in different nations) and ruled by dedicated laws for international settlements issued by apposite institutions (like the International Chamber of Commerce)\(^{88}\).

**Structured finance mechanisms**

Under this category fall many financial practices that aim at transferring the financial risks borne by the company to other subjects or to international markets, through complicated mechanisms of financial engineering that often are also barely legal\(^ {89}\).

The main concept at the base of these operations is the concept of “securitization”\(^ {90}\). Securitization is the creation of a new financial instrument obtained by pooling together different types of assets that consequently will be sold to investors in the form of bonds, offering different risk-return combinations to match their appetite for risk.

The issuer can pool any kind of assets to originate the new security, like residential mortgages\(^ {91}\), commercial mortgages, credit card debts and other illiquid assets that are unlikely to be sold individually. Securities are then usually divided into tranches or into different levels of seniority, and placed to investors that receive timely payments originated from the asset underlying the security. In this way, the company issuing a security can transform a future cash flow (originated from the underlying asset) into a sum that is immediately raised from investors that purchase the instrument.

The concept of **debt-tranching** then, is important to enhance the quality of credit, both for the new securities issued and for internal operations of companies. The debt is portioned in different slices, from the most senior to the most subordinated. Senior classes have

\(^{88}\) Wikipedia, 2013f.

\(^{89}\) Structured financial instruments have been often criticized because the remoteness of the underlying assets on which they are based limit the correct assessment of underlying risks. It is believed that products of the financial engineering have substantially contributed in the 2007 financial crisis, in particular those backed by residential mortgages.

\(^{90}\) Investopedia, 2009a; Wikipedia, 2013i.

\(^{91}\) Securities that are based on residential mortgages are also called Mortgage-Backed Securities (MBS), while securities having other underlying assets are called Asset-Backed Securities (ABS).
better credit rating, reimbursement precedence but at the same time, allows for lower returns; junior or subordinated tranche are the riskiest, reimbursed after all the other tranches but also those that generate highest returns.

The practice of debt-tranching allow investors to create securities that have, at least, one part with a better credit rating than the average of all the underlying assets. They also help investors in improving the diversification degree of their investments, because they are composed of multiple underlying assets.

Tranching is also a solution often adopted by supra-national organizations (like the European Investment Bank) or multilateral financial institutions to create credit-enhancing instruments to support newborn companies in their initial process of finance gathering. In this phase, project companies issue bonds divided in tranches to obtain financing at a lower cost and attract investors with different risk propensity.

The mechanism of first loss protects these investors from a certain and pre-agreed amount of financial losses that can arise from the default of the project company. In fact, the subordinated part of project bonds bears the first part of loss and it is owned by the backing institution that, in this way, absorb the riskiest part of the investment. These instruments improve the financial and liquidity profile of the projects, as well as their creditworthiness.

Example of first loss mechanism is the EU Project Bonds Initiative\(^92\) (supported by the European Investment Bank).

### 3.2.3 Insurances

Insurances are the most diffused and known instruments of risk mitigation. They offer a solution to investors seeking to hedge their investment against potential and uncertain future losses. Insurances are contractual agreements that transfer the risk of losses from

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\(^92\) EIB, 2013.
the entity that initially bears them to the insurance provider, against the payment of a price.<sup>93</sup>

Insurances can be provided by private and public institutions and can be tailored in many ways to match the specific needs of their clients (called “policyholders”).

Private insurance companies are able to cover any kind of risk that may concern investors, but only if similar risks: 1) are perceived by a large number of investors with the same profile (and so allowing for statistical estimates); 2) generate definite loss that can be precisely quantified; 3) are originated by events that are very unlikely; 4) do not all happen at the same time; 5) are not catastrophic events, which require massive reimbursements.

Catastrophic events are mostly covered by public institutions, like governmental agencies or international financial institutions. On this market in fact, investors can find coverage against two main typologies of risks: political risks and catastrophe risks.

The most important example of the first typology is the Political Risk Insurance (PRI), provided by the Multilateral Investment Guarantee Agency (MIGA), a member of the World Bank Group that is specialized in supporting foreign investments in developing countries against the risk of local political dangers. The Agency and its insurances will be described in depth in the third chapter.

Catastrophe risks can be mitigated by national institutions and IFIs, again with the World Bank on the lead, providing solutions against risks like floods, earthquakes, droughts, heavy storms, and other disasters in developing and also developed countries.

Climate change in fact, increases the likelihood that these events will happen more frequently and with more violence in every geographical region of the planet. The World Bank, directly or indirectly, is able to provide catastrophe risk insurances.

The price that policyholders pay to the insurance company is called premium and it is calculated over the likelihood of the insured event and the value of the insured asset.

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<sup>93</sup> Wikipedia, 2013e.
The presence of insurances in project finance operations is fundamentally important and great efforts are allocated to guarantee the proper coverage for all the risks in every phase of the economic life of the project, in particular technical and physical risks\textsuperscript{94}. Insurances and guarantees may appear having a similar mechanism, but in practice it is not true. In the case of guarantees, when a default happen under the agree circumstances, the guarantor is required to reimburse its client. Under an insurance contract instead, if a triggering event occur the insurance company needs to examine the claim and reimburses its client only if the claim is valid and acceptable.

### Delays in start-up (DSU)

When unexpected events interrupt the process of building the project’s infrastructures, economic losses can occur (in terms of additional interest payment, loss of incomes or other extra costs). Delays in start-up (DSU) insurances protect their holder from this type of damages when interruptions arise from certain events, specified in the insurance contract.

Usually DSU contracts are calculated and priced in relation to the value of the underlying asset insured and a multiple time factor. Timings considered are the insured period (during which the investor is covered if a delay occurs), the indemnity period (over which are calculated the incomes lost or the extra expenses to reimburse) and the length of the delay (time between the delayed start of the business and its initial starting period in a non-delayed situation)\textsuperscript{95}.

### 3.2.4 Revenues supporting mechanisms

\textsuperscript{94} Gatti, S., 2008.  
\textsuperscript{95} IRMI. 2013.
The most endorsed mechanism used by governments of developed and developing countries for the promotion of low-carbon investments are the policies for revenues support. Their target is to improve the capacity of projects to generate profits in order to attract private investments and concretize the development of the sector. Different types of policies exist that can cover all the phases of the economic life of the project, from its planning to the decommissioning and include tax exemptions, revenues support and other subsidies.

Feed-in Tariffs

The mechanism of Feed-in Tariffs (FiTs) has been developed to boost the national diffusion of power production based on renewable energies. Governments set in advance the price at which the energy produced with clean technologies will be sold and sign long-term agreements with the power producers to grant them of these prices. Power producers know in advance the price they will receive over a long time horizon, reducing in this way many financial risks. The prices granted depend on the production cost of each technology and may decrease over time, in order to encourage the reduction of costs and avoid the market saturation\textsuperscript{96}.

A similar scheme is the Feed-in Premium (FiP), used in Italy to support the photovoltaic diffusion. In this case, the price clean energy is composed by two factors: the market value of electricity, exposed to market fluctuations, and a premium defined by the public authority\textsuperscript{97}.

\textsuperscript{96} Wikipedia, 2013d.
\textsuperscript{97} Il Sole 24 ORE, 2013.
Trademark permits

Cap-and-trade market systems are adopted in many regions (like the European Union or certain states within the United States) to reduce the emissions level of certain polluting industrial sectors, and theoretically, these systems represent the most cost-efficient way to reduce atmospheric pollution.

Public authorities impose determined emissions “caps” and, at the same time, businesses receive a certain amount of polluting permits. Industrial businesses are then obliged to comply with these limits, either by reducing their emissions levels or by purchasing other permits for emitting more.

Under the European Union Trading Scheme (EU-ETS) the permits for polluting are called European Union Allowances (EUAs) and one EUA authorises its owner to emit one tonne of carbon dioxide or the equivalent quantity of another greenhouse gas.

Another type of tradable permit is the Certified Emission Reduction (CER) that represents a credit for the production of a certain amount of energy from renewable sources located in developing countries and is obtained through the Clean Development Mechanism (CDM). They can be traded on this market and partially can be used by companies in the EU-ETS market to comply with emission limits.98

Tax credits/Tax equity

The tax credit is a form of tax exemption used by governments or by sub-national authorities to encourage the diffusion and the installation of low-carbon technologies, both small and large scale. A tax credit is a deduction from the total amount of taxes (on properties, on incomes or VAT) that a subject has to pay to its country. In this way, the implementation of renewables is fiscally less onerous than fossil fuels alternatives.99

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98 NASDAQ, 2013a.
99 Wikipedia, 2013k. EIB. 2013
Tax equity is a form of fiscal and financial policy support to renewable energies (including solar, thermal and wind) developed in the United States. This mechanism allows large taxpaying entities (such as banks, insurance companies and utilities) to provide mezzanine capital to renewable energy projects and obtain in exchange not only revenues, but also fiscal benefits. In this way, these companies are incentivized to participate in clean projects and become their passive shareholders (they provide only capital and do not interfere with the management)\textsuperscript{100}.

**Fossil fuels subsidies policy**

This is not a category of risk mitigation instruments properly directed to support low-carbon technologies, but rather is a substantial voice of governments’ expenditures that can potentially be channeled to the support of such technologies.

Fossil fuels subsidies in fact are governments’ initiatives aiming to support the sector of fossil fuels power production, by altering the prices in the market. Acts like increasing the price received by power producers or lower the price paid by energy consumers, as well as tax cuts, loans provided at better conditions, privileged access to certain sites or environmental resources, energy supply agreements and restrictions on energy imported\textsuperscript{101}.

All these action for the support of fossil fuels are costs for governments and taxpayers, estimated in USD 775 billion in 2011\textsuperscript{102}, more than twice the money spent in the same year for all the mitigation and adaptation to climate change.

These subsidies represent an indispensable aid for the fossil fuels side of the energy industry and at the same time, alter artificially the competitiveness of the renewable

\textsuperscript{100} Vireoenergy. 2013.
\textsuperscript{101} The Price of Oil, 2013.
\textsuperscript{102} IISD, 2012.
energies market. Their elimination will have a huge impact on the reduction of public expenses and greenhouse gases emissions.

3.2.5 Political and institutional support

All these instruments are provided by public organizations (governmental agencies, sub-national and supra-national authorities, international financial institutions) as a support for the implementation, development and diffusion of private projects. The consolidated experience of publicly owned institutions is often extremely important, especially for the mitigation of risks of projects located in developing countries and for those involving the most innovative (and immature) low-carbon technologies.

These interventions can be given under many forms, like funded contributions or sharing of expertise.

**Risk-sharing facilities**

These facilities are usually implemented by supra-national institutions and development agencies that have enough contractual power and financial stability to share part of the risk of beneficiaries’ projects and help them to access capital markets.

Risk can be shared between the supporting institution and beneficiaries in many different ways. The Risk Sharing Finance Facility (RSFF), for instance, established by the European Investment Bank and the European Commission, provides long-term loans and guarantees to small and medium private and public companies that invest in research, development and technologies innovation, in order to enhance the access to credit from commercial institutions and lower the overall risk\(^\textsuperscript{103}\).

IFC instead, has established risk-sharing facilities to support the banks of developing countries in providing loans to small-scale domestic projects (for energy efficiency in

\(^{103}\) EIB, 2013a.
particular). IFC shares the risk of these investments with such banks, bearing the first crunch of losses that eventually may arise in case the projects are unsuccessful.

**Capacity building and technical assistance**

Capacity building is a term introduced and often used by international organizations for development. Indicates to all the efforts directed to improve the skills, capacities and abilities of the poor countries’ societies to let them overcome the barriers that impede their development and that confine them into poverty. Capacity building is based on the understanding of these impediments that reduce the effectiveness of populations, governments and international organizations in achieving their developmental objectives. In this context, public grants are often involved to remove information barriers, to help develop local financial markets and to provide technical assistance. Technical assistance in particular, is a form of non-financial support provided by expert institutions, in order to improve the quality of the assisted initiatives operating in specific sectors and achieve their successful implementation. This type of support includes training, consultancies, sharing of information, data and expertise that are often tailored project by project and depend on specific sectors.

**Database and information providers**

Additional platforms for data gathering on green projects and technologies can improve the knowledge needed by investors to commence a business in this sector. Investors of any type and risk profile aim to achieve the most granular level of information to reduce uncertainties and prevent unforeseen risks to the extent possible.

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106 Unesco, 2013.
Databases, data providers and any other tool for collecting information can support investors in tracking the risk-return performances of similar initiatives and better evaluate their initiative. These instruments are particularly important when the most innovative technologies are involved and finding appropriate information about their history is challenging.

**Quality standards**

Many construction and operational risks can be addressed and avoided if minimum quality requirements are mandatory in the development of green infrastructures. These standards certificate the quality of the project and can provide a helpful assistance to calculate their real value, especially from the point of view of stakeholders located in different countries. International public and private organizations provide quality standards elaborating their results on best practices considerations.

**Other national policies**

This category includes any other effort oriented to address investment risks related to climate change mitigation and adaptation, either in developed and in developing countries. National, regional and local policies (subsidy schemes, incentives, fiscal benefits...) and programs are included, as well as popular initiatives targeting sensible sectors. This category includes also government’s actions directed to modify the structure and the rules of domestic markets, like for instance, introducing a cap-and-trade scheme or a carbon tax to regulate the emissions from polluting sectors that before were unregulated. Also the activity of market making or price determination is considered (for example, when public authorities fix the price of tradable permits or when they manipulate the price of energy sold to the population).
3.2.6 Direct investments

One of the biggest impediments for the correct implementation of low-carbon projects and for the implementation of economic initiatives on large-scale in general is the lack of adequate funding.

Public sector institutions (like development finance institutions, ministries, governmental agencies) can support the process of fund-raising of companies through direct investments to the project in order to make it achieving the financial closure.

Grants

Grants are monetary contributions that do not require the repayment from beneficiaries to grantors. For this reason, public nature institutions provide the high majority of all grants, while a residual part is represented by private actors, under the action of philanthropic foundations and high worth net actors. Grants play a crucial role in lowering the cost of target projects, either by reducing the cost of capital invested or by supporting the cost of specific phases of the project (often grants are committed to finance the appraisal phase or the technical assistance for specific projects, mainly those promoted by DFIs or other public authorities).

Concessional loans

Concessional loans are usually issued by financial institutions for development (like multilateral and bilateral development banks) and target specific projects located in developing countries. What differ these instruments from commercial loans is their high level of “concessionality”, referred to part of the total value of the loan that does not need to be repaid or to payments for interest rates that are considerably lower than
market rate If the concessionality reaches at least 25% of the entire value of the loan, this loan can be marked as Official Development Assistance (ODA) and the effective discount is classified as “aid”. Often borrowers of concessional loans also benefits from extended repayment periods and grace periods\textsuperscript{107}.

Public equity injections

Public institutions can provide equity to private projects or public-private partnerships under different forms. Operations of this kind may be directed to take strategic positions in the management or supervision of the company or often to help companies in raising the financing needed (especially in key riskier sectors). DFIs, for example, provide equity to its beneficiaries either directly (allowing for greater influence and a better control) or through certain intermediaries or dedicated facilities such as private equity funds\textsuperscript{108}, that provide equity to final end-users.

Climate Funds

Climate Funds are mechanisms that merge the financial contributions of their donors whose mission is finance specific projects and initiatives, mainly located in developing countries, related to mitigation and adaptation to climate change. Many climate funds have been recently established as they represent a particularly appropriate instrument to leverage capital from private investors and expanding, in this way, the effectiveness of public donations. The most significant climate funds are the Green Climate Funds (GCF), the Adaptation Fund (AF) and the two Climate Investment Funds (CIFs): the Clean Technology Funds (CTF) Strategic Climate Fund (SCF).

\textsuperscript{107} CPI, 2011.
\textsuperscript{108} ODI, 2007.
Public-private partnerships (PPPs)

Public-private partnerships (PPP) are contracts signed between a public authority and a private company for the implementation of projects that typically are big infrastructures, like hospital, schools, toll roads, airports and many other public goods and services. The PPP is an option that is often chosen as it ensures substantial advantages for both parties: governments can share risks and profits of the development of important public infrastructures with private contractors; contractors are highly incentivized to respect the time and budget agreed with governments; the overall quality of projects implemented under these agreements is often higher than disjointed operations.

There are many different structures of PPPs, depending on the specific characteristics of the projects. The most diffuse kinds are: the Build, Operate and Transfer (BOT); the Build, Operate, Own and Transfer (BOOT); the Build, Operate and Own (BOO).

The first type consists in a public concession given to a private company to realize a public infrastructure that will be operated by the same company for a pre-agreed period of time, retaining the revenues generated from the project. At the end of this period, the company transfers the project’s ownership to the public authority without any charge (in the case of BOTs) or against remuneration (in the case of BOOT where the private party is entitled of the project’s property). In BOO schemes the private company owns and operates the infrastructure for all its economic life, without transferring it to the public authority.¹⁰⁹

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¹⁰⁹ Gatti, S., 2008.
CHAPTER 4

4.1 OVERVIEW OF THE WORLD BANK GROUP

The purpose of this thesis is that of presenting, to the maximum extent possible, the complex world of climate finance with a particular focus on all the risk types that are typical of low-carbon and climate resilient investments. The analysis has then been complemented with a mapping of all the existing instruments directed to the mitigation of the mentioned risks. Finally, in order to give the best possible picture of this topic, I have provided an extensive description of the biggest provider of risk mitigation instruments in the world, the World Bank Group (WBG)\textsuperscript{110}.

This chapter will introduce this important and sometimes criticized international institution, presenting, for each of its forming divisions, specific information about their approach to climate change and their supply of risk mitigation instruments.

The World Bank Group is an international financial group for development, made of five institutions: the International Bank for Reconstruction and Development (IBRD), the International Development Association (IDA), the International Finance Corporation (IFC), the Multilateral Investment Guarantee Agency (MIGA) and the International Centre for Settlement of Investment Disputes (ICSID)\textsuperscript{111}. Its mission is to achieve the elimination of extreme poverty and the promotion of the economic prosperity in least developed countries by providing financial resources and sharing knowledge.

Formerly known as the World Bank, it has been established in 1944 at the Bretton Woods Conference with the initial purpose of assisting devastated countries in seeking the financing needed for post-World War II reconstruction.

\textsuperscript{110} From now on I will refer to the “World Bank Group”, “World Bank”, “The Bank” or “WBG” meaning the same institution.

\textsuperscript{111} The ICSID is an international institution for arbitration. Its primary purpose is “to provide facilities for conciliation and arbitration of international investment disputes” (ICSID, 2013). Given its specific nature, it will not be reviewed in this thesis.
Nowadays the World Bank has become a network of five institutions known as The World Bank Group. The World Bank is led by its President and governed by its 188 member countries that are represented in the Board of Governors, constituted by one representative of each country (usually the ministry of finance of the country or the governor of its central bank). The 188 Governors meet once a year at the Annual Meeting of the Board of Governors and their decisions are taken in accordance with the weighted voting rights of each country. The voting power of member countries reflects their annual contribution to the capital of the Bank, calculated in proportion to their GDP. The Board of Directors instead, conducts the daily activities of the Bank. It is composed of 25 Executive Directors of which 5 are permanent and designated by the 5 most important countries per contribution (USA, Japan, Germany, United Kingdom and France) while the remaining Directors are nominated by the delegates of the remaining countries.

The WBG operates through a vast selection of financial and non-financial instruments. They range from concessional loans to capacity building support, from grants to insurances for catastrophic events, from guarantees to private investors to temporary credit lines for governments. With its dimension and its affirmed experience the World Bank is able to provide support to developing countries both directly by helping to foster partnerships between their governments and private investors. In fact, its financial solutions and institutional backing make it a perfect vehicle for addressing almost every risk circumstance that may concern investors in developing countries.

The World Bank operates in many sectors of crucial importance for the development of its assisted countries, such as, among others: health, education, communications, infrastructures, energy, public governance, progress of private businesses, local natural resources management and preservation, as well as climate change. From now on this thesis will focus only on the World Bank’s action in the climate change field, even if some future descriptions and figures may refer to operations that reflect the WBG as a whole.
Recently the Bank has undertaken important steps in becoming a leading player in the fight against climate change. The World Bank Group’s President Jim Yong Kim declared in July 2013, that extreme poverty could not be eradicated without facing the climate change issue. As the poor populations will be the first to be hit in case of harmful future consequences of global warming, the commitment of the World Bank in this compartment must be stronger.

In the past, the World Bank has been severely criticized by many for its historical support to fossil fuel power plants (in particular, coal, the “dirtiest” technology) in developing countries, but it is a situation that is coming to an end. As a first important effect of the new Bank’s redirection on climate change, it in fact recently issued an Energy Sector Directions Paper, where the Group committed to minimize the environmental costs of energy supply, and affirmed that financing to new coal power generation plants would happen in the future only in case of “rare circumstances” (Reuters, 2013) and only if other valid lower-carbon technology alternatives were not feasible.

This is just the latest action of an evolution started officially at the G-8 summit in 2005 with the international community’s highlight on global warming. In response to their recommendations, in 2008 the World Bank issued its first operational guideline on climate change and sustainable development, the Development and Climate Change: a Strategic Framework for the World Bank, which established the foundation for moving towards a more comprehensive engagement in the field. It recognizes key guidelines that can be strategically crucial for the joint achievement of economic development targets and climate change abatement.

The WBG has also undertaken an active role in supporting the Sustainable Energy for All

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112 WB.org, 2013.
113 WB, 2013c.
115 Support climate change within the growth programs of developing countries; leverage resources from the private sector; develop market-based financing instruments; develop new technologies and improve capacity building in the poorest countries.
Iniciativa\textsuperscript{116}, launched by the United Nations in 2011, which demands governments, businesses and civil society to achieve a 30\% share of renewable power produced and consumed by 2030, and double the rate of energy efficiency.

Anyway, even in the absence of a proper mandate, the World Bank has committed substantial resources to climate-relevant projects and initiatives, especially in the form of debt instruments. IBRD and IDA in fact, its core institutions were able to lend almost USD 12 billion\textsuperscript{117} in 2012 to financially supporting this sector. Most of the resources went to renewable energy generation, an area to which IBRD, IDA, MIGA and IFC have committed USD 12.5 billion over the last six years. This is roughly one-third of all the financing that have been provided to dirty energy production over the same period, but the share rises to 44\% if considering 2012 only, where renewable energies received USD 3.6 billion from WBG’s institutions. Energy efficiency is also another crucial area that is largely funded by the World Bank\textsuperscript{118}. Contributions of the World Bank to climate change reduction through financing mechanisms are assuming more and more relevance, year after year.

Complementary to its debt and grant instruments, also risk mitigation instruments have been engaged in these activities. How often they have been used, which projects have supported, how many resources have been committed are questions that me and the Climate Policy Initiative team have investigated and tried to answer in our publication called World Bank Risk Mitigation Instruments for Climate Change\textsuperscript{119}.

This chapter has been implemented following the approach and methodologies used in the research\textsuperscript{120}. Unlike Chapters 2 and 3, data in this Chapter refer to the financial year

\begin{footnotesize}
\footnotesize 116\footnotesize\textsuperscript{WB}, 2013c.
\footnotesize 117\footnotesize\textsuperscript{WB.org}, 2013a.
\footnotesize 118\footnotesize\textsuperscript{WB.org}, 2013b.
\footnotesize 119\footnotesize\textsuperscript{CPI}, 2013a.
\footnotesize 120\footnotesize For this reason it must be considered that activities that fall under the World Bank’s definition of climate change mitigation and adaptation differ from those accounted by CPI in the Landscape of Climate Finance 2012 and in the World Bank Risk Mitigation Instruments for Climate Change. CPI uses a more conservative approach to identify which are the projects to consider, excluding
\end{footnotesize}
In the analysis, it emerged that substantial resources are allocated every year to provide risk mitigation to supported projects (approximately USD 2 billion a year), but only 10% of the money targets projects relevant for climate change.

Over the last two decades in fact, from 1994 to 2013, the World Bank Group’s institutions have allocated on average USD 233 million a year in guarantees and other risk mitigation instruments to support climate change mitigation and adaptation activities.

The numbers rise considerably if considering only the last three years, in which the commitments to climate change rose to almost USD 600 million a year, 14% of the overall commitments to risk mitigation over that period.

In conclusion, the recent operational redirection to decarbonized business, the boost of financing and the increased resources for the risk mitigation of climate change relevant projects are evidences that the World Bank is seriously considering the climate issue and is committing itself to address it.

4.2 International Bank for Reconstruction and Development - IBRD

The International Bank for Reconstruction and Development was the first part of the World Bank being established in 1944 (and effectively it is the Bank itself). Its initial mandate was to provide funding dedicated to the reconstruction and development of countries destroyed by World War II. Nowadays, the IBRD pursues the global abatement of extreme poverty as its primary objective. Its activities are principally focused on the support to the public sector, through the promotion of sustainable economic growth and the social development of middle-income and lower income countries with better creditworthiness. To achieve its targets, the IBRD makes use of a wide range of controversial technologies like large hydropower and conversions from fossil fuel to fossil fuel (like coal to natural gas), for example.

121 The World Bank classifies countries according to their GDP per capita: 1) middle-income countries are those with a wealth per capita ranging from USD 1,000 to USD 10,000 (they can...
instruments in its projects that can be grouped in three categories: financing instruments, risk mitigation tools and other services (Country Assistance Strategies\textsuperscript{122} and knowledge assistance).

Financing necessary to implement IBRD’s operations is mostly raised from the issuance of AAA rated bonds on international financial markets and from the contributions of its member countries (that stand as the “equity” of the Bank). Revenues obtained from the financial instruments used are another, smaller, part of IBRD’s pool of capital, and they derive from the repayments of concessional debt provided to developing countries in previous years and from the fees sustained by clients for its risk management instruments.

According to the Annual Report 2012 of the World Bank, in the fiscal year 2012, ended in June 2013, IBRD gathered USD 38.4 billion with the issuance of bonds on international financial markets that have been channeled to finance new investments. Precisely, USD 20.6 billion have been committed to projects mainly located in the least develop countries of Europe, in Central Asia, in South America and the Caribbean region. Of these new commitments, the bulk has been directed to public administration, justice and law, transports and energy sectors.

As shown in the table below, finance committed by IBRD in 2012 to pursue its targets is lower than the previous year and more than half of the USD 44 billion committed in 2010, but it is the highest level ever reached by the organization\textsuperscript{123}.

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\textsuperscript{122} CAS are country-specific guidelines to drive the operations of the WBG. They are implement in partnership with the country’s government and other stakeholders.

\textsuperscript{123} WB, 2013.
All the instruments offered by the IBRD benefit from the expertise and technical support of the organization, that is a specialized and experienced team of specialists. Moreover, all the projects supported by the World Bank must respect certain requirements to ensure the environmental and social safeguard for all the stakeholders involved directly and indirectly. IBRD’s financing instruments are mostly directed to the support of the public sector in middle-income and creditworthiness lower-income countries, but also to private projects supported by governments. These are:

- **Flexible loans**: budget supports to governments directly or to sub-national authorities and private sector companies with the intermediation of the host government. They are offered at better conditions and rates than those retrievable from commercial institutions. In particular they benefit from longer maturities (up to 30 years) and flexible solutions to help their repayment (like grace periods). The interest rates are indexed to the LIBOR\(^{124}\) plus additional fees (that can be fixed or variable and depending on the maturity). Furthermore, they can incorporate (against supplementary fees) risk management options to mitigate the risks of currency and...

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\(^{124}\) The London Interbank Offered Rate, the rate at which banks can lend and borrow money between each other.
interest rate volatility (like swaps for converting the currency or interest rate caps and collars).

- **Local currency loans**: when the loans are approved and repaid back to IBRD, they are denominated in hard-currencies, but borrowers can request they are disbursed in the local currency where they are located.

- **Contingent financing**: these tools are considered on the borderline between financing and risk mitigation instruments. Contingent financing provided by the IBRD helps governments to overcome periods of temporary liquidity shortfalls due to particularly adverse circumstances like, for instance, financial shocks provoked by unfavorable events (such as depressing economic growth or adverse volatility of commodity prices) or natural calamities hitting the country. These crises require massive financial disbursements from developing countries ‘governments that sometimes are not immediately available. The Deferred Drawdown Options of IBRD’s loans are a dedicated solution, providing a liquidity injection to governments in the immediate aftermath of these events, in the form of a contingent credit line\(^{125}\).

### 4.2.1 Risk mitigation activity of IBRD

IBRD provides risk mitigation to its clients through different channels: through dedicated product lines (the case of guarantees, options embedded in loans and contingent financing) and in the form of institutional backing by co-financing of other facilities like the (DRFI\(^{126}\)) or by acting as implementing entity of international funds, like the Global Environment Facility (GEF)\(^{127}\).

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\(^{125}\) WB Treasury, 2012.

\(^{126}\) The Disaster Risk Financing and Insurance (DRFI) of the Global Facility for Disaster Reduction and Recovery (GFDRR) - managed and co-funded by the World Bank Group\(^{126}\). The facility promotes the financial risk management of natural disaster risk, providing support for the reconstruction of devastated private and public infrastructures. More information on this topic can be found at: \[https://www.gfdrr.org/node/337\].

\(^{127}\) CPI, 2013.
The most important instruments for risk mitigation issued by the IBRD are its loan guarantees, namely the:

- Partial Risk Guarantee (PRG);
- Partial Credit Guarantee (PCG);
- Policy Based Guarantee (PBG);
- Enclave Partial Risk Guarantee.

All the guarantees aim at supporting projects located in those developing countries eligible to receive the financial assistance from IBRD, that are middle-income and creditworthy lower-income countries. Partial Risk Guarantees are offered also by IDA (International Development Association), but they specifically targets the poorest and least developed countries in the world.

 Guarantees are powerful tools for the Bank to pursue its targets of development and poverty reduction. Through them, the World Bank can boost the growth of lower-income economies by the involvement of private capitals in the realization of infrastructures projects of public and private interest. In fact, guarantees are able to unlock long-term funding from private companies, investors and commercial lenders, expanding the overall financial contributions to projects at a lower cost than using other instruments more onerous for the Bank, such as grants. The relationships established with the countries can influence future operations based on partnerships between the public and private sectors, such as privatizations, or other operation to help countries in accessing to private capital markets.

 The trigger at the base of this kind of leverage is that World Bank’s guarantees are designed specifically to cover the performance risk of developing countries’ governments in honouring their liabilities, contracted with the private sector, that normally the market is not able to address\textsuperscript{128}.

\textsuperscript{128} WB, 2013d.
Despite their potential guarantees had a limited diffusion since their inception in 1994. Over almost 20 years in existence, IBRD and IDA guarantees have supported only 28 projects\textsuperscript{129}, which indicates their limited use if compared to the 93 lending operations undertaken by IBRD only in 2012 (WB, 2013). This scarce deployment can be imputable to several factors: first of all, the overlap with similar instruments offered by the World Bank Group (like the Political Risk Insurance of MIGA and the guarantees of IFC), that is further enhanced by the “principle of last resort”\textsuperscript{130} that guides the clients in approaching the Bank’s services. The Bank is considered a more adequate support only for more complex projects\textsuperscript{131} characterized by a riskier and tricky environment, where the counter-guarantee of the host country (fundamental requisite of the IBRD and IDA’s guarantees) can provide additional safety on the government’s reliable behavior, lowering the overall risk level and making it viable. On the other hand, the counter-guarantee requires the full collaboration and reliability of the host country that, in some cases, may induce countries to reject the World Bank’s conditions\textsuperscript{132}.

In order to respond to the missed success of its guarantees and possibly invert the negative trend, the World Bank has started a process dedicated to the modernization and revitalization of its guarantees that is still ongoing\textsuperscript{133}.

**Partial Risk Guarantee**

The Partial Risk Guarantee (PRGs), issued by the IBRD, is designed to reduce the vulnerability from political risks of private sector projects, dependent on certain contractual agreements signed with the host government (or publicly owned companies), like concessions, privatizations and other partnerships involving public sector’s

\textsuperscript{129} CPI, 2013a. This number can be inconsistent with other publications.

\textsuperscript{130} For this principle, investors concerned by political risks must seek protection from MIGA and IFC before demanding World Bank’s direct intervention (IEG-WBG, 2009).

\textsuperscript{131} IBRD’s Guarantees cover on average larger initiatives USD 151 million (CPI, 2013).

\textsuperscript{132} IEG-WBG, 2009.

\textsuperscript{133} CPI, 2013a.
obligations. The PRGs ensure commercial lenders (the beneficiaries of the guarantee) that the loan they provided to such private companies will be repaid even if they default. The loan is covered only if such default is originated from the governments non-honoring the obligations agreed and this situation can result from a lot of sovereign events. Modifications in laws and regulations, failure to deliver the contractual performances and payments, interference in dispute resolution, expropriation, inconvertibility of currencies, war and politically-motivated violence, denial of concessions and permits and several other political risk are triggering events. If one or more of these events originate the company’s default, IBRD is liable to reimburse the beneficiary of the PRG, but only if the exact events are specified in the contract and only for a determined tranche of the total loan (including the notional amount and the payments for interests, in full). PRGs, PCGs, and other guarantees apart from the Full Credit Guarantee, in fact ensure only a certain percentage of the loan, defined as the “minimum amount necessary to achieve a successful transaction” (IEG-WBG, 2009), and practically, to make the project viable.

In order to complete the PRG contract and make it effective, the government must provide its counter-guarantee\textsuperscript{134} to IBRD that in case of default and consequent payment from IBRD to the beneficiary of the guarantee, the government will reimburse IBRD for its payment.

Investors can apply to PRGs only if the project is located in a country that is eligible to receive loans from IBRD, that specifically are middle-income and creditworthy lower-income countries (WB, 2013e).

Partial Credit Guarantee

Partial Credit Guarantees (PCG) are based on a similar concept but slightly different from the PRGs. They protect loans issued by private lender to infrastructure projects owned by the host country or other publicly-owned entities, against the risk of debt service default.
by the host government itself or other publicly owned companies. This mechanism (that is visually represented in the figure below) is similar to the PRGs, but the key difference between the two products is that the Partial Credit Guarantee compensates its beneficiary regardless of the type of event that caused the default (and not specific political risks only like the PRGs). They default can originate from any politically, technically, financially motivated reason occurring over a determined time horizon and in all case the compensation from IBRD is due.

Another difference is the entity of the compensation granted to the beneficiary of the PCG: it is designed to cover a part of the insured debt. This means, for example, that in case of default IBRD can cover the principal amount and not the interest payments, or the interest payments but not the principal amount, or also the principal amount plus interests over a specific period (not over the entire maturity of the loan).

Exactly like the PRG, the Partial Credit Guarantee is available only for those commercial institutions that lend to projects located in countries eligible to obtain funding from the IBRD. PCGs require also the counter-guarantee from the host government\(^\text{135}\).

**Policy Based Guarantee**

The Policy Based Guarantee (PBG) is the third guarantee product issued by the IBRD. They are based on the same mechanism of the PCG, but their extent is slightly different. PBGs have been introduced in 1999 to offer a form of alternative financial support to governments of developing countries for the implementation of their national reforms, policies and other relevant programs. When governments implement policies, they usually issue long-term bonds on the domestic capital market to gather the funding needed, and bonds are usually purchased by private institutional investors that in practice are lending money to the country. In exchange, private lenders receive interests from the country plus their capital, repaid at a future date, and this is exactly the point where the IBRD

\(^{135}\) WB, 2013f.
intervenes. The PBG guarantees a part of the insured private lending, exactly like in the PCGs. With the support of the World Bank, institutional investors can enter in markets that are usually perceived as more risky and, at the same time, developing countries receive the funding they need that otherwise would have been harder to obtain, or more expensive\textsuperscript{136}.

**Enclave Partial Risk Guarantee**

This is a particular kind of Partial Risk Guarantee, directed to assist projects located in the lower-income countries (those having an income pro capita that is lower than USD 1,000) with a superior creditworthiness. Such projects (called “enclave projects”) are usually oil and gas extracting companies that earn their revenues from foreign off-takers (generally public utilities) and have a concession contract in place with the host country. Enclave PRGs cover the loans provided by commercial institutions to the project, against the risk of governments non honoring their obligations\textsuperscript{137}.

For example, consider a natural gas extraction plant located in India (creditworthy lower-income country) on a government’s land concession that has a Power Purchase Agreement active with a utility based in Nepal and that is financed through loans provided by a bank. If the host government revokes the concession of the production site and forces the project to close, IBRD will guarantee the lender that its loan will be repaid even if the project defaults. IBRD will then seek for reimbursement from the host government, in force of the counter-guarantee signed between them.

**4.2.2 IBRD’s commitment on climate change**

\textsuperscript{136} WB, 2013g.
\textsuperscript{137} WB, 2013h.
Despite the process of change that the World Bank has recently undertaken to become a worldwide leader in the reduction of climate change, at present IBRD still lacks of an explicit mandate for conducting its operations on climate change, even if it considers it a main priority.

Regarding the lending activity, in 2012 IBRD committed around USD 7 billion to climate change assistance, which is the bulk of the total financing provided by the World Bank. The major part was directed to the support of projects for mitigation in developing countries, exactly USD 4.8 billion (69% of the total). The biggest part of these resources went to instalment and development of renewable energies, accounting for USD 3.22 billion, exactly two thirds of the total. The remaining 31% of IBRD’s financial support to decarbonization, corresponding to USD 2.2 billion, contributed to adaptation initiatives.

The total amount of money lent for climate purposes does not differ much from the allocation of the previous year. In 2011 in fact, IBRD provided slightly less than USD 7 billion. In 2011 the allocation for mitigation was higher than the previous year, amounting to around USD 6 billion, that compensates a very low commitment for adaptation, sized USD 0.85 billion.

In addition to the lending activity, IBRD issued also guarantees for the support of climate change-related projects.

The analysis conducted by CPI on the risk mitigation instruments of the World Bank\(^{138}\) indicates that IBRD’s guarantees, despite their introduction to the market dating almost 20 years ago\(^{139}\) have been utilized very rarely. Precisely, they supported only 22 projects to date with an overall financial commitment\(^{140}\) that is slightly above USD 3 billion.

The underperformance of IBRD guarantees is even more evident when climate projects are considered. Only two projects were complemented with guarantees, in details a Partial Credit Guarantees for a geothermal project in the Philippines in 1994 and another

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\(^{138}\) CPI, 2013a.

\(^{139}\) The first guarantee has been issued in 1994.

\(^{140}\) Resources committed under the guarantees represent the amount of the reimbursements due to their holder in case of the triggering events occur.
one for a hydro power project in China in 1995 (the last year in which they have been used for this purpose)\textsuperscript{141}.

PRGs, PBGs and Enclave guarantees have never been used to support climate mitigation or adaptation projects within IBRD.

IBRD is able to provide risk mitigation also indirectly, through other assisted institutions and programs. In the Disaster Risk Financing and Insurance (DRFI)\textsuperscript{142}, a program implemented by the Global Facility for Disaster Reduction and Recovery (GFDRR), managed and co-funded by the IBRD, private and public investors can mitigate several financial risks provoked by the impact of natural calamities, finding economic support for the reconstruction of their devastated infrastructures through many instruments\textsuperscript{143}.

Under the DRFI, almost half of the projects, corresponding to more than 70% of the financial resources, support climate change-relevant projects.

4.3 International Development Association - IDA

The International Development Association (IDA) is the division of the World Bank focused on the 82 poorest and least developed countries in the world. Half of these countries, whose populations have an annual income per capita lower than USD 1,000, are located in the African continent.

IDA was established in 1960, to complete the architecture of the World Bank and bridge the organization from its old mandate on post-war reconstruction to the current activity of multilateral international assistance for development.

IDA works to reinforce the fragile economies of its supported countries in order to guarantee a better existence to their populations, free from extreme poverty. The

\textsuperscript{141} IEG-WBG, 2009.
\textsuperscript{142} More information on this topic can be found at: https://www.gfdrr.org/node/337.
\textsuperscript{143} Insurances for public and private properties, contingent credit lines for governments and other instruments to help investors in overcoming catastrophes, like insurances and derivatives for agricultural support in case of droughts or floods.
instruments IDA uses to pursue these objectives are long-term highly concessional loans and grants. Loans provided by IDA are different from those of IBRD, as they require lower or even zero interest from borrowers and often encompass extended grace period (up to 10 years). In particular, the level of concessionality of the IDA’s financing is decided in relation to the income level and other indicators of economic development of countries. The more a country is economically and socially weak, the more the financial assistance will be concessional or also constituted of grants only (in the poorest situations).

IBRD and IDA are governed in the same way, approving their projects according to the same guidelines and procedures, but they differ in the way they are financed. The financial resources of IDA in fact, originate from donations of developed countries’ governments, pledged every 3 years in the “IDA Replenishment”, the meeting in which members of IDA concord the strategies to adopt and the priorities of the organization. Other resources can flow from IBRD, from donations of IFC and from the repayment of loans from beneficiaries.

The Annual Report 2012 of the World Bank states that USD 50.9 billion has been allocated in the latest replenishment in order to finance IDA’s operations and project for the financial years 2012/13/14 (figure 8 shows the historical resource allocation between 2008 and 2012). As a result, in 2012 the organization effectively committed USD 14.8 billion to several projects, with more than 80% of the contributions channeled through concessional lending, around 15% in the form of grants and the remainder represented by guarantees (WB, 2013).
4.3.1 Risk mitigation activity of IDA

The assistance that IDA provides to its supported countries is not only limited to financial contributions. The association can issue Partial Risk Guarantees, in order to mitigate the political risks faced by investors and unlock additional capitals from private institutions to implement infrastructure projects in the least developed countries. The mechanism of IDA PRGs is exactly the same of those issued by IBRD, with the only differences lying in the geographical availability (lower-income countries, not eligible for the Enclave guarantees of IBRD) and the higher pricing. This is due to the greater political risk perception of investors operating in such countries\textsuperscript{144}.

4.3.2 IDA’s commitment on climate change

IDA operates in the poorest and least developed countries in the world, that are also the most exposed to the future effects of climate change. Here, the joint achievement of

\textsuperscript{144} WB, 2013f.
poverty eradication and climate change reduction (especially adaptation) is fundamental and all the IDA operations are based on this awareness.

In its last replenishment process, IDA included climate change amongst the special themes to follow in order to achieve its targets for the period 2012-2014\textsuperscript{145}. The two main outcomes were 1) delivering financial assistance for the economic development of member countries and, at the same time, 2) leverage additional funds for climate change adaptation and mitigation.

Like the other institutions of the World Bank Group, the operational approach to climate change of IDA is based on the *Development and Climate Change: A Strategic Framework for the World Bank*.

IDA’s financial commitment to climate in 2012 is almost twice that of the year before and amounts to USD 4.6 billion\textsuperscript{146} (USD 0.88 billion in 2011). Lending for adaptation activities (agriculture advancement, improved water access, disaster resilience in particular) accounts for half of the money, rising from USD 1.4 billion in 2011 to USD 2.3 billion in 2012. IDA has also exponentially improved its commitment in the climate mitigation sector, switching from USD 0.88 billion in 2011 to USD 2.3 billion in 2012.

In the *World Bank Risk Mitigation Instruments for Climate Change*\textsuperscript{147} we discovered that, unlike IBRD, IDA has been more active on the guarantee market, but still in a way that is below the expectations. Since 1998, the year in which the very first Partial Risk Guarantee was issued, IDA has supported 13 projects, only 3 of which were climate-relevant initiatives. The first of them was dated 2005 and 3 more clean projects are expected to be approved in 2013, proving that IDA is taking climate change into increasing consideration.

4.4 International Finance Corporation - IFC

\textsuperscript{145} IDA, 2010.
\textsuperscript{146} WB.org, 2013a.
\textsuperscript{147} CPI, 2013a.
The International Finance Corporation (IFC) is one of the two divisions of the World Bank (the other one is MIGA) that are explicitly focused on the promotion of the private sector investing in the least developed countries. The IFC, founded in 1956, is owned by its 184 member countries that govern it through a Board of Governors and a Board of Directors, operating independently from the World Bank. Countries are also shareholders of IFC, providing part of its capital. The rest of the financial resources constituting IFC’s capital come from bonds issued on international financial markets and from revenues flowing from the products and services issued to investors. This makes the IFC a financially autonomous institution.

The projects approved by IFC aim at promoting the economic development of the least developed countries through the support of privately owned sustainable investments for-profit in key sectors, like capital markets, agriculture, health, infrastructure and microfinance\(^\text{148}\).

The range of financial products and services offered by IFC is wider than the other institutions of the World Bank and the offer can be grouped into three distinct categories: direct investments, risk mitigation instruments and advisory services.

The first category includes loans and equity contributions. Unlike IBRD and IDA, loans of IFC can be provided directly to private borrowers or alternatively, can be channeled to co-finance projects with private investors in order to produce a leverage effect on the money committed. All the loans are approved are approved at market rates. In addition, IFC can promote new projects by holding a minority part of their shares and acting like a silent shareholder (only participating in the capital and without interfering with the management).

Risk mitigation instruments will be described in the next paragraph.

Lastly, the IFC’s advisory services dispense expertise and technical assistance to private businesses and governments, supporting them in the successful implementation of their initiatives.

\(^{148}\) Cgdev, 2011.
4.4.1 Risk mitigation activity of IFC

IFC has a large portfolio of risk mitigation instruments to promote the private investments in developing countries. The research conducted by CPI on risk mitigation instruments showed that IFC has significantly increased the use of these tools in the last 5 years (in particular PCGs and risk sharing facilities), shifting from 7% to 43% of annual commitments. On the other hand, loan and equity investments have been progressively reduced\(^{149}\).

Products for risk management offered by IFC are:

- **Trade Finance Facilities.** They use several mechanisms like letters of credits, advance payment guarantees and performance bonds to ensure the agreed payment in trade transactions in developing countries. Producers of clean technologies goods and services can be assisted at better conditions and prices under the Climate Smart Trade Initiative (which is a part of this program).

- **Guarantees.** IFC provides credit guarantees, exactly like those of IBRD. IFC can also implement guarantee facilities in partnership with commercial banks to reach a larger number of beneficiaries.

- **Carbon Delivery Guarantee.** This is the only product that has been explicitly designed to assist projects relevant to reduce the climate change. In detail, it offers a guarantee of success in operations involving the trade of carbon credits. IFC guarantees the effective supply of credits to their purchaser and at the same time guarantees that the seller will be paid correctly.

- **Risks Sharing Facilities.** These platforms are used by IFC to support the banks of developing countries in providing loans to small scale local projects. IFC shares the risk of these investments with such banks, bearing the first crunch of losses that

\(^{149}\) CPI, 2013a.
eventually may arise in case the projects are unsuccessful. They have been adopted several times to finance initiatives of energy efficiency.

- **Hedging Instruments.** IFC is able to provide derivative instruments to its clients, to address many of the financial risks that are real or just perceived in emerging markets, like currency or interest rate volatility. IFC acts as an intermediary between its clients and commercial institutions issuing hedging products, because usually clients are not in the position to enter the market of derivatives\(^\text{150}\).

### 4.4.2 IFC’s commitment to climate change

IFC is probably the most active institution for climate change within the World Bank Group, in terms of number of products explicitly dedicated, increased commitments and transparency in its operational mandate and long-term strategy.

Climate change is, in fact, one of the top strategic priorities of the institution that have also launched a specific unit, called the Climate Business Group\(^\text{151}\), to drive its operations related to renewable energies and climate related projects.

Under the unit, IFC allocated 14% of its overall resources in both 2011 and 2012, corresponding to USD 1.7 billion to each financial year.

In its roadmap plan for 2013-2015\(^\text{152}\), IFC identifies a clear strategy for the activities conducted in the sector and a clear target: allocating at least USD 3 billion a year for the climate business.

With respect to risk mitigation, IFC committed a significant and constantly increasing part of its resources to support climate relevant projects. Precisely, in the last 13 years the Corporation allocated 12% of its risk mitigation commitments that in 2012 touched a

\(^{150}\) Not all the investment and advisory services provided by IFC have been reviewed here. Comprehensive information can be found at: [www.ifc.org](http://www.ifc.org).

\(^{151}\) Further detailed information can be retrieved in the official page of the Unit: [http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/cb_home](http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/cb_home).

\(^{152}\) IFC, 2012.
record share of 25%. Over the large portfolio of risk mitigation instruments of IFC, only the risk sharing facilities played a significant role in this sense, attracting almost USD 1 billion for application in energy efficiency initiatives. The Carbon Delivery Guarantee, instead, is the only product within the entire World Bank Group that is specifically conceived for assisting climate projects, but investors to date have not significantly adopted it.

4.5 Multilateral Investment Guarantee Agency - MIGA

Established in 1988, the Multilateral Investment Guarantee Agency, commonly called MIGA, is the insurance division of the World Bank Group focused on political risk in the least developed countries. Its mission is that of protecting and enhancing the investments of foreign industrialized countries flowing to projects located in developing countries, against the political risks that may impact the initiative. These projects are supported and implemented to contribute to the local economic and social progress. MIGA pursue its objectives by offering insurances and technical assistance to private investors and debt providers, against the risks of political nature that may arise in the project’s host country.

The Agency is owned by its 179 member countries (154 developing and 25 industrialized countries) that are also providers of its capital, along with contributions from the Bank. MIGA is, like IFC, a World Bank’s arm that is explicitly designed for the assistance to the private sector, even though some state-owned businesses (only if the operate for making profits) are eligible to obtain its insurances. Unlike the other WB institutions, MIGA does not provide any financing service to its clients, whose investment projects must be financially feasible and must possess certain requirements of social and environmental safeguard. The entire activity of MIGA is in fact centered on its Political Risk Insurance.

4.5.1 Risk mitigation activity of MIGA
MIGA is the largest provider of risk mitigation within the World Bank Group, allocating more than USD 30 billion to over 700 projects since its inception in 1990. The Political Risk Insurance (PRI) is the only instrument issued by MIGA that offers coverage to commercial lenders and private equity providers for their investments placed in the poorest countries, against losses that may arise from illicit behaviors of the host country. Often PRI are referred to as guarantees, which technically are not equivalent, but informally this is acceptable.

The PRIs have two big advantages over the other risk mitigation products of the WBG: 1) their capability of covering equity investments, a peculiarity that no other institution is able to provide; 2) the ability that MIGA has demonstrated historically in mediating legal disputes between its clients and host governments and finding agreed solutions. Its efficacy in this field is proven by the low number of claims not solved and forced to reimburse over the years (just 6 claims over 25 years), working in countries that are politically and socially extremely unstable.

The PRI can cover against several political risks, in particular: currency inconvertibility and transfer impediments; expropriation of assets; war, terrorism and social unrest; violation and non-performance of contracts stipulated with the host governments. In case one of these situations happens, MIGA assesses if the compensation is due to its client or not. If it is due, MIGA reimburses the insured investment almost entirely\(^{153}\), plus a part of lost future incomes attributable to the investments (interests not paid in case of insured debt or future earnings that the insured equity would have generated).

As shown in the table below, in 2012 MIGA has provided an outstanding amount of commitments to its 52 operations, corresponding to USD 2.7 billion and significantly higher than the previous years\(^{154}\).

\(^{153}\) 90% of the equity value or 95% of the debt.
\(^{154}\) MIGA, 2012.
4.5.2 MIGA’s commitment on climate change

MIGA does not have a publicly disclosed institutional strategy for climate change, but at the same time it supported several projects since the very first political risk insurance issued in 1990. The majority of these projects were geothermal or hydro power generations located in its member developing countries. If compared to all the financial resources committed to more than 700 projects during MIGA’s history, climate change investments accounted for approximately 4%, which is not a particularly significant contribution.

As MIGA is the biggest provider of risk mitigation instruments and has developed an established experience in dealing with governments of poor countries, its impact on climate change support can potentially be very significant if it is provided with a clear mandate in this direction.
CONCLUSIONS

In this thesis I have tried to describe, in the most accurate way possible, the complex universe of climate finance in many of its aspects.

I have tried to quantify what financial efforts are already in place and what others are needed to stop or, at least, reduce to a sustainable level, changes that at this moment in time seem almost unavoidable and, very likely, catastrophic.

In addition, I have highlighted the main financial risks that can impede the flowing of resources from investors to projects relevant for climate change mitigation and adaptation. The analysis has been then complemented with an extensive review of all the instruments that can address such risks.

Eventually, I have described the structure and operations of the World Bank Group that is the most important multilateral institution for development and the biggest provider of risk mitigation instruments.

What emerged from this thesis is an extremely articulated and complex picture of the current status of climate finance. Nowadays, climate finance seems to possess all the characteristics required to attract the investments needed to solve the climate problem. However, despite such potential, the investments deployed are still insufficient.

This thesis has also aimed to show how the future of our world heavily relies on financial criteria and political decisions, and wishes to provide a sense of urgency to policymakers for prompter and more decisive action on climate change mitigation. We hope this modest contribution will not go unheard.
ANNEXES

### Annex 2: summary list of risks reviewed

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### Annex 3: summary list of risk mitigation instruments reviewed

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Ringraziamenti

Desidero ringraziare di cuore il Prof. Carlo Giupponi per la sconfinata pazienza che ha dimostrato nei miei confronti e per avermi introdotto a Climate Policy Initiative.

Inoltre ringrazio Barbara Buchner per avermi accolto in CPI, dimostrando di avere fiducia in me.