Predict risks. Avoid impacts. See Opportunities. Integrated Climate Change Risk Analysis for the Financial Sector.

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Definitions

Climate: Climate in a narrow sense is usually defined as the "average weather", or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system. It is not the same than weather (IPCC, 2012).

Climate Change: Climate change refers to 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 forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the Framework Convention on Climate Change (UNFCCC), in its Article 1, defines "climate change" as: "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods". The UNFCCC thus makes a distinction between "climate change" attributable to human activities altering the atmospheric composition, and "climate variability" attributable to natural causes (IPCC, 2012).

Climate variability: refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability) (IPCC, 2012).

Global Warming: synonymous sought for Climate Change, which actually it is not. Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities (USEPA, 2012).

Greenhouse Gas Emissions: Greenhouse gases (GHG) are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the

atmosphere and clouds. This property causes the greenhouse effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary greenhouse gases in the Earth's atmosphere. Moreover there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine and bromine containing substances, dealt with under the Montreal Protocol. Beside CO_2, N_2O and CH_4, the Kyoto Protocol deals with the greenhouse gases sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) (IPCC, 2012).

Greenhouse gas effect: Greenhouse gases effectively absorb infrared radiation, emitted by the Earth's surface, by the atmosphere itself due to the same gases, and by clouds. Atmospheric radiation is emitted to all sides, including downward to the Earth's surface. Thus greenhouse gases trap heat within the surface-troposphere system. This is called the natural greenhouse effect. Atmospheric radiation is strongly coupled to the temperature of the level at which it is emitted. In the troposphere the temperature generally decreases with height. Effectively, infrared radiation emitted to space originates from an altitude with a temperature of, on average, -19°C, in balance with the net incoming solar radiation, whereas the Earth's surface is kept at a much higher temperature of, on average, +14°C. An increase in the concentration of greenhouse gases leads to an increased infrared opacity of the atmosphere, and therefore to an effective radiation into space from a higher altitude at a lower temperature. This causes a radiative forcing, an imbalance that can only be compensated for by an increase of the temperature of the surface-troposphere system. This is the enhanced greenhouse effect (IPCC, 2012).

Impact: Strictly, the difference between what is expected of a projection and what it would have without climate change (IPCC, 2012).

Resilience: The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures. (UN/ISDR, 2004)

Vulnerability: Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity. The vulnerability of climate change is different according to country and sectors, thus some sectors will be more vulnerable to climate change than others (IPCC, 2012).

Mitigation and Adaptation: Mitigation measures are actions, which reduce the emission of GHG in order to reduce the potential effects of global warming. Adaptation measures on the other hand are a response aiming to reduce the vulnerability of ecosystems and humans to effects resulting from global warming and climate change (IPCC, 2001).

1. Introduction

Climate change is already a socio-economic and environmental threat for our planet. It is now commonly accepted that climate change impacts will bring challenges for businesses and countries worldwide, affecting the way how firms operate and prosper. For instance, it is a general consensus that climate change will very likely reduce countries' annual gross domestic product (GDP) (IPCC, 2007a).

Nonetheless a crucial problem for triggering earths change in temperature is connected to conventional ways how businesses carry out its activities, meaning, the way how businesses extract raw materials, further process and turn them into products and services, within a production and consumption cycle which emits a high level of greenhouse gas (GHG) emissions, depletes of earth´s natural resources and reduces ecosystems capacity to be maintained and regenerated.

Similarly, impacts from climate change can also directly affect businesses bottom line on the short term and long term capacity to operate. These direct impacts could be in the form of:

- extreme weather events;
- sea level rise;
- natural resource scarcity;
- ecosystem and biodiversity decline;
- energy, water and food security,
- and health impacts.

Additionally, the globalization of our world economy together with predicted socio-economic future trends indicates a rise of the world urban population belonging to the middle class. This rise will place further stress on earth's temperature balance, because urban and income growth implicates an increased demand for goods and services, as well as, provision of housing; infrastructure construction, utility and transport services necessities in urban areas. As consequence, the consumption of fossil fuels and production of waste will also be intensified which will finally create a higher level of greenhouse gas emission into the atmosphere and aggravate climate change.

Therefore natural resource constrains will also be further worsen off as consequences of our global economy globalization process, future socio-economic trends and conventional ways of doing business.

Our socio-economic system is highly integrated with our planets' biosphere, thus a change in the biosphere drives effects into our own socio-economic system. These effects will be in the form of:

- increase of energy and raw materials price volatility,
- new regulations to curb natural resource usage and greenhouse gas emissions, and
- change in consumer preferences in favor for companies which address these issues and perform sustainable practices.

Nevertheless, internal consequences for businesses, in the context of this unbalanced relationship with our biosphere, will be in the form of physical assets disruption; human resources insecurity, supply chain unpredictability and customer demand decline. Thus, the fact is undeniable, that businesses will face difficulties for building the capacity to attend higher market demand in a resource constrained society, as well as, to adapt and to respond to socio-economic and environmental impacts.

Company's perception of what good performance means, should consider its accountability for contributing to climate change, similarly companies should also take into consideration climate change impacts that they are exposed to. Thus after considering these two aspects it seems clear that there will be a need to change the conventional ways of doing business towards new values embedded into new operational models, which seeks to minimize or neutralize its effect on our planets' biosphere balance and climate change contribution.

Therefore the role of business in our society is shifting away from only providing goods and services to satisfy our needs and serving as a mere source engine for economic growth. Today it is widely recognized by the society that firms are accountable for their socio-economic and environment impacts.

Moreover risks posed by climate change will require more responsible business practices towards a sustainable development of our economy and society. Because business plays an important role in the mitigation of climate change through the reduction of GHG emissions and because it has the capacity to launch innovative products and services which will help us to live in a more sustainable way.

Hence businesses will not only need to handle their vulnerabilities from current risks and impacts from climate change but they will also need to incorporate social and environmental considerations in its decision making and anchored it into their core business models. Proactive corporate social responsibility towards addressing climate change must be inside business operations in order to manage risks well; create business and competitive advantage opportunities; pursue environmentally and socially sustainable growth strategies and avoid costs associated with inaction.

Conventional ways of doing business is not longer viable to attend our needs, and to aspire economic growth. In order to understand and handle issues that climate change impacts will bring, will require a complex but necessary relationship between business and society responsibilities.

The Role of the Banking Sector

In the middle of this complex relationship relies the importance of the banking sector since it is one of the world's largest industries which plays a crucial part on aggravating or bringing solutions towards climate change. This is because banks, in particular retail banks provide mortgages and loans to individuals for all sorts of purchases; commercial and corporate banks finance business to extract oil, build power station, and asset managers direct the world's capital investment and trading in assets like bonds, shares, equity and property.

According to the International Panel on Climate Change (IPCC) over the last decades International trade and foreign investment have more than tripled; trade in natural resources grew six-fold; and internationally-traded financial assets such as bank loans, bonds, and portfolio equity soared twelve times (IPCC, 2007). Thus Businesses has been benefited from exceptionally low interest rates, which allowed them to access cheap capital and drove a major increase in trade, mergers and acquisitions (KPMG, 2012).

Based on these facts we can consider the responsibility of the banking sector on controlling carbon impacts through its lending, investing and asset management activities. This responsibility can be further extended towards the accountability that banks have on financing carbon-intensive activities. On the other hand banks can also influence the increase of project-financed activities for sustainable development, such as, a special line of financing renewable energy projects.

Following this reasoning of finance responsibility, today we can see present in the market the Equator Principles. These principles are a voluntary set of standards that define the responsibility on banks to determine, assess and to manage social and environmental risks in projects that are financed under these principles. Including not financing projects where the borrower will not or is unable to comply with social and environmental policies and procedures implemented into the

Equator Principles. Thus the Equator Principles emphasize the importance of banks investment and lending responsibility, especially when information about socio- and environment risk impacts within the lending or financing venture proposal are well know (Equator Principles, 2012). The Equator Principles are one example of present voluntary market standards but also an example of future climate change regulatory standards. This would bring the need to improve the banking sector institutional responses to climate change risk management and also a chance to create new business value for the overall business performance value.

Considering possible climate change risks, banks will be better capable to manage such risks through including mitigation measures into their business model, CSR practices and through finding new opportunities for products and services. For these reasons we have decide to develop a risk analysis framework tool to be applied within the banking sector. Our group has realized the need to create a tool where banks could identify risks posed by climate change and the level of gravity of each risk for the organization. We have identified a gap in the banking sector regarding the lack of comprehensive risk analysis performance and integration of corporate social responsibility measures to mitigate climate change by considering real risk it poses on banks per se.

Another reason for developing an analytical climate change risk framework tool is the fact that there is a current failure of the banking sector to identify, assess and ultimately manage a wide range of climate change risks, for instance in the banking sector only 5 % of banks have integrated climate change into their core business processes over the entire value chain (SAM 2009, 8). At the same time government and policy makers are not doing enough in applying necessary market regulation in the financial sector. Therefore this tool can bring banks opportunities for a full integration of climate change risk analysis into businesses sustainability perspective and operational strategy practice.

In order to test the effectiveness of our analytical climate change risk framework tool we decided to work with the Spanish bank Bankinter and test the tool within its current operation scenario, environment policies and initiatives. Our decision to work with Bankinter was based on its leadership and commitment to address climate change within its business activities and corporate social responsibility programs.

Bankinter

Bankinter was founded as a joint venture between Banco de Santander and Bank of America and since its creation in 1965, it has focused its search on new market niches that may offer high returns and a sustained growth capacity. In this context, the Bank came up with the idea of the necessity to reach its economic growth, not only considering economical factors but also social and

environmental dimensions. Furthermore, Bankinter included in its strategy the good governance and the necessity to implement the corporate social responsibility as a company's commitment to create value and respond to its different stakeholders.

On the other hand, the Bank is member of Global Compact which is an international initiative proposed by the United Nations to achieve the voluntary commitments of companies towards social responsibility principles, by means of the implementation of the ten principles in the areas of human rights, labor, the environment and anti-corruption. The Bank understands corporate social responsibility, not only as a tool for social empowerment, but also as a basic principle in order to contribute to a more sustainable development. The implementation of the environmental policy of the Bank Group provides the means and procedures on the activities to improve the environment impact associated with: material consumption efficiency, waste management, employees' impact awareness and many other activities.

Bankinter has being able to successfully achieve some climate change mitigation activities, for instance in 2010, it became the first bank in Spain to calculate its carbon footprint. Since this calculation the Bank has implemented different measures to reduce and compensate its CO_2 emissions. On the other hand, although Bankinter has been giving great importance to its environmental policy performance and towards lowering its level of CO_2 emissions, it has not carried out a full climate change risk analysis study in order to understand the materiality of direct and indirect risks that the bank is and will be facing in relation to climate change.

Finally, this year, the bank has launched a Sustainability Plan for 2012-2015, called "three in a row" which includes economic, social and environmental dimensions, with special analyses on the environment. The plan proposes different actions towards operating responsibly, creating value, saving cost, improving the bank's reputation and responding to the most relevant issues that the bank (and the society) will face in the following years regarding sustainable development. However without a deep understanding of relevant issues and risks accompanied to climate change, Bankinter may not have the chance to accomplish its sustainability plan goals and at the same time considering important climate change risks.

Local Impacts of Climate Change

In the context of Spain climate change will produce very different direct and indirect impacts on the environment, as well as, in social and economic areas. In fact, Spain is more exposed to risks from climate change than any other European Union country (thinkspain, 2012).

One of the main consequences in the country will be the rise of the sea level and the variability on precipitations. Although there are different scenarios depending on the policies that the government is committed to implement, predicted consequences will have a huge impact on the ecosystem and in the Spanish economy. Further climate change will probably cause impacts in the Spanish food and energy security, human health and provoke safety problems.

Although Bankinter has implemented many initiatives towards minimizing its impact on climate change, there are still opportunities for progression towards a more proactive approach by the bank towards strategically addressing this global issue. Thus taking also into consideration the Spanish vulnerability to climate change, it makes clear that there is a need for Bankinter to carry out a complete risk analysis in relation to climate change.

In order to understand and evaluate the real level of risk exposure that banks stands against climate change it is necessary to pursue a complete climate change risk analysis. For this reason our risk analysis tool intends to identify direct and indirect risks posed by climate change on banks, but also to measure the level of Banks risk sensitiveness and readiness to deal with this risk impacts, looking at a specific case which is Bankinter.

Scope of the Risk Analysis

We have identified four main risk categories that the banking sector is more likely to be affected in correlation to climate change impacts. These risk categories are:

1. Credit and financial risk in line with increased credit defaults, uncertainties about terms of debt, lower than expected Return on Investment and problems in financing availability;

2. Strategy risk includes decrease in reputation, loss of competitiveness, poorer HR performance and concerns from shareholders and investors connected with the awareness of climate change issues and uncertainty regarding how the bank is addressing it;

3. Operational risk regarding damage of physical assets, IT infrastructure and changes in conditions for insurance;

4. Legal and regulatory risk related to an increase of regulations and policies to limit emissions and punish practices that are unsustainable.

The risk categories are further composed of risk subcategories which have as drivers, problems occurring from forces on our socio-economic and biosphere balance.

Once risk sensitiveness and readiness analysis is assessed, the tool is able to demonstrate which areas the bank should give priority to address. Nonetheless our climate change risk analysis tool also serves to help banks to develop long term planning, to get prepared, to adapt and to mitigate climate change challenges and effects.

Our group intention on developing this climate change risk analysis tool is to help businesses, more precisely the banking sector, to examine its real level of contribution and exposure to climate change. Hence the tool will be able to be used in the application of actions towards not only managing risks but also on giving directions where to integrate actions into core business activities and long term strategy towards business sustainability in relation to climate change. Most importantly the tool seeks to demonstrate in which areas the bank can improve its efficiency, as well as, to innovate, to capitalize opportunities and to add value for their business.

Methodology

In order to organize our work we assigned roles according to our personal strengths:

- Leader (Francesco): motivate the team, design the whole project, have the overview about the project and assign responsibilities to tasks; design the presentation.

- Report standards (Marie): keep an eye on the structure coherence and on details, responsible for the formatting and design of the document, put together the presentation.

- External and internal communicator (Patricia): stay in contact with our Mentor Kepa Solaun, Bankinter, and other external stakeholders, define schedule for meetings and disseminate information within the team.

- Researcher (Carlos): organize the resources and assist other team members with information and which part of the paper would fit to their topic, develop the bibliography and coherent quotation.

To obtain primary information we approached several regulatory bodies including: The Spanish Banking Association, The Bank of Spain, The European Bank Federation, The European Central Bank, The National Stock Market Commission of Spain, The European Commission and European Banking Authority, and asked them: what is the reason for the absence of legal framework for financing institutions to actively address climate change on its organization policy, operations, products, services and strategies? And If will be changes in the regulatory framework regarding banks and climate change?

However only The Spanish Banking Association has responded and confirmed some of our indications regarding the lack of legal framework by saying that prudential regulation that governs financial institutions does not set any specific rules related to climate change, the European Union has also not included this provision in the Banking legislation either, some of the reasons behind this lack of framework for the sector is because banks are not considered responsible for contributing with direct GHG emissions and hence aggravating climate change. At moment there is no forecast when climate change impact regulations will be imposed on the sector.

As sources of secondary information we used public reports and websites, all listed in the bibliography. The communication within our group took place via email, personal conversations and weekly meetings. Like this we stay informed about the progress of the others and have the possibility to discuss further tasks.

We have chosen Kepa Solaun as our mentor, because he is an expert in the field of greenhouse gas emissions and climate change. He is very passionate about mitigation and adaptation measures and connects us with other experts. His believe is that everybody can and should contribute to mitigation and adaptation of climate change and should take a stand for a stricter climate change regulation, as it will affect every single person on the planet.

We have chosen Bankinter as a representative of the financial sector to conduct our analysis about the readiness and sensitivity towards climate change risks and opportunities. This decision was based on its leadership and commitment to address climate change within its business activities about its transparency on corporate social responsibility.

2. Climate Change Risk Analysis Framework

2.1. Introduction

Nowadays, given the new role of business into society and the reflections above mentioned, strategies and actions which involve Environmental, Social and Corporate governance can be considered an inevitable priority for business leaders everywhere, as society has been increasingly judging businesses from a moral perspective and it has been considering businesses responsible for duties they did not expect to be part of their agenda.

Many companies have consequently embraced activities to improve the social and environmental consequences related to their businesses; actually it is universally recognized that including environmental and social governance helps the business to reduce costs, achieve regulatory compliance, improve reputation, and assure the societal license to operate. Generally the most common initiatives that managers start working on are waste reduction and resource efficiency, as it automatically means more efficient operations and consequently save money.

In addition and more recently, among the actions taken toward such direction there is the estimation of the company's carbon footprint: assessing the impact on society in terms of greenhouses gas emissions allow the company to identify a baseline regarding its contribution to climate change and consequently having the possibility to respond adequately. It is a new step forward regarding the implementation of a sustainability strategy, by taking into account one of the most urgent and important issue to be dealt with by society, being climate change.

Yet, such actions which are also supposed to bring together business and society after decades of declining trust among them, often coincide only with a company's regulatory interests or with the defense of its bottom line from external pressure. In reality, social and environmental initiatives driven by short-term behavior and characterized by poor integration with each other and the overall business strategy may turn out to be even socially disadvantageous or environmentally wasteful. The general public and even sustainability experts are not able to identify the value creation that company claims to convey as further societal benefits, nor to "taste" tangible results toward its climate change goals. Rather, isolated or superficial initiatives result on more confusion among people regarding both the terms used to define actions and their effectiveness to solve societal issues. Often the public may even be driven to lose confidence about our possibility to change things, as results are rarely satisfactory. The concept of Corporate Social Responsibility as well as the expectations regarding response to climate change have been consequently identified with a too broad set of approaches, which don´t enable a clear understanding about what really they mean

and what benefits they bring to society. Simple questions can be advanced to better clarify what surrounds business activities: are companies' operations as a whole creating additional value to society, or are they still mostly detrimental to it? Is the contribution of a company to the causes of climate change controlled or managed as a whole or punctual action are at the end ineffective to reduce impacts?

Let us consider some real examples: DuPont, one of the largest chemical companies in the world, has saved over $2 billion from reductions in energy use since 1990. It claims to be at the forehead on environmental management and on the fight against climate change. Yet, it is highly involved in genetic engineering, which often happens to be serving a very intensive way of farming. Those techniques forced by the use of engineered seeds require the farmer extra use of fertilizers, pesticides, and also extra water for the irrigation of fields. Now, said that the chemical industry produces globally more than 4 % of total emissions and that, the substances used in agriculture soils account for another 5.2 %, the obvious question is: to fight climate change, it is enough to save energy, or a wider approach involving the entire business model is needed? Is that company reducing really its contribution to climate change or it may even make things worse?

Again, changes to the materials McDonald's uses to wrap its food have reduced its solid waste by 30 %; yet it also contributes to intense farming which, as explained, is inauspicious for both human and the planet health. Intensive farming involving livestock causes among others consistent GHG release due to manure production and enteric fermentation.

Those examples suggest that climate change commitment should not be claimed if it is not the case because the general public receives not only a wrong perception of Environmental and Social Corporate Governance (ESG) and its impacts on society, but it also will find trust toward businesses drastically reduced in the long-term, as reality come up. Even one of the main objectives adopted by business to approach environmental issues, being reputation, will be soon undermined as a consequence of wrong aptitudes that may lead people to blame a company of green washing.

In addition, strategically speaking, response to climate change as a way to appease pressure groups and improve reputation may not always result in great operational performance and enhanced profits: it actually may lead backwards, as companies may incur in additional operational costs and intensified scrutiny. If management does not fully understand a corporation's competencies and responsibility to contribute to a common goal, it will rarely identify the path to influence it while assuring business attainment.

To summarize, it means that sustainability goals are still missed: uncoordinated actions to respond to climate change as well as philanthropic activities disconnected from the company's strategy are

not sufficient to help a company identify, prioritize, and address the social issues that matter most or the ones on which it can drive the biggest social and environmental benefit together with enhancing the firm's long-term competitiveness.

By contrast, a way to properly respond to external factors together with bringing benefits for the business bottom line is to understand the system in which the business operates. Without a clear and shared understanding of how the business affects the system and how the system affects the business, no effective measures can be agreed upon. A system analysis actually answers those considerations.

2.2. System Theory

A system is a well functioning entity which cannot be explained as just the sum of its parts, but thanks to the bigger overall mechanism that is generated from all the complex interactions between the system's components, and between the components with the surroundings. Every variable and the interconnections it has with the others enable the system as a whole to come up with a specific outcome, which is referred as system behavior. The system outcome is supposed to be constant as the system is stable, meaning that the functioning mechanisms are maintained and both the variables' functions and their interconnections are resilient or unaffected somehow along time.

To better enable the reader to understand, let's suggest a simple example: consider a car. A car as a system has been conceived to allow the driver to reach a point of destination quickly. We can add also safely, effectively, and comfortably. Such system behavior or outcome is reachable thanks to all the components and functioning mechanisms inside a car. Simplistically, burning fuel to enable motion of the wheels, controlled by pedals and steering wheel. Now, it is obvious to understand that if some of the functions described fail, eventually the driver will not be able to use the car as the system doesn't comply with its normal behavior or general outcome it is meant to deliver. Equally, if surroundings (a street) are inadequate (interruption due to works in progress), the driver may be not able to satisfy his objectives either. Such conclusions however are so much more difficult to be advanced when dealing with far more complex systems, where various and different variables can be taken into consideration and their relations are likely to be not fully understood. Those systems are the ones of our daily life; they can be the company we work in, the community we live in, the system society as a whole, or broadly the Biosphere that features the planet Earth.

Yet, as explained, if we are about to planning toward an issue resolution, the systems involved must be fully understood, as our action will try to address its behaviors. If the issue is global it makes sense to try to understand the global system. If the issue is climate change it makes sense for a

company dealing with it to understand how the company contributes to it and how by contrast such system's effects can influence the company's performance.

Thus our project has a double overall objective:

- Commit to promote activities which will allow society to really experience the multiple benefits arising from a truly climate change strategy, and;

- Enable businesses to understand how a systematic risk analysis can strategically integrate climate change and drive success both for the business and for the society they operate in.

In order to achieve those superior goals we wish to provide a methodology that will enable a company to identify how and where climate change may signify a risk for operational performance, and how and where it eventually may be turned into opportunities of competitive advantage.

2.3. Risk Analysis starts from identifying Climate Change Main Forces in socio-economic Global System that alter Biosphere Balance

Climate change will bring and is already bringing physical effects. It is global, so that those effects will be impacting the Biosphere, which is the whole system composed by all the living and non living things on Earth. As society, we are in it and we depend on it for the conditions which enable life. Without the actual functioning of the system Biosphere, the planet would be a very uncomfortable place to live on for humans, and eventually we would not be here if conditions had been different. Actually we just need to recall the atmospheric and ecosystems conditions of millions of years ago, where CO_2 was the predominant gas composing our atmosphere and the water of the oceans was so acid to make life impossible for us. Fortunately, evolution during millions and millions of years wanted that today the planet is this friendly home perfect for humans to thrive. An incredible self-regulating system has created the conditions for the life to happen and continue.

However, the physical effects that may drive this system to change are not coming from the Biosphere itself, rather from a subsystem of it, the socio-economic system which we directly control. Which are then the forces inside the socio-economic system so powerful to drive change in the global system Biosphere?

It happens that four sufficient and necessary mechanisms occur together in the socio-economic system:

1. Population growth,

2. carbon intensive economy,

3. resource intensive economy, and

4. increasing demand.

Together these forces have made possible that humans alone are able to change an astonishingly powerful and resilient system which has self-created life and self-regulated the conditions for it to prosper. Together these forces have attained to drive the system unstable, opening the doors to unexpected and looming consequences. In a word, humans are undermining what they depend on. Another factor apply as well: not only they are occurring together but changes are also happening fast. That eludes one of the most extraordinary strength of humans: adaptability. With such quickly changing conditions human beings may not achieve to adapt promptly, neither does the majority of other species.

2.3.1. Socio-economic Forces and Climate Change

We recognize that the combination of the above-mentioned forces has eventually caused not only climate change, rather a series of interconnected events. Also we understand that other drivers may be identified for a more extended analysis regarding the problems faced by the biosphere. Yet, since our intention is to develop a risk analysis methodology for businesses to respond to climate change, we deliberately selected the main four forces in relation with climate change.

2.3.2. Population Growth

We can assert that humanity's path toward civilization started about ten thousand years ago with the agriculture revolution, when humanity cut off the necessity of hunting and gathering and became able to create and store its own food supplies to satisfy necessities. It was considered the beginning of civilization because, in order to cultivate fields and successively exchange goods, humans begun to extensively communicate and collaborate. Many arms were needed to raise the fruits of Earth and effective dialogue was required for all to enjoy the new status: settlements appeared in middle-east in the Mesopotamian region, society was born. From that time on, population has experienced a steady upward trend, with a stable growth rate of under 0.05 % per year, at least till the eighteenth century.

However, the effect on population growth of the agriculture revolution is nothing compared to another equally important cultural revolution: the industrial revolution. What can be considered the magnificent strengthening of science has enabled goods to be massively available. In addition, humanity experienced the development of urban areas, highly dense conglomerates of people to

better support industries. During this stage, improved standards of hygiene compared to the past and more modern medical techniques began to drive the death rate down, leading to a significant upward trend in population size. A great boost for the quality of life of a constantly growing population, which around 1800 reached one billion, and an additional one was achieved in only 130 years more (1930).

Last but not least, the petrochemical and genetic engineering revolution of last century: extraordinary advances in drug research and the capability to synthesize whatever we need ourselves, made humanity comparable to God. We can reshape the genetic alphabet, as well as producing whatever substance we consider useful, even if it doesn't exist in nature. Actually the most people thought we could get along without nature, or control it by the way. In addition the petrochemical revolution brought an easy and cheap way to deliver unimaginable amount of energy to fuel a consumption-driven way of life. While energy production increased 9 fold, world population quadrupled last century to take advantage of this extraordinary (but unsustainable) advance. Faster and faster. If it took humanity thousands of years to sum one billion, during last century the same amount has been added in less than thirteen years, with a peak of annual growth rate equal to 2.19 percent, which was touched in 1963.

However, few haven't overlooked such surprising population trends. Already in 1798 classic economist Malthus advanced the prediction of future mass starvation in England due to strong population increase and limited agricultural area. Although his predictions weren't accurate, it is the first clue regarding the fact that influent thinkers came to challenge the concept of unlimited growth and the inflated optimisms about unconstrained resources.

More recently the club of Rome in 1972 published the book "*The limits to growth*" where the Malthusian idea of human population constrained by ecological limits is restored and elaborated thanks to computer modeling to better show the unsustainability of such interconnections. Activists on the fight against climate change started to state that it is necessary to take action to stabilize the population. Others, not for the sake of climate, actually did: Chinese leader Deng Xiaoping established the "one child policy" in 1979 to limit China's population growth. Although designated as a "temporary measure, it continues a quarter-century after its establishment. The policy limits couples to one child. Fines, pressures to abort a pregnancy, and even forced sterilization accompanied second or subsequent pregnancies" (Rosenberg, 2010).

Fortunately, although population will continue to growth extensively for many years, the rate of growth is declining, which means that we are not far from a population peak and eventually the inversion of the trend. Nonetheless it is undeniable that in a limited system as the system Earth, the

impacts of an overpopulated humanity are already evident and may still extend for long time, overall if considered together with the other forces we are going to discuss. Today, after climbing over seven billions, the world population would have needed a planet and a half to sustain its necessity according to the global ecological footprint concept. We represent around 1.5 % of biomass on earth, yet we "consume" much more of photosynthesis byproducts, the primary engine of the biosphere, which creates life and the conditions for us to survive defying the law of entropy (creating order from the disorder of matter decomposition).

Thus we strongly believe on the idea of limitation. However the Chinese solution goes far beyond our ethical values and our democratic believes. Banning childbirth appears to us like looking on the eyes of the youngest of the current generation and telling them: it would be better if you were not here. Consequently, rather than limiting population we will focus on promoting the limitation of consumption and to eliminate the barriers which prevent people to enjoy a dignified way of life.

2.3.3. Increasing Demand

The second factor, which combines with population growth to put consistent pressure on the biosphere, is the increasing trend in the demand of goods and food. Not only the population has been growing faster and faster as explained, but the average consumption of every single individual in the planet has been keeping the pace upward as well.

This is happening mainly because globalization and progress of the developing countries are driving more and more people on earth to pass from the bottom of the pyramid to join the middle class, defined by the Organization for Economic Cooperation and Development (OECD) as people holding purchasing power of between US$10 and US$100 per capita per day.

Workers in developing countries have often demanded and finally obtained improved conditions and salaries, as they develop higher expectations and become more closely connected with the rest of the world. This interconnection makes disparities between working conditions and wages in different countries increasingly apparent (KPMG, 2012), encouraging the workers to fight for their rights and exposing internationally an eventual undemocratic repression guided by authorities.

In the next 20 years this share of the global wealth distribution is supposed to grow 172 %. Specifically, the size of the "global middle class" will increase from 1.8 billion in 2009 to 3.2 billion by 2020 and 4.9 billion by 2030. The bulk of this growth will come from Asia: by 2030 Asia will represent 66 % of the global middle-class population and 59 % of middle-class consumption, compared to 28 % and 23 %, respectively in 2009 (OECD, 2012).

This is great news for social development. Finally other countries are somehow catching up with the life standard of western countries. A more consistent middle class can be considered a very positive event for such less developed areas like Africa, where the increase of purchasing power may results in improved education, nutrition, and in general a better satisfaction of human's basic needs. In addition it may boost internal economy, as also internal demand will increase, so that eventually more political and social stability could be assured, driving a further step toward democracy and development.

Yet, if western model has been proved to be unsustainable regarding impacts in the biosphere, we can imagine the effects of such life style multiplied by almost three.

More bio-productive land, water, forests, materials and so forth would be required to support a growing population that consumes more and more. This is obviously physically impossible with current most used technologies that do not respect the Earth capacity of regeneration and absorption (ecological carrying capacity of the biosphere). Unless new ways of production as well as new style of consumption are quickly implemented, increasing demand will be never satisfied sustainably. It means that new middle class welfare will be simply apparent, as few may satisfy their needs while the rest of the world population will struggle for survival, in a scenario of constantly rising inequality. Geopolitical consequences are inevitable if that is the case. Social unrest and instability are by far optimist predictions. Due to physical constraints, what was supposed to be the outcome of social development of the neediest risks to be the recipe for disaster for the entire world population. Instead of wealth, an ever-increasing demand could bring catastrophes.

The conditions leading to climate change will not be spared from such predictions. Today, industrial agriculture alone is already emitting a consistent share of greenhouse gas emissions, equal to around 15 % of the total according to the World Resource Institute. With more and more people asking for meat (which is the kind of food that most ecological inputs requires), more and more fields will be needed for livestock to graze. More and more cereals will be needed to feed the livestock. More land and water will be needed to grow cereals. Finally more and more fertilizers and pesticides will be required to increase soil productivity. The result is a devastating positive feedback loop in term of emission involving deforestation, releases from enteric fermentation and manure management, soil impoverishment, and massive use of emitting chemicals, among others.

A bigger middle class does not imply that the gap between the poorer and the richer is narrowing, neither relating to individuals between countries, nor among countries in the international arena. According to Oxfam, we already have overcome the cap of 1 billion people living in starvation few

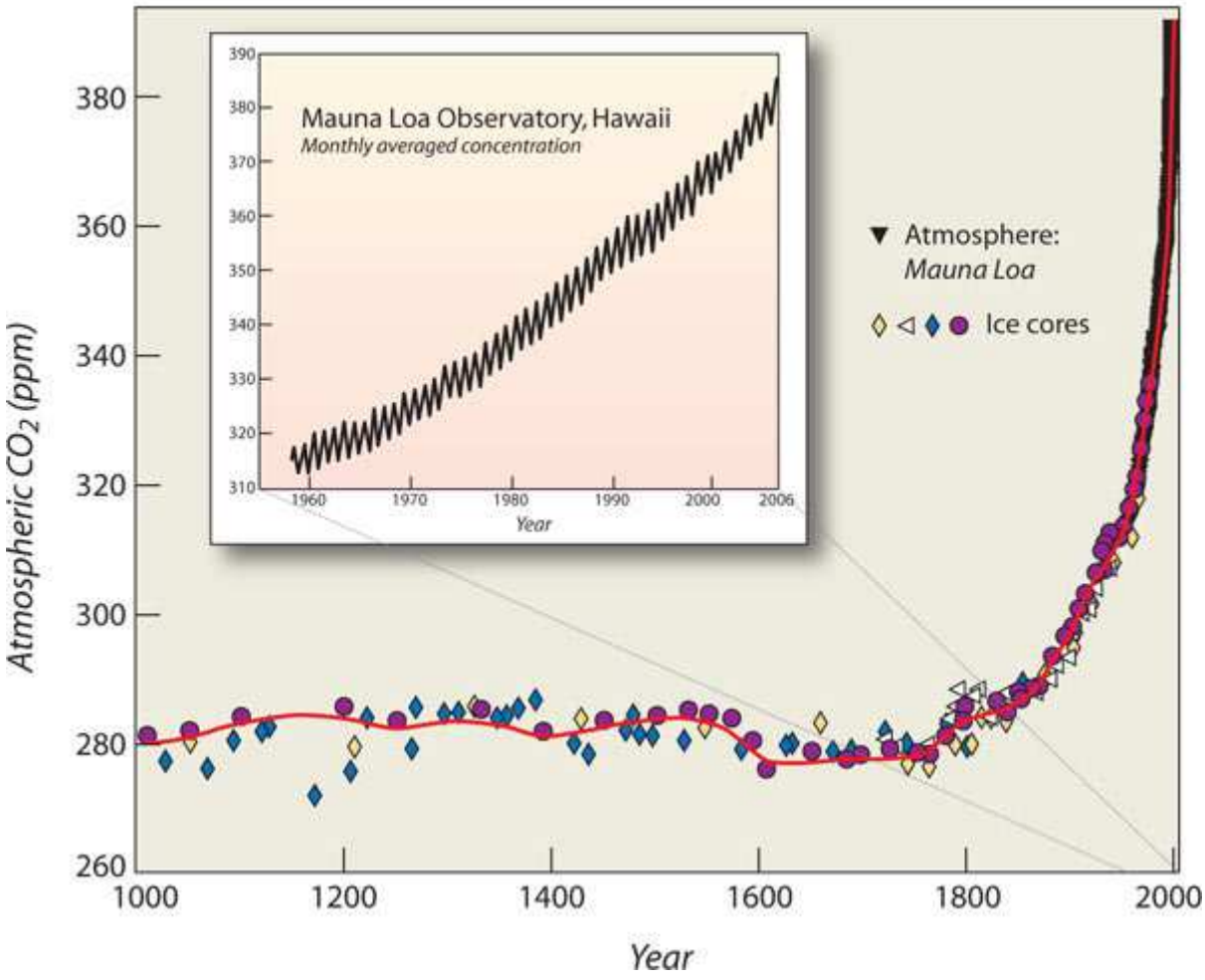
years ago, and forecasts are quite looming regarding the connections between increasing demand and poverty. Actually, according to economic laws, as the demand increases, the price of the good increases as well. Since in places like Africa around 50 % of the income is devoted to the purchase of first necessity food, the reader can imagine the immediate consequences of further price booms: more people will be under the poverty line, meaning that they live with less than $1.25 per day and suffer from hunger.

Finally, if food production has its responsibility in triggering climate change, eventual new planet conditions will hit back consistently. Being affected the hydrological cycle and the fertility of soils due to desertification and coastal erosion just to mention some effects, agriculture productivity will be highly damaged. High demand, which will not be a driver of climate change if population were low and the business model attentive to emissions, becomes now a very dangerous trigger.

2.3.4. Carbon Intensive Economy

As we stated, we are today in the oil age. To be accurate, we are in the decline of the oil age. Almost everything in our day-to-day life depends on oil. The food we eat, the fiber we dress. The way we move around, the way we heat our home, the way we cook our food. The way we provide electricity, the way we synthesize materials. We can go further on describing our dramatic dependence on oil. We are basically living on the Triassic inheritance, but unfortunately it is finite and its quick depletion is harmful for the environment. Climate change is already affecting our life as we are approaching the peak of oil production, which is supposed to happen as we speak. If we are going on as business as usual, injecting into the atmosphere what nature has sequestered underground slowly, eventually our civilization will be doomed even to disappear. In such circumstance, when nothing will be left, still ice caps will remember our age, where concentration of CO_2 in the atmosphere doubled in two centuries compared to millions of years of historical evolution.

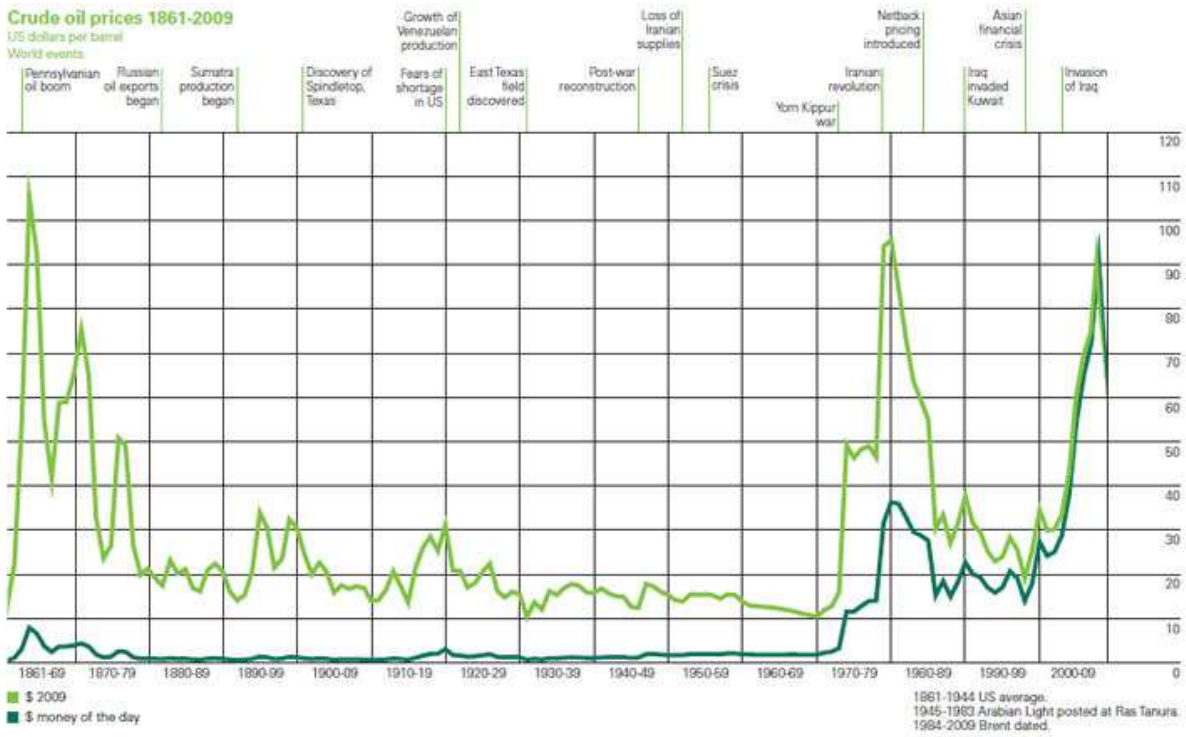
Graph 1: Atmospheric CO_2 Variations Since 1000 AD



Source: WHOI, 2012

Essentially there are expert on the field of climate change and energy that believe the recent economic crisis of 2008 being triggered by energy supply before than by financial mismanagement of entities like Lehman Brothers. In fact, in July 2008, before the fall of the financial market, the entire world experienced a very important fact: the oil price peaked at 147 dollar per barrel causing commodity prices to boom. As the prices roofed, food riots exploded in several countries, from Haiti to Bangladesh to Egypt, "where the soaring costs of basic foods have brought the issue to a boiling point and catapulted it to the forefront of the world's attention" (CNN, 2008).

Graph 2: Crude oil prices 1861-2009



Source: planet3, 2012

Since everything depends on fossil fuels, once oil price hit the wall, purchasing power obviously dropped, and consequently the entire economic engine was shut down. According to Jeremy Rifkin (economist, writer, political advisor, and activist) the financial collapse was the aftershock, while the oil crisis was the earthquake which shook the world.

Maybe the shock served as an effective warning for the world to react. Leaders in many nations started to discuss global targets for reducing emissions of greenhouse gases. The European Union has already set its targets since 2009 with the European Climate and Energy package, intended to bring 2020 emission levels 20 % lower than those of 1990, among other measures. Yet, international negotiations have been still unproductive about an effective global agreement to curb emissions. Under the United Nations Framework Convention on Climate Change (UNFCCC) countries meet yearly in December in the classic Conference of Parties (CoP), but alignment struggle to come up. According to McKinsey & Company (2009), “stay below the 2 degrees Celsius threshold will be highly challenging and a 10-year delay in taking abatement action would make it virtually impossible” to keep global warming below the mentioned objective.

In the meanwhile, last conference in Durban may have refueled hopes, after the delusion of Copenhagen in 2009. The Kyoto Protocol is practically dead in effectiveness since countries like Canada, Russia, and Japan will not participate in the new phase, but at least it will be possible to continue with the implementation of Joint Initiatives (JI, now also between Annex B countries) and Clean Development Mechanisms (CDM), enabling countries to maintain flexibility on their path toward a low carbon economy. In 2015 finally a new framework should be presented which should become operative from 2020. Globally we recognize that essential factors to succeed are energy efficiency, the development of smart grids, the deployment of renewables, new ways of transportation and of life style, among others. In our project we want to help businesses be part of the solution rather than part of the problem, in a low carbon economy.

2.3.5. Resource Intensive Economy

When we refer to a resource-intensive economy, we intend to criticize the lack of efficiency in our society according to the usage of natural resources, such as ecosystem services, minerals, water, and so forth. Efficiency is a term that rewards the attainment of an objective applying as few inputs as possible. It is strictly related to the concept of waste: if an outcome could be reached with a determinate minimum of resources applied, then if more and more of them are deployed, the excess of resources from the minimum is an inefficiency, a wastage of resources. Efficiency is not a criteria that should be used to describe the quality of an outcome; the quality of a product can be obtained either with few or many resources. Efficiency in the biosphere is about freedom and solidarity. It is about being aware that we are all part of the same community, which must be shared with other being, which are equally important for the wellbeing of the system. Consequently efficiency is a must of living together. Every process needs to be efficient because others should have the possibility to pursue the same service with the same inputs. It is about understanding that for the community to thrive, natural resources must be maintained and preserved along time, since they are finite.

This basic concept has not been fully integrated yet in our socio-economic system. Rather society has conducted along history a continuous race toward the massive usage of resources, believing that the more resources are employed, the more prosperity is assured. In our economy, trapped in a mechanism which requires perpetual growth to avoid collapse, increasingly high volume of resources are involved to provide services, which often go beyond the concept of human basic needs. It does not require a Nobel in economy to understand that perpetual increment of resources used in a finite system is not a sustainable option.

By contrast, our society not only is inefficient regardless of other beings essential for the biosphere, it cannot sustain even itself: last year, recalling the concept of ecological footprint, humanity

would have needed a planet and a half to provide its services. Yet, as we stated, over 1 billion people suffer from starvation, while according to a report of the International Energy Agency (IEA) 1.3 billion people lack access to electricity and 2.7 billion are without clean cocking facilities (IEA, 2011).

Now we can easily understand that a resource intensive economy combined with the rest of the forces mentioned above means devastating consequences for humanity. How does it relate with climate change? It occurs that one of the most important ecosystem services is providing a perfect atmosphere where clean air abundant of oxygen allows humans to survive. Recalling the engine of life, photosynthesis, it happens thanks to the cover of forests on Earth which transforms basically sunlight, CO_2, and water into oxygen and nutrients. As intensive deforestation and degraded ecosystem services due to human activity are reducing the capacity of plants to clean the air from toxic CO_2, more and more shares of this gas will be trapped in the atmosphere. Consequently, we are not only reintroducing the Triassic CO_2 back in the sky, but we are also undermining the most powerful mechanism that phases it out.

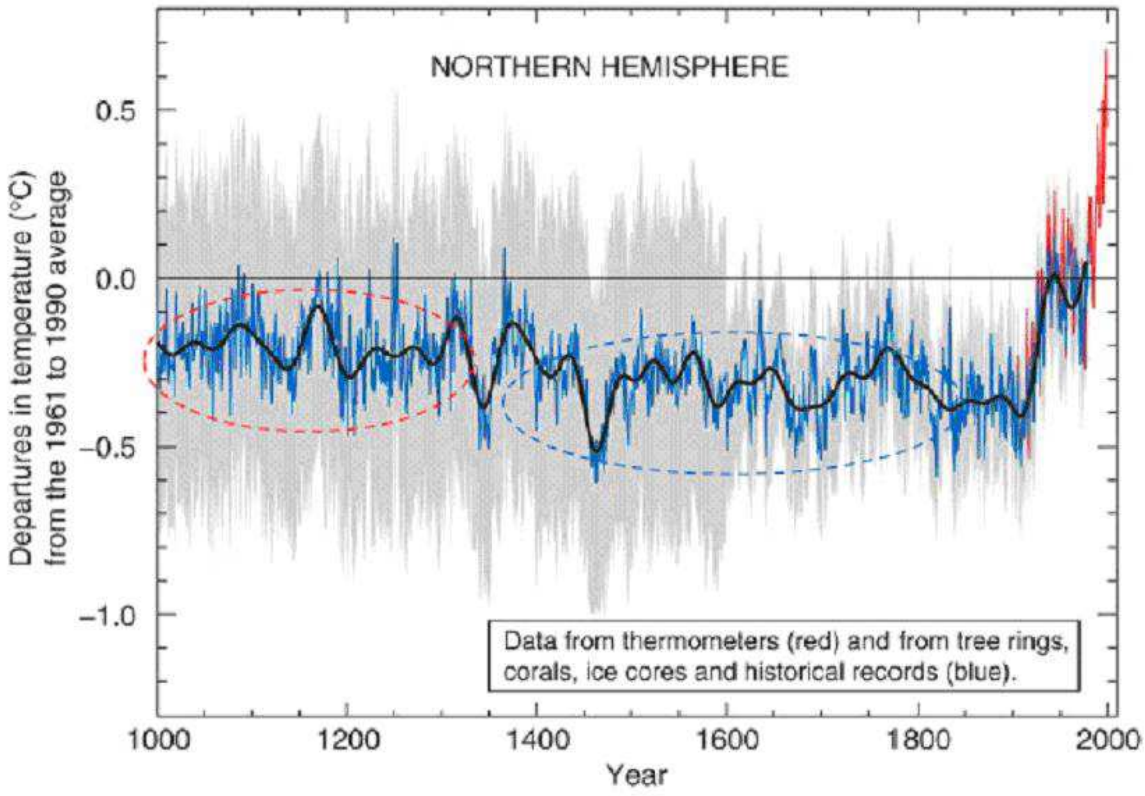
Which is the threshold of efficiency when using natural resources? Obviously, the most efficient process is the one which doesn´t use resource at all. For example, as during the day we can enjoy the sunlight to provide illumination, we should not use electricity for that purpose. However, there are situations where we are forced to use inputs in order to satisfy our necessities. In such case we need to distinguish between regenerative resources and non regenerative.

For the first group, we need to know and respect the regeneration rate of the resources in order to avoid its depletion. A forest for example should not be harvested at a rate bigger than the re-growth rate. In the second group, resources do not regenerate, or at least they do not do it in a space of time appropriate for human civilization. It includes fossil fuels, minerals, metals, topsoil, for instance. Actually topsoil is created in thousands of years from microbes' constant action and other factors. Consequently, to take out the most of those resources, we cannot allow wasting them. It is important to create a model of economy which allows those resources to be reused and reused over time, without losing their properties. This reflection refers to the concept of "cradle to cradle" according to which the phase of disposal does not exist during the life cycle of a product or service. Once the use it was meant for is considered to be over, the materials that compose a specific product and their properties are maintained and made available again as raw materials for a new product. To entail such concept, it will take a complete rethinking of our industrial society, starting from the design phases of a process: a product/service must be designed to allow its full re-utilization.

2.4. Climate Change and Ecosystem

More than 100 years ago, population from around the world began to increase its consumption of oil and coal because of higher level of global industrialization and resource intense lifestyle. This consumption increased can evidently be seen through the higher usage of lighting, electrical equipments, different means of transport, as well as, factories which started to use more energy-intensive machinery incurring in a increase of carbon dioxide emissions and other greenhouse gases causing an increment in global temperature. In fact, according to the Intergovernmental Panel on Climate Change (IPCC), global average of the temperatures rose 0.8 °C during the twentieth century (IPCC, 2007).

Graph 3: Departures in temperature (°C) from the 1961 to 1990 average



Source: IPCC, 2001a

However climate change has not only triggered an increase of temperature but also has caused other impacts on the ecosystem such as the decrease of snow cover or the rise in 1 to 2 mm of the sea level during the twentieth century. Indeed, because temperature increase, in the northern

hemisphere snow cover has decreased by 10 % compared to the first records observed in the 60 and 70s. In addition, Arctic sea-ice extent had declined by about 10 to 15 % since the 1950s.

On the other hand, temperature increase is causing (and will cause) associated impacts on terrestrial and Aquatic ecosystems, as well as, in global socio-economic indicators. This chapter tries to analyze most important changes in physical parameters and how these changes will affect different socio-economic indicators. However, although there are different studies that allow us to determine the real impact so far, the future climate (as well as emissions) is very uncertain since climate change depends on many factors such as, changes in the economy, implementation of climate change and renewable energies public policies, population growth, among others.

2.4.1. Future Scenarios

In 1990 and 1992, the Intergovernmental Panel on Climate Change (IPCC) developed several emission scenarios in order to establish the impact from climate change in medium and long term. These scenarios have been used extensively for the analysis of climate change, its impact, mitigation and adaptation. In 1995 these scenarios were evaluated in order to include important changes occurred since 1992 in terms of understanding the driving forces governing emissions and methodologies of evaluation. These changes concern, for example, to the carbon intensity of energy supply, income gap between developed and developing countries and emissions of sulfur. Accordingly, the IPCC decided to develop a new set of scenarios; A1, A2, B1, B2.

A1 (Orange) describes a future with a very rapid economic growth: World population reaches its peak in mid-century and declines thereafter, and new efficient technologies are introduced quickly. A1 scenario is divided into three groups which describe alternative directions of technological change in energy system. The three A1 groups are distinguished by their technological emphasis: energy sources fossil intensive (A1F1), non-fossil (A1T) or a balance across all sources (A1B) (where it is defined as not relying too heavily on one particular source of energy, but assuming similar improvement ratios to all forms of energy supply and end use technologies).

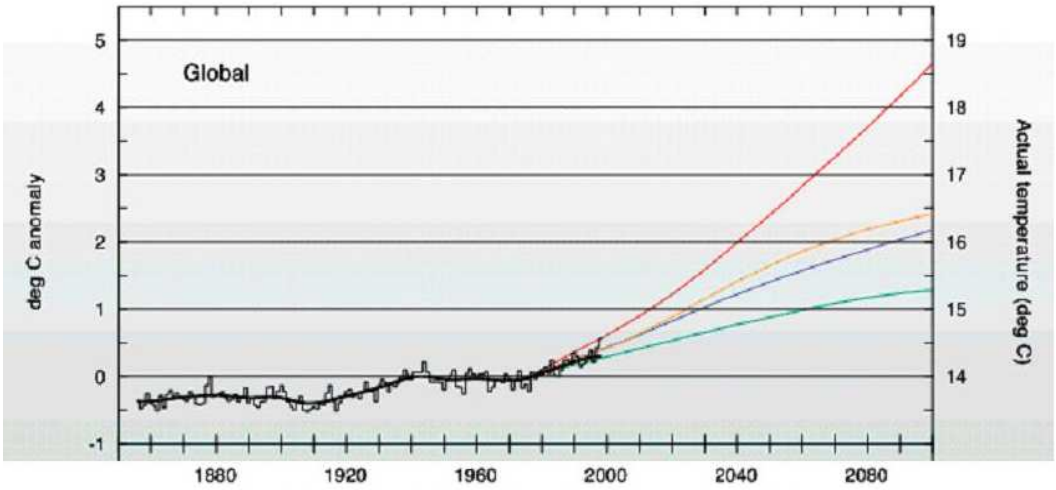
A2 (Red) scenario describes a very heterogeneous world with a continuously increasing global population. Economic development is primarily regionally oriented. Furthermore the economic growth per capita and technological changes are more fragmented and slower than other story lines.

B1 (Green) describes a convergent world with the same global population, reaching its highest level in the mid of the century to fall afterwards. It involves rapid changes in the economic structures

towards an economy of information and services, reducing the consumption of materials and introducing clean and efficient resources.

B2 (Blue) scenario describes a world where the solutions to economic, social and environmental sustainability will come from local countries or communities. It involves a world continuously increasing global population at a rate less than the A2 storyline, with less rapid and more diverse intermediate levels of economic and technological changes than in B1 and A1.

Graph 4: Predictions of the global temperature according to different scenarios



Source: WWF, 2012

According to the chart, all the scenarios have associated an increase of the temperature. This increase is extremely linked to different factors such as the increase in the emissions. In fact, by 2100, the changes in carbon dioxide emissions from energy sources and/or industry ranges from a decrease of 4 per cent (scenario B1) to an approximate increase of 320 per cent (scenario A2). Although, the impact for each scenario will be different, all scenarios are associated with a temperature increase, and therefore an increase of the environmental impact.

However, climate change and the scenarios established not only will trigger a temperature increase. Climate change will impact on different ecosystems causing changes in the cryosphere, see level rise, quality and quantity water, limitations on the agriculture production, forestry and food chain among others. Most of the impacts included in this chapter affect directly or indirectly to banking sector and how the bank actually should address Climate Change in its risk management especially in its investment portfolio. However, impact will depend on the scenario chosen since each one has different considerations and conditions.

2.4.2. Cryosphere

Climate change impacts directly and indirectly on the cryosphere, meaning the earth's elements composed of ice, such as, mountain glaciers and ice caps, floating ice shelves and continental ice sheets, seasonal snow cover on land, frozen ground, sea ice and lake and river ice. A change in the cryosphere influences on the whole Earth system, since it is much interconnected with other parts of the system. In fact, cryosphere is affected differently by climate changes and its interactions. And its main consequences are the following:

- A first very well know consequence is the increase in sea level due to melting ice and glaciers in Polar Regions. Some studies show that both the Arctic and the Antarctic, ice shelves several thousand years old have started to collapse due to warming (Lemke,P., et al., 2007). In addition, temperature rise has also started to melt mountain glaciers such as Alps and Andes (Schwörer, D.A., 1997; Bowen, N., 2002, Laternser, M., et al, 2003, Casassa, G., et al., 2003).

- On the other hand, and possibly one of the less-known consequences of climate change is the direct relationship between ice melting and global warming. When solar radiation hits the ice or snow, approximately 90 % is reflected back into space. As warming ice melts, the inner layers (darker) absorb more solar radiation releasing more heat into the atmosphere.

- Finally, last impact on the cryosphere is the melting of the polar soils. Since these soils storage huge amounts of carbon for thousands of years, once they melt they emit huge amounts of greenhouse gases.

2.4.3. Hydrology and water resources

Climate change is affecting the hydrological cycles and water resources. In fact, any change in our planet water hydrological cycle component alters the entire system since it is a totally dependent cycle. Changes in water amount of runoff, lake levels, groundwater, floods and droughts, and water quality, with observed climate variability, climate trends, and land-use and land-cover varies all the hydrological system. In addition, increase of temperature affects directly to the cryosphere modifying also all the water cycle. Furthermore, increase of temperature can raise evapotranspiration from vegetation and land surfaces and as consequence decreasing the amount of water that gets into streams, lakes and reservoirs.

At the overall scale, there is evidence of a broadly coherent pattern of change in annual runoff, with some regions experiencing an increase at higher latitudes and a decrease in parts of West

Africa, southern Europe and southern Latin America (Milly,P., et al., 2005). Furthermore, some studies show evidence that an increase in temperature intensify the overall runoff (Labat , D.,et al., 2004).

On the other hand, Climate change is also modifying the distribution of river flows, groundwater recharge over space and time and ocean circulation. For instance, in North America and northern Eurasia, climate change is modifying the occurrence of spring peak river flows and causing an increase in winter base flow in basins with important seasonal snow cover, according with local and regional climate warming in these areas (IPCC, 2007). Likewise, an increase in annual runoff is projected in Easter and southeastern although it will be tempered by adverse impacts of increased variability and seasonal runoff shifts on water supply and flood risk, in particular in heavily populated low-lying river deltas (Kundzewicz, Z., et al., 2007). Furthermore, if the extra water cannot be stored, additional precipitation during wet season in those regions may not alleviate dry season problems. In respect to ocean circulation, all the hydrological changes mentioned before, can trigger alterations in ocean circulation such as salinity, freshwater input or intensification of coastal storms frequency among others.

However, changes are not being only about distribution or quantity but also about quality. Water quality depends on many factors such as concentration of salts, ratio of charging, evaporation ratio and so on. Therefore increasing rainfall will affect directly both ground and surface water and consequently its quality. As regards to ground water, increased run off will mean reduction of water infiltration in the soil and in aquifers resulting in higher salinity of the soil (IPCC, 2007).

Last but not least, melting of glaciers in high latitudes will produce flooding and increasing pollution of water bodies especially the surface water bodies. Furthermore, due to increase in concentration of dissolved salts in most bodies of water, fresh water availability for human consumption will decrease. Thus, the water quality reduction can also be explained by the increase of runoff and precipitation because it increases the level of pathogens and water contaminants, since pollutants were originally stored in underground water reserves can be dispersed (IPCC, 2007). Similarly, when drought conditions persist and groundwater reserves are depleted, the remaining waste water is often of inferior quality. This is a result of the filtration of contaminated or saline water from the surface of the earth, the confining layers, or water bodies adjacent that have highly concentrated amounts of contaminants. Therefore rainfall and runoff decrease also result in a concentration of pollution in the water, leading to an increased microbial load in waterways and drinking-water reservoirs (IPCC, 2007).

2.4.4. Marine and Freshwater Biological Systems

The marine system occupies 70 % of the planetary surface and plays a fundamental role in modulating the global environment (Legendre, L., et al., 2002). Climate change is seriously affecting it, mainly, marine and freshwater ecosystems, coral reefs, marine fisheries, lakes and rivers.

Most of impacts observed in the marine ecosystems are being biogeographically such as changes in distribution, phenological, physiological such as changes in rates of metabolism, reproduction, development, photosynthesis and respiration and changes in the species abundance. The evidence collected and modeled to date indicates that rising CO_2 has led to chemical changes in the ocean, which in turn has caused an oceans acidification (Royal Society, 2005). In marine and freshwater ecosystems, many changes observed in the phenology and distribution are related to water temperature increase as well as salinity changes, oxygen levels and circulation. Worldwide, freshwater ecosystems are showing changes in the abundance of organisms and productivity, expansion of distribution area, and phenological changes (including fish migrations) that are linked to rising temperatures.

On the other hand, three main problems have being observed in the coral reef: acidification, storm intensity and sea surface temperatures (Bindoff, N., et al., 2007). Corals, which are microscopic polyps, build their reefs by removing calcium from the surrounding water and using it to build small houses. The shape and the structure are determined by the timing of accumulation (usually for centuries). This process, known as calcification, is sensitive to temperature and acidity. Therefore, changes in both temperature and acidification can hamper the growth. However, both affect differently corals; while ocean acidification directly affects the calcification process of corals (Kleypa. J., et al., 1999), storms affect coral reef directly through the waves or indirectly through light attenuation by suspended sediment and abrasion by sediment and broken corals.

2.4.5. Coastal Processes and Zones

The factors that are impacting more in coastal regions are sea-level rise, anthropogenic geophysical factors, land subsidence and changes in storminess. However, in the future, sea-level-rise is expected to be the main impact due to the difficulty of adaptation. In fact, global sea level has been rising at a rate of about 1.7 to 1.8 mm/yr over the last century, with an increased rate of about 3 mm/yr during the last decade (Church, J., et al., 2004; Church, J., et al., 2006; Bindoff, N., et al., 2007). In addition, land subsidence and changes in storminess are increasing the vulnerability of the coast. During the last years the number of storm-surge has increased causing in some cases disastrous consequences. For example, in Venice, Italy, the frequency of surges has

averaged around 2 per year since the mid-1960s, compared with only 0.19 surges per year between 1830 and 1930, with land subsidence and expanded sea-lagoon interactions (due to channel dredging) playing a greater role than global sea-level rise (Camuffo, D., et al., 2004). All these factors are lead to some changes or impacts on the coasts as well as its development process.

Although all these changes have been particularly relevant in recent years, the most intensive have been the coastal erosion, and changes in coastal wetland and coastal vegetation. These changes have produced (and are producing) important impacts on the socioeconomic trend (which will be explained in more detail in the next chapter) rising the risk in some regions but also the opportunities in others. Thus, these changes are having more impact (and will have) depending on the capacity of each country to adapt itself to these new conditions. However, although impacts are being obvious worldwide such as USA, Canada, Egypt or UK, the most vulnerable and affected countries and communities are being the poorest ones specially in Asia, Fiji and India, because of their lack of adaptation capacity (Zhang, K., et al., 2004, Penland, S., et al., 2005, Taylor, J., et al., 2004, Frihy, O., et al., 1996) and their important economic dependence of coastal regions.

2.4.6. Terrestrial Biological Systems

The Intergovernmental Panel on Climate Change shows, based on predictive models, that the 33 % of current forest area will be affected because of changes in frequency and intensity of fires, water distribution and diversity of wildlife (Dale, V., 2001). The effects on terrestrial ecosystems vary from region to region. For instance, dry subtropical forests in Zimbabwe could decrease about 45 %, while dry Mexico's forests are expected to expand and coverage of wet tropical forests are expected to decrease. In addition, in tropical regions changes in the structure and composition of forests are also expected, because of their sensitivity to variations in water availability and soil moisture. On the other hand, in boreal and temperate forest, temperature rise could increase temporal ranges of growth and reproduction, favoring its expansion toward the poles and increasing the frequency of fires and pest outbreaks (IUCN, 2000).

Changes in climate have a direct influence on the distribution of the species since each species has a threshold of physiological tolerance to precipitation and temperature. Currently this distribution is changing in latitude toward the poles and to higher altitudes. The exchange rate varies between species and within the same species, involving different dispersal abilities (Kleidon, A., et al., 2000, Gian-Reto, W., et al., 2002). For instance, an increase of just 1°C can cause significant changes in the composition and distribution of certain plant populations. In fact, according to the (IPCC, 2002) and (EPA, 2000), it is expected the replacement of the trees associate with mature forest (slow-growing species) for trees and shrubs of rapid growth associated with disturbed areas. In addition it

is also foreseen the distribution of vegetation at higher altitudes moves to at a rate of 8-10 m per decade (Grabherr, G., et al., 1994), causing, in turn, the extinction of some species restricted to mountain tops (PROMAS, 1999) In fact, according to the (EPA, 2000), species should migrate just over 3 miles a year to adapt to climate change, which does not seem feasible for trees whose seeds are dispersed by wind or heavy fruiting trees, resulting in a reconfiguration to less diverse forests. On the other hand, fauna will also be affected. Some studies show that margins of distribution of some species of birds and butterflies also has moved to a higher altitude (Samways, M., et al. 1999). In medium-long term, it is expected to intensify these impacts.

2.4.7. Agriculture and Forestry

Climate change also causes several impacts on agriculture and forestry. In fact, the relationship between climate change and agriculture is bidirectional: agriculture contributes to climate change and climate change, in general, affects adversely to agriculture. However, the impact is not as negative in some regions. Indeed, in the mid-latitude or high regions, a local moderated temperature increase can trigger small beneficial impacts on crop yields while in the low-latitude regions, a moderate temperature increases are likely to cause negative impact on performance. In addition, the most temperature increases, the most negative will be the impact.

On the other hand, probably, one of the effects which will have more impact on agriculture will be in the form of water scarcity. In fact, water scarcity and periods with less water availability will increasingly constrain agriculture production. Therefore, in order to adapt agriculture to climate change, it will be necessary to acquire a new vision of water storage to cope with the impacts derived from more extreme precipitation, higher intra and inter variations and higher rates of evapotranspiration in all types of ecosystem. In fact, extreme weather events (floods and droughts) are increasing (and will increase) and it is estimated that their frequency will increase affecting significantly forestry, food production and food security in regions worldwide. In addition, climate change is having other impacts such as modifications in the plants distribution, invasive species, pests and disease vectors and may increase the incidence and geographic location of, not only many human diseases, but also animals and plants diseases.

2.4.8. Human Health

There are numerous studies showing that human health is being affected by climate change (Istas et al., 2012). It is causing an increased incidence of diseases, especially those that are highly sensitive to temperature and rainfall changes. Furthermore, some vectors of infectious and noninfectious, as well as, changes in the timing of pollen allergenic are being modified because of climate variations. Furthermore, temperature increase is causing changes in the optimum conditions of some diseases,

facilitating the appearance of some of them, such as malaria, dengue, malnutrition and diarrhea, in areas where supposedly they had already been eradicated.

On the other hand, the impact of climate on human health is not distributed evenly in the world. The populations of developing countries, particularly small island states, arid and high mountain and densely populated coastal areas are considered particularly vulnerable due to the their lack of capacities, mainly economic and technical, to adapt themselves to these new conditions and these new diseases. Furthermore, economic limitations are also related sometimes to problems in good governance (corruption in some cases) or capacities to distribute evenly and efficiently cures or drugs to reduce the impact of new infections.

Finally, we cannot forget also that climate change is facilitating the increase of natural disasters. Indeed, it is demonstrated as a major cause of increased natural disasters such as heat waves, floods and droughts (more information in the next chapter) and therefore it is has caused directly an increased mortality.

2.4.9. Disasters and Hazards

During recent years, climate change has effected directly on the frequency, geography and/or severity of any disaster or extreme events such as extreme river floods, intense tropical and extra-tropical cyclone windstorms, as well as, most severe thunderstorms. Different studies show in the decade of 90 the maximum amount of daily observed flow of some rives, was four times higher than observed in the highest flow in 60s. In addition, during the last years, some of the major rivers of Europe have recorded their highest flows. Furthermore, while overall numbers of tropical cyclones worldwide have shown little variation over the past 40 years (Pielke, R., et al., 2005), there is evidence for an increase in the average intensity of tropical cyclones in most basins of tropical cyclone formation since 1970 as well as, in both the number and intensity of storms in the Atlantic (Emanuel, K., 2005).

Moreover, according to the IPCC, there are many other extreme weather events as a result of climate change which will increment human vulnerability and transform extreme events into climatic disasters, these extreme weather events are:

- Increased frequency and severity of heat waves.
- More intense rainfall, causing more flooding in some regions, which in turn cause major landslides, avalanches and increased soil erosion.

- Drier and longer summers, that would lead to increased heat stress in the fauna and flora, crop damage, forest fires and pressure on water supplies.

- Increased hurricane activity, since tropical ocean warming increases the frequency and severity of tropical cyclones.

2.4.10. Socio-Economic Indicators

Climate change impacts on the ecosystem are producing both economic and social direct impacts on the population. Most of these impacts are related to the measures that governments and communities are applying in order to adapt themselves to the new conditions caused by climate change, as well as, mitigate its effect.

Socio- economic indicators have changed in recent decades also in response to climate change. These modifications can be seen in the indicators for energy demand, tourism, insurance costs and changes between the markets for natural resources (timber, fisheries, agriculture and so on) due to new conditions in ecosystems caused by climate change.

In addition it is important to note that, as impacts on the ecosystem, socioeconomic indicators will not be the same for developed countries and developing countries, because of different factors, such as, difference in geographical location, level of dependence on agriculture and the lack of some basic services. Furthermore, many developing countries have its economy based on agriculture and tourism, therefore socio-economic impacts in these countries will be higher in the short-medium-long term. In respect to European countries the socio-economic sectors which will be most affected by climate change are: agriculture, tourism and insurance.

2.4.10.1. Economic and Insurance Losses

Regarding the insurance sector predictions indicate that the overall costs due to extreme weather events such as storms, tornadoes, hurricanes, floods, droughts and heat waves will increase, as result, this will reflect in a higher cost and risk for the industry. Costs associated with insurance losses due to natural disasters has increased in recurrence and severity of these events. For instance in the USA insurance cost has risen from U.S. $ 75.5 billion in the 1960s to U.S. $ 659.9 billion in the 1990s (a compound annual growth rate of 8 %) (UNDP, 2004). However, insurance companies are implementing new measures to transfer risk or mitigate the effects from climate change. The most used mitigation are the traditional insurance against unexpected climatic events covering events whose probability is low but the risk is very high and weather derivatives, covering events of low risk but high probability such as fluctuations in heat, cold or rain in a season set.

It is important to define what is understood as climate derivative in order to facilitate the reader the understanding of the risk; "Weather derivatives are financial instruments whose underlying asset is the weather. It is a contract in a given region and is valid for a set contract period. Contracts of weather derivatives relate a specific event and may be issued under defined climatic variables, taking simples or multiple weather events" (Chantarat, S, et al, 2008). The quantity of pay-off or payment shall be fixed in the contract. This agreement includes the conditions of compensation depending on the climatic results observed and measured, such as precipitation or temperature variations in a given period of time. If final conditions exceeds or are below historical averages and temperatures required in the contract, the buyer of the option may exercise the right to demand payment to cover the risk.

For example: a company that manages an amusement park can be covered with a climate derivative to weather forecasts made by meteorologists saying there will be a season colder than the historical average. The company can forecast that its incomes will be affected by weather and to be assured by means of weather derivative a payoff prefixed per unit of heat lower than expected. This event has a low risk but high probability of occurrence.

Moreover, when a bank or an insurance company, fund or insure a project for any business the presence of these financial instruments is crucial to maintain, or minimize the losses in the rate return of any project.

2.4.10.2. Energy Demand

Energy demand is predicted as one of the main socio-economic indicators that will be modified due to climate change. Several studies have shown that over the last years temperature and solar radiation are changed dramatically, and the current calculations of the climatic data can cause large deviations in the real energy consumptions.

One factor most affected by deviation in energy consumption will be the buildings. "For example, based on 1976 to 1995 temperature data from 3 key UK sites, Levermore, G., et al., (1998) found that the annual mean dry-bulb temperature had increased by about 1°C over the 19-year period, with milder winters and warmer summers" (IPCC, 2007). Such increases in temperature will demand more consumption in buildings. In particular, especially in hot seasons, the energy consumption for cooling will increase according to the new conditions. In addition, houses are rising the consumption of their air conditioners, which in fact are the largest consumers of energy in developing countries (Levine, M., et al., 2007). Therefore, they will require more efficiency and resilience to meet the real demands without increasing unduly the impacts associated with. However, it is difficult to establish the real consumption associated with climate change since people will adapt its future

energy consumption depending mainly on the cost of energy. Therefore, more temperature may not mean more consumption as usual because of the cost of energy will be higher and people will be forced to modify and adapt their level of thermal comfort (Dear, R., et al., 1998; Nicol, F., 2004).

2.4.10.3. Tourism

In general, climate is one of the main factors for tourist when choosing a destination (Aguilo, E., et al., 2005). Optimal temperature changes, as well as, in the conditions of climate, generate changes in locations and in seasons to visit. In fact, different studies show that climate conditions are as relevant for tourist as economic and political conditions, media attention and environmental quality (Maddison, D., 2001; Lise, W., et al., 2002).

The new conditions will demand the sector new marketing studies, as well as, focus on new market niches that allow them to overcome the losses that climate will have in their business. Tourism companies, as well as, their indirectly affected, are required to conduct studies about what will be the future climate scenario and what are the factors more relevant for tourists when they choose a destination. In addition, they must also find alternative tourist attraction since many beach destinations, will be greatly affected by climate change causing an increasing risk of loss of customers.

On the other hand, new conditions allow some regions to become attracted for tourism due to the increase in the optimal conditions. For instance, regions where the current conditions (too cold, or with a few days of sun and beach) do not allow them to attract tourism, because of reduction of these adverse conditions will convert them in optimal regions for tourism. However, these changes on climate do not affect only to “beach tourism” but also “mountain tourism”. Climatic changes will impact on the biodiversity, fauna, flora, accessibility of resources and so on, generating changes in the mountain tourism as well.

2.5. Spain Scenario

2.5.1. Spain Regional Adaptation

One of the main objectives of this study is to show in a real case how our methodology could be applied in order to assess the risks associated with climate change regarding banking sector. Since the Bank choose to implement a real analysis risk to climate change is Bankinter, a Spanish bank operating in Spain, this chapter will try to identify the main impacts in Spain, as well as its vulnerability to climate change.

In 2007, Spain carried out the National Plan of Adaptation to Climate Change which presents the general framework for the activities of impact assessing, vulnerability and adaptation to climate change. Thus, it provides a overall structure where "fit" different evaluations methods depending on the sector, system and region (PNACC, 2006). Therefore, all the administrations and agencies, as well as companies in charge of developing plans or strategies of adaptation, can base their strategies on the scenarios included in this document, as well as, the tools and methods to assess impacts, vulnerability and adaptation to climate change. Since its adoption in 2006 by the Policy Coordination Committee on Climate Change (CCPCC), two reports of monitoring have been developed. The first was published in 2008, and picked up the progress so far developed in the four lines of action: regionalized climate scenario generation and evaluation of the impacts of climate change on water resources, biodiversity and coastal areas. The second PNACC Monitoring Report conducted in 2011 continues the first, picking up the progress made in the previous lines of work and incorporating a number of new lines and actions (more information in PNACC, 2011).

2.5.2. Spain: Direct and Indirect Impacts

Climate change will produce different direct and indirect impacts on the environment, as well as, in the social and economy aspects of Spain. In fact, it is, due to its geographical location and socioeconomic characteristics, the most vulnerable country to climate change in the European Union (thinkSpain, 2012). Thus, climate change will produce different impacts on the ecosystems and the different socioeconomic sectors. The main impacts to consider are: declining water resources and coastal regression, loss of biodiversity and natural ecosystems, increase in the processes of soil erosion, and loss of lives and properties resulting from the intensification of adverse events associated with extreme weather events such as floods, wildfires and heat waves. In this chapter, all the different predicted impacts of climate change are included, with a special attention to those that may affect the banking sector.

2.5.3. Climate in Spain

Spain's climate is extremely varied due to its complex topography and location geography. During the twentieth century, temperatures in Spain increased in a higher magnitude than the global average. In addition, rainfall during this period has tended to decline, especially in the south and the Canary Islands. On the other hand, although the trends of future climate depend on socio-economic scenarios used, (Magrama, 2005) establish the following:

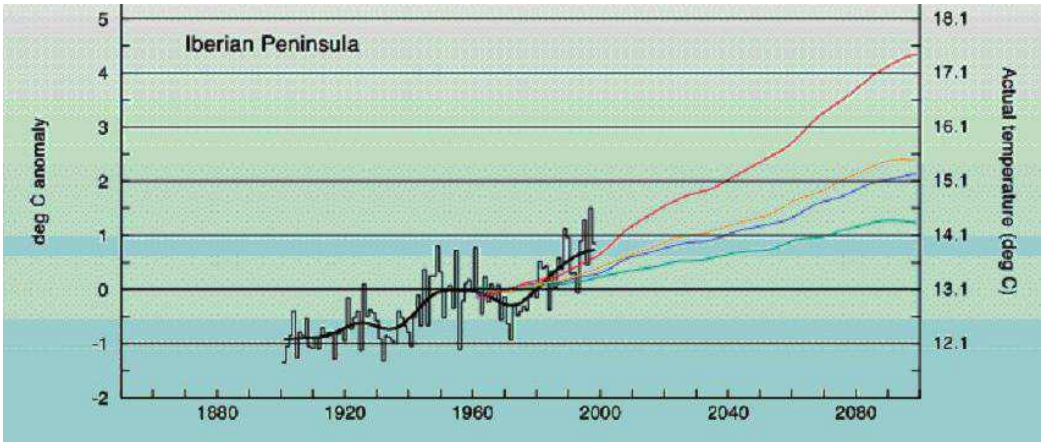
1. Temperature increases. It is projected a temperature increased in the Iberian Peninsula essentially uniform throughout the century, with an average trend of 1.2°C every 30 years

in winter and 2°C every 30 years in the summer for the A2 scenario and 1.1°C and 1.8 ° C respectively for B2.

2. Reduction of rainfall. Changing trends throughout the century are not generally uniform, with notable differences between the global models. However, all the models agree in a significant reduction of total rainfall per year, somewhat higher in the A2 scenario than the B2. In addition, these reductions are greatest in spring and somewhat lower in summer.

3. Thermal increase. The thermal increase projected for the Iberian Peninsula, depending on it is used more or less favorable scenarios (less or more emissions, respectively), is uniform throughout the century, with an average trend of 0.4 ° C / decade in winter and 0.7 ° C / decade in summer for the least favorable scenario (A2 according to the IPCC), and 0.4 ° C and 0.6 ° C / decade, respectively, for the most favorable scenario (B2 in the IPCC).

Graph 5: Predictions of the temperature according to different scenarios in the Iberian Peninsula



Source: WWF, 2012

Finally, and taking into account all the results and scenarios included, it is possible to establish the reliability of each change because of the climate change as follows (Magrama, 2005):

1. Progressive tendency to increase temperatures over the century.

2. Trend to a warming more pronounced, the higher the emissions scenario were considered.

3. Average temperature increases are significantly higher in summer than in winter.

4. The heat in summer is higher in inland areas than in coastal or on the islands.

5. Overall trend to lower annual accumulated precipitation.

6. High amplitude and frequency of monthly temperature anomalies.

7. More frequency of days with extreme maximum temperatures on the Peninsula, especially in summer.

8. For the last third of the century, the greatest reduction in rainfall in the peninsula is projected in the spring months.

9. Increased precipitation in the west of the peninsula in winter and in the Northeast in autumn.

10. Changes in rainfall tend to be more significant in the higher emissions scenario.

2.5.4. Water Scarcity

It is likely that water scarcity is one of the main problems that Spain will face in the following years. The temperature rise, besides the reduction in rainfall will cause a decrease in water input and increased demand of the irrigation systems. In Spain, the sensitivity of water resources to increased temperature and decreased precipitation is very high. However, the impact will not be the same over Spain but it will be higher in southern of Spain. The most critical areas are the semiarid ones, which water input can decrease in a 50 % of the potential resources of the area. In addition, changes in water availability will affect many other sectors and ecosystems such as aquatic and continental ecosystems, animal and plant biodiversity, agriculture, forestry, energy consumption, tourism and human health.

By 2030, a reduction of water contribution is expected. In fact, considering two scenarios, one with only an increase of 1°C in the temperature and another with a 5 % decrease in mean annual precipitation and 1 ° C increase in temperature, a reduction of water contribution between 5 and 14 % is expected. The basins more severely affected will be Guadiana Canary, Segura, Júcar, Guadalquivir and Balearic South. Therefore, in the following years, and considering the new policies, it is foreseen that government and the society in general demand businesses and projects to adapt their consumption to the new conditions.

Furthermore, in short-medium-long term, because of scarcity, governments, and society in general will require projects to reduce demands and reduce losses or inefficiencies. Projects to optimize

water use (demand management), improved water resources system and its management, in particular groundwater and increased non-conventional resources, rainwater storage, inter-basin diverting, desalination and reuse are showed as a very good opportunity for investment. Therefore, if Spain wants to mitigate and indirectly adapt itself to the demand of climate change regarding water, reducing the impact on the agriculture, biodiversity and tourism; projects to promote efficiency, consumption reduction, and losses reduction seem to be key in order to maintain a good well supply of water in a short-medium-long term.

2.5.5. Sea Level Rise

Another of the factors that will impact severely in Spain will be the sea level rise. It will not affect only to coastal areas, but also physical environment aggravating floods, erosion, saline intrusion, loss of wetlands and algae proliferation. In Spain, available data indicate that sea level has already risen from 2 to 3 mm / year in the north of the peninsula during the second part of twentieth century (Magrama, 2005). Thus, future projections forecast that in 2050, the minimum value of sea-level rise will be 15 cm (Abanes, J. et al., 2007). Furthermore, sea level rise will impact directly to tourism attraction since it will modify the coastal areas (see Tourism section).

2.5.6. Biodiversity

Another of the problems related to climate change will be the reduction of biodiversity. Climate variations will increase the number of flora and fauna species in danger of extinction. Some habitats, especially in the south area of Spain, will change their conditions. In fact, some habitats located nowadays in the south of Spain will not be located in the south anymore but they will be located in more altitude areas in the north of Spain. These habitats changes will cause a decrease of species in some areas, specifically those species unable to move into these new habitats more optimal for their survival.

2.5.7. Land Use: Agriculture

Another physical means affected by climate change will be the ground. Soil provides goods, such as food or timber products. Therefore, changes derived from climate change can involve significant alterations in agricultural production or livestock, as well as the need to change land uses in order to adapt the sector to these new conditions. In fact, if Spain is not able to change some land uses, the profitability of livestock and agriculture enterprises may be affected by the harmful effect of high temperature. In addition, this high temperature will affect pests and diseases of both crops and livestock, modifying the timing, frequency and intensity of them. The desertification (currently a 31.5 % of the Spanish surface is seriously affected by desertification (Abanes, J., et al, 2007) will affect greatly the south of Spain.

On the other hand, the two main components of desertification are erosion and salinization. Projections of climate change exacerbate these problems, indeed, the expected impacts of climate change will particularly affect the salinization of irrigated soils and the risk of soil erosion. The impact of salinization will focus on the Spanish regions of drier climate.

2.5.8. Human Health

Perhaps the best known impact on human health caused by climate change is the increase in respiratory disease from air pollution and deterioration of air quality (see Human health impacts). In Spain in particular it could be enhanced diseases transmitted by African population because of not only its proximity but also the similar climate conditions. Indeed, the possible risk would be associated with the new conditions in Spain, hotter and drier, since they would import and facilitate the appearance of these diseases from Africa and subtropical regions. Theoretically, the disease easier to be transmitted would be dengue, West Nile encephalitis, Rift Valley fever, malaria and leishmaniasis; tick-transmitted diseases such as Crimean-Congo hemorrhagic fever, tick-borne encephalitis, Lyme disease, spotted fever and endemic relapsing fever, and those transmitted by rodents. However, the largest and most viable threat would be the establishment of Aedes albopictus mosquito, which would be capable of transmitting viral diseases such as West Nile and dengue. Nonetheless, the real establishment of the mosquito will depend of other factors such as deterioration of the health situation or simultaneous animal or livestock and human reservoirs (Magrama, 2005), (PNCC, 2007).

On the other hand, in addition, there are other problems such as changes in mortality due to temperature or effects of extreme meteorologic events. In addition, and perhaps, one of the new impacts that will come up in the following years around the world (and in Spain in particular), will be the deaths/diseases associated with extreme temperature events, specially the intensification of heat waves.

2.5.9. Energy

Spain is one of the countries that have pushed more for renewable sources over the past years. However, the international Spain's energy dependence is still very high (it imports 80 % of its primary energy consumption, basically oil and natural gas). This creates a huge dependency that, in the case of changes in markets or instability in the supplier countries, increases the risk of access. On the other hand, obviously, this consumption of non-renewable sources causes an increase of emissions and therefore the accentuation of climate change. At the same time, climate change also has a direct impact on energy demands. In fact, a temperature increase raises the electricity consumption during the whole year, and natural gas consumption, in winter. Thus, according to the

forecast scenarios established, warmer winters reduce fuel consumption while hotter summers increase the electric consumption. On the other hand, surely one of the most affecting incidences in the energy generation will be the water scarcity, exacerbated by a reduction in precipitation. It will directly affect hydroelectric power (about 20 % of Spanish Electric mix) as well as thermal and nuclear power plants which need water for cooling.

Spain has developed various plans to promote renewable energy, as well as efficiency such as the Development Plan for Renewable Energy and the Spanish Strategy on Energy Saving and Efficiency. However, considering last cuts in the subsidies to renewable energies, these plans could be affected. One of the main opportunities that come up for banking sector are the investment in projects to promote renewable energies since it is one of the best solution to reduce climate change effects. At the same time, since water will be scarcer in medium-long-term, the investment in projects to promote renewable energies, as well as, the projects to promote a less consumption of water, are expected to be very profitable.

2.5.10. Tourism

Tourism is one the most important economic sectors for Spain (representing approximately a 10 % of the GDP), so the affectation by the climate change can cause an important effect on the Spanish economy. Furthermore, climate is one of the main factors to attract tourists to Spain. At the same time, since the Spanish tourism is based on sun, beach and mountain, and the fact that both typologies of tourism are linked with climate, it is essential to take into account new weather conditions in future projects in order to assure the tourism profitability for the country. Some important factors which can interfere with the tourist sector in Spain due to climate change impacts includes:

- First, the rise in sea level will impact on tourism prominently (the coast produce about 80 % of tourism in Spain which represents an 8 % of Spanish GDP) since it will modify or remove some beaches, as well as, some infrastructures.

- Second, higher temperatures could cause the shift in tourist preferences from regions or seasons with more favorable conditions.

- Third, one of the main constrains for the tourism development will be the availability of water. It will reduce the possibility of some areas to support a high demand of tourism, reducing the limitation of investment or demanding too high investments for the tourism sector.

In order to assess these issues, it will necessary to develop new tourists plans and strategies including possible future changes in these variables in order to take into consideration these new conditions to develop tourism in a sustainable and optimal way. Thus, this may generate new business opportunities, since for certain areas seasonality may disappear.

Furthermore, in order to find solutions to these impacts and identify the actual relationship between real variations of climate change and tourism, it is essential to create indicators to analyze the areas and tourist products in relation to climatic variations and trends. One example of it is the creation of Climate Index for Tourism (CIT) that captures weather information relevant to specific tourist activities in a particular location. Using this information, and the different variables used by tourist activities, such as humidity, precipitation, wind, visibility, the tool detects how many days the conditions will be acceptable, unacceptable, or ideal for a particular tourist activity. Therefore, analyzing this index, and consulting the website (http://cliturmed.uib.es/) is possible to determine the trend of optimal days to carry out different tourist activities, which indeed will decrease rapidly in medium-long term.

2.5.11. Insurance

Another Spanish sector affected by climate change is the insurance sector. The studies conducted so far are focus mainly on the study of increased accident rate related to floods, storms, frost, hail and drought (ConsorcioSeguro, 2011).

In Spain, there is an Insurance Compensation Consortium which aims to compensate for losses caused by extraordinary events, including climatic risks. The results show that since 1971 to 2010, compensation for flood and atypical cyclonic storms are increasing. However, it is difficult to establish the direct relationship between climate change and these effects since there are an increasing number of insured, as well as, a higher volume of capital insured. Spain, in particular, is very exposed to numerous and dangerous events, which may bring a larger bill to be paid, such as, the presence of storms and flooding events. Moreover, it is expected that insurance relating to damage to property, industry, engineering and fire will be the most affected.

Otherwise, perhaps one of the sectors most directly affected, in addition to the services sector, is the agricultural sector. According to the results obtained by Agroseguro, the Spanish Association of Agricultural Insurance which aims to managing the agricultural insurance system, eastern half of the peninsula is confirmed as the most sensitive to climate changes because of its high exposure to climate and weather, and the high concentration of sensitive crops to these variables. In addition, insurance companies, in order to adapt themselves to these new dangers, vulnerabilities and economic value cost, are continually changing and establishing new insurance conditions and covers.

Thus, they are trying to detect the effect depending on each typology of agricultural product since, for instance, the capacity of adaptation of an olive is not the same than a tomato.

Therefore, it is highly necessary to provide tools to insurers to predict or estimate the effects of climate change to reduce risk and losses, as well as, to find new opportunities and solutions for agriculture and insurance sector.

2.5.12. Coastal Areas

Spanish coastal system is very sensitive to climate change since it is a highly dynamic system, with a high spatial and temporal variability and fragility. The system will be affected by modification in waves (height and direction), wind, atmospheric pressure and average sea level. In Spain, the main problems of climate change in coastal areas will be changes in frequency and / or intensity of storms, as well as the rise of sea level. However, impacts will not be same around Spain. According to forecasts, results show promotions of about 50 cm or 1 meter in the most pessimistic hypothesis for late 21 (Magrama, 2005).

While these impacts appear to be in a long term, impacts can be observed in short-medium term. For instance, a rise in sea level will cause an increased erosion of the beaches with a reduction in the total useful floor area or displacement thereof. The retreat will depend on the specific characteristics of each beach and the level of anthropogenic changes for adaptation. In general, scientists assume that for each inch of vertical rise in sea level, sea erosion progress is one meter horizontally (Bruun Rule). Therefore, setting the stage of 0.5 m, this increase in the eastern Cantabrian might cause the removal of 40 % of beaches, if there is not an increased supply of sand (natural or artificial) to those beaches. However, the current estimation is not very accurate since it should include variations in pitch and intensity of wave and tide forecasts.

On the other hand, in general, the most vulnerable areas include coastal deltaic areas, beaches, coastal lowlands, estuaries, cliffs and soft. Among them, beaches and coastal lowlands will be the most affected by climate change. In addition, according to the Magrama 2005 “In the coastal lowlands, deltas and coastal wetlands for agricultural use areas or constructed in the vicinity of estuaries or coastal floodplains, the hypothetical rise in level of the sea could mean a flood of thereof”. In the eastern Cantabrian could mean flooding of lowland areas estimated at 23.5 km^2, while in the Mediterranean and the Balearic Islands, most threatened areas apart from delta (Ebro and Llobregat), will be the Manga del Mar Menor (20 km), lagoons in Cabo de Gata (5 km) and the Gulf of Cadiz in Doñana Coast (10 km). Furthermore, in 2050, the maximum height of flooding along the coast, generated mainly by the increase in the average level of the sea, is expected in Cornice Galicia and North of the Canary Islands while the minimum is expected in the Gulf of Cadiz. Thus, it

is also expected a general beaches recession throughout the coastal zone. In particular, the Cornice Galician is predicted as the maximum backward, the zone of the Gulf of Cadiz and the Alboran Sea is expected as a medium, while the north Area of the Mediterranean Coast is expected to have a minimum setback.

Therefore, these changes will have significant changes in major socio-economic sectors in Spain as well as major impacts on ecosystems in areas such as natural parks as valuable as Doñana or Cabo de Gata. As a recommendation, in the future, when promoting projects and strategies will be important to establish the possible scenarios and risks associated with such changes, since any changes will interfere directly, not so much on infrastructure itself, but in the conditions and environment to develop any economic activity.

3. How to assess the Risk

3.1. Climate Change and Risk Analysis

In the previous chapters we clarified how climate change is happening in our close surroundings and how it is already affecting the aspects that are important for both people and businesses. Consequently, it appears quite clear that unless the risks related to climate change are managed appropriately also in a company strategy, they will increasingly impact business performance in ways and circumstances that decision makers are not ready to deal with.

The concept of risk traditionally means that there are potentially negative consequences to wrong choices about internal processes or external factors, which may have impacts on business activities and overall performance. Usually an analysis tends to estimate the significance of those potential impacts, meaning their magnitude or capacity to undermine finally the success of a project or operation. In risk analysis, another concept is equally important: it is the concept of uncertainty, which refers to the fact that it is hard to predict what will happen in the future: since a risk is about events or circumstances which we do not know if, how, and when will happen, it is important to consider the probability of the risk to occur.

Traditionally, "choices" is the key word. As a risk is attached to specific facts or occurrences, a decision maker has often the freedom to choose if embracing the risks related or not, when taking a decision about a project or a strategy to achieve business objectives. However, in today's complex and interdependent society this capability to rationally choose can be drastically reduced. Nowadays with so many variables playing roles in the socio-economic system, the level of uncertainty is extremely high, and also the possibility to be affected from uncontrolled or unexpected circumstances is more consistent. The cause – effect approach is not sufficient to drive decision making in complex systems.

For such reasons, no business activity can be assumed being immune to the threats deriving by a changing climate. Directly or indirectly, every industry will pay the bill and will need to adapt, better if before competition. Yet many sectors still consider that risks presented by climate change are issue-specific, and consequently they believe to be relatively not exposed to problems. The financial sector for example seems to underestimate its contribution to the global warming, and its capability to influence mitigation and adaptation. This could be eventually accepted considering a direct operational perspective: obviously the emission contribution of banking sector holds less relevance compared to other energy intensive industries. However such consideration does not apply if we consider indirect contribution through financing. Being the engine of the economy, the

financial sector become extremely important to promote mitigation and adaptation to climate change, since it can adopt more stringent and eco-friendly frameworks to allow credit accessibility. In addition, the financial sector may tend to believe that its products and services are also immune to the consequences of new climate patterns. Actually there is no allusion about climate change related risk on international financial sector agreements such as the Basel III promoted by The Basel Committee on Banking Supervision (BCBS), which is a regulatory framework to be incorporated in national law that recommends on banking laws and regulations in order to define international convergent standards on banking operating.

By contrast we consider that every organization, no matter the sector, to plan for a successful future cannot set aside one of the biggest human challenges ever. As an outcome of our efforts we wish that the economic environment will be featured by activities and investments that are more climate resilient or can better overcome the barriers advanced by the changing conditions. As the International Financial Corporation warns, climate change "is already altering the availability of and demand for resources, supply and demand for products and services, the performance of physical assets, and the need for innovation. Failure to consider climate change in investment strategies can undermine projected financial returns and affect the non-financial risk management of institutions, particularly on development, environmental, and social issues" (IFC, 2010). Consequently, only the organizations that will embrace proactively a climate change risk management strategy would eventually reduce the probability to suffer from impacts. As a starting point, in its decision making process a company should at least ask itself: What are the risks for our business due to the effects of climate change? Which ones may have the greatest impact on the business performance? Are we ready do deal with them?

To answer such questions, it is necessary to:

1. Identify the likely risks for the sector that can be intensified by climate change, and eventually the new risks;

2. Have a look at what most the company success depends on, meaning understanding the business model and the value chain;

3. Understand company's relations with the effect of climate change;

4. Assign a procedure to prioritize the risk.

3.2. Risk Identification

Climate risk assessment and management can be conducted using a classic risk-based approach which every organization is familiar with. Actually we believe that most of the risks that will be considered in the practical application of the analysis that follows are already included in standard risk management frameworks. Understandably, however the criteria to estimate the relevance of such risks need at least to be reviewed and enlarged. During the risk identification phase we do not pursue a new different mechanism to complement the existing ones, we rather aim to integrate the climate change perspective in what the companies already face. It is important to remark that climate change will alter existing threats or opportunities, apart from creating new ones.

Consequently, when dealing with the financial sector specifically, we regard traditional issues as credit or financial risks regarding debt financing and equity investments, among others. The mission here is to enable the reader to understand how and to what extent climate change is altering those risks. Connecting the dots assumes great importance to allow strategic decision-making: a financial institution needs to know the parameters on which to rely when assessing the feasibility of a future investment, or the new conditions which may lead a client to default.

Other aspects of the risk analysis approach are quite new for the financial sector. For example reputational risk deriving by the public perception that an institution is failing to contribute to climate change mitigation and adaptation may undermine a company public acceptance and operational performance, overall considering the societal raising awareness regarding climate-related issues and the minimum trust levels toward banking sector after the financial crisis we are still experiencing.

To give the reader a clear picture of the climate risks faced by financial organizations we adopted approximately the classification suggested by the IFC, considering 4 main risk categories:

1. Credit and financial
2. Strategy
3. Operational
4. Legal and Regulatory

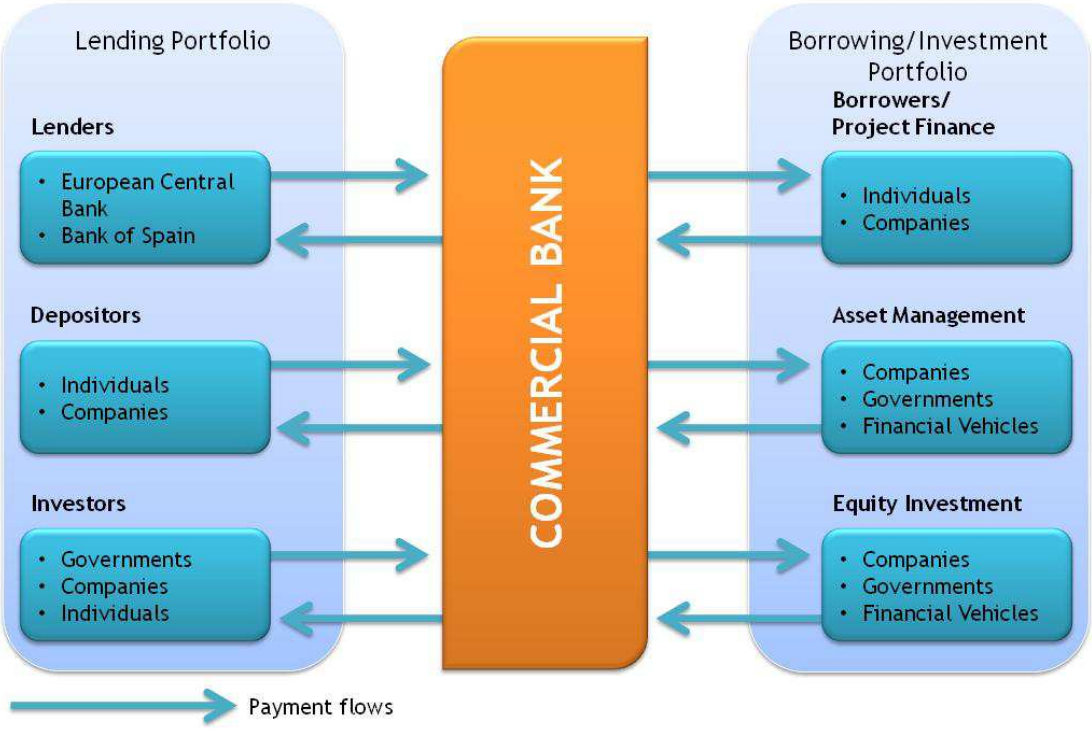
Later on the analysis we will provide and extensive description of every single issue considered relevant for our purpose on climate change integration into risk analysis.

3.3. The Business Model and its Relations with Climate Change

How can a company integrate a climate change perspective into the core frameworks of management as well as into risk assessment practices to guide its business strategy? The interdependence of a company and climate change can be analyzed with the same tools that strategy global leaders as Michael Porter created to analyze competitive position and inform business model. Thanks to a value chain analysis an organization can break down all the components of its value creation, designing an inventory of problems and opportunities that need to be investigated, prioritized, and addressed, from an inside-out point of view. By analyzing what a company depends on and what are the outputs of activities, a company in practice will be able to identify where climate change is likely to have an impact, and also where the company can play an important role on promoting mitigation and adaptation.

Obviously the banking sector is a wide environment and it holds deep differences inside. A national central bank does not face the same problems as an investing bank for example. Nonetheless the financial sector basically thrives on the same superior principle: being the set of financial intermediary institutions between the borrowers and the lenders of an economy. Those who create surplus of resources are the lenders, the ones instead who need financing are asking for loans as a borrowers. In the most simplistic way, a bank value chain is composed by the lending portfolio and the borrowing portfolio. Here it emerges clearly how climate change can be affected by, as well as it can affect a bank performance. Depending on the decisions the management does in relation with its portfolio, it will absorb indirectly the consequences that the portfolio will suffer from. At the same time, when lending money, a financial institution assumes great power to influence borrowers' behavior. The considerations regarding a financial institution portfolio become extremely important when implementing a risk assessment, and they will drive evaluation in any specific risk the planner analyses.

Graph 6: Payment flows to and from a commercial bank



Source: own graph

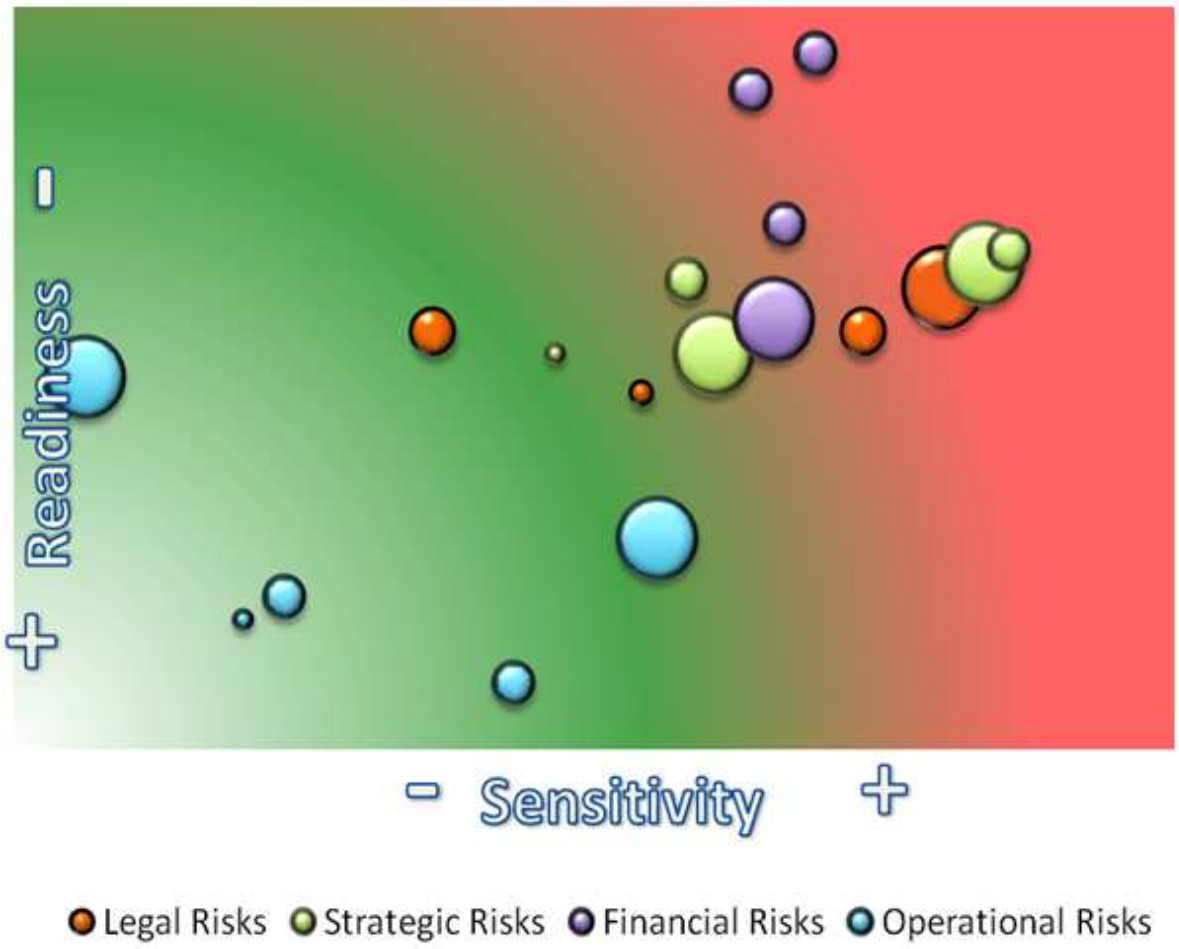
3.4. How to prioritize the Risk: the tridimensional Matrix

Once we have identified every most likely risk as well as the assumptions and reflections rising from the interconnection between a company value chain and the effects of the changing climate, the risks need to be prioritized in order to enable the decision maker to take the most strategic action. As we stated above, risks are potentially negative consequences to wrong choices made internally or externally, which may have impacts on business activities. Consequently, the objective of a team that undertakes a risk analysis is to appraise measures that drive the company to be resilient from internal wrong choices and external events. Resiliency refers to the capacity of a system to withstand changes or pressures. In a business it means that performance is maintained sound along time, no matter what occurs outside, or regardless of bad isolated strategic choices. Resiliency looks like an inspirational objective which every organization aims to, it is something that perhaps is never attainable, but the company can continuously close the gap between it and the current state, eventually reaching it in the long term. In a word, the concept can be assumed to be as part of the company vision.

According to such a reflection, the risk analysis assumes the function of a baseline assessment, with a future outlook about a climate resilient business in accordance to a successful and sustainable vision. By estimating to what extent a company is vulnerable today in reference with climate change risks, we want to inform the steps to follow in order to permit the narrowing of the gap toward the achievement of resiliency, which actually holds the opposite meaning of vulnerability. The literature on climate change considers the concept of vulnerability as an aggregation of quantitative and qualitative factors to estimate the climate change risks for countries. For example, the Global Adaptation Index (Gain), created by the Global Adaptation Institute, a non-profit organization guided by a vision of building resilience to climate change, defines vulnerability as the exposure to climate related hazards, sensitivity to their impacts, and the ability to cope with those impacts (adaptive capacity). It aggregates 24 indicators that measure them in relation to well being fundamental factors such as water, health and infrastructures among others. In brief, exposure analyze how much a region is impacted by physical effects of climate change, the sensitivity functions to see how the socio-economic system of a country is responsive in relation to a change in the climate conditions, and finally the adaptive capacity refers to the ability of economy and society to adjust to stresses related with climate change.

For a company context we adopted approximately the same rationale, but in addition we still assign remarkable importance to the possibility of mitigation, and we keep in mind also the uncertainty, or in our case the probability for the risk to strike the sector. As mentioned above, we assume that climate change is already impacting, but from a private sector point of view, which is considered by most the main driver of a carbon intensive economy, we believe that it is very important to understand if companies are still part of the problem or are already on the side of the solutions. To analyze the risk for a company then it is fundamental to assess if they have mitigation strategies in place before eventual adaptation measures. And here we can gather another clue to estimate if a company integrate climate change into strategy: a proactive company understand that it needs to urgently correct the errors of the past in order to avoid further stresses for society and the environment, on which the company rely to drive its performance.

Graph 7: Risk Matrix



Source: own graph

Matrix components and evaluation

Size of the bubble: It represents the overall probability of the risk to strike the sector, or to be intensified in magnitude, in relation with the occurrences originating from climate change. This dimension assumes particularly importance when a planner is about to properly prioritize risks considered of the same relevance. It deepens the analysis including the factor of "urgency to respond", estimated between risks having similar scores of Readiness and Sensitivity. A risk can actually be in the danger zone, yet if others at the same level are more certain to occur, they require priority of action, as the company finds itself more likely to have its performance negatively affected.

To estimate such factor, a qualitative reflection carried out by the focus team is suggested. It involves extensive knowledge and expertise regarding the sector in question in relation with the specific risk and climate change implications, so that we do not consider practical to set general criteria that work for every risk category. More simplistically, after group discussion we consider opportune to assign the bubble size which reflects our common understanding of the risk, according to the following metrics.

Table 1: Risk Metrics for Probability

Score	Probability
Very likely	> 75 % probability
Likely	> 50 % probability
Unlikely	< 50 % probability
Very unlikely	< 25 % probability

Source: own table

Readiness (y-axes): we aggregate criteria in order to assess the capacity of the company to deal with the risk and the capacity to respond to its eventual impact. This aspect can inform the analyst about the maturity of a business in relation with climate change issues. In addition, it also inform about the capacity of a company to be proactive and consequently strategic: by preparing to address climate change issues a company assure integration of long-term success´s factors into core operations.

Once criteria have been qualitatively analyzed thanks to an exhaustive description of evidences that drive evaluation, the focus team gathers to give a final pointing to the company readiness in relation to the risk. In order for the evaluation to be coherent along the whole analysis and to enable a fair but clear visualization of the matrix, the following metrics are applied to estimate a final unique pointing for each risk:

0 - Totally oblivious to Climate Change. According to the criteria analyzed, the company does not consider climate change having a relation with the risk nor with the company performance, consequently no actions or measures are in place to avoid, mitigate, or adapt to the risk. Managers and leaders miss to fully understand what are being the causes of climate change and its consequences to society and the economy, so that the business direction is not able to find out how it eventually contribute and how it can plan to adequately respond to the risk on the eventuality that climate change cause it or make it more intense.

1 - Awareness of Climate Change. The company is aware of the physical issues that are likely to occur in the locations in which it operates, but it struggles to recognize the links between operational performance and climate change. The company tends to overlook in the strategy proposition the long term trends involved with a changing climate, as demographics and mobility, energy security, food supply, and resource availability among others. It does not consider direct implication to the causes, neither the possibility to remedy or adapt. Consequently the actions and measures toward avoiding, mitigating, or adapting to the risk are moderated and poor, motivated mainly by mandatory regulations. A broad appreciation of the core climate change implications in relation with the risk is not taken into account in the business decision-making. Management and workforce can be considered having a basic knowledge of some of the issues, but in general the competences to apply this concept to specific activities are missing.

2 - Application. The company undertakes measures and actions which inform about its ability to supplement with practical response the basic knowledge of the issues that climate change is likely to bring in relation with the risk. The management and the workforce in general hold basic competence to apply knowledge to specific activities and decision-making. Actions are taken when evidences of short-term beneficial impacts are identified, and the company is attentive to what competition is doing regarding the issue. Anyway the company does not fear particularly the direct and indirect climate change effects on business performance. The driver of action is still the concept of return for shareholders which are by far the most important group of stakeholders. Rather than from a risk prevention strategy, the company response is directed to minimize external reputational pressures. Punctual actions often do not relate with each other or with the overall business strategy.

3 - Responsible. The organization holds consistent understanding of issues related with climate change and it is increasingly considering possible implications that the specific risk in question has for the business performance, even if a systematic approach to deal with climate change risks is not in place. The management tends to have a long-term vision when planning for business expansion, so that it is well aware of trends which will develop as a consequence of climate change. The company is increasingly taking responsibility for contributing to mitigate and adapt to climate change, yet more participation and integration within departments and business units is necessary to bring effective results, tangible for society and the business itself. Attentiveness to competitors in relation with the risk is complemented with dialogue with stakeholders that may help to better understand the proportion of the risk and its perception in society with reference to the sector. The dialogue is supposed to grow along time and there are relevant people inside the organization willing to integrate it in the decision-making process.

4 – Integration of Climate Change into Strategy. The organization holds an in-depth understanding of the issues relating with climate change, its causes and the triggers to develop strategies to address what is material for the business and the overall society in which it operates. Expertise in climate change and related topic is treasured inside the organization, allowing it to be embedded into the business decision-making process, which also benefits from active stakeholder engagement. The integration of such expertise has produced a remarkable strategy to respond to challenges that the risks brings to the business performance, and the climate change strategy is a firm pillar of the company value creation. The risk management related to climate change extends outside the walls of the organization, since the leadership understands that the long-term success of the business depends on the enhancement of multiple capitals such as environmental and human apart from the financial. Workforce feels active and empowered to contribute to climate mitigation and adaptation, and fully understands the benefits. The organization can be considered a leader in the sector and an example of best practice when dealing with the risks.

Sensitivity (x-axes): we aggregate criteria to estimate the company exposure to the risk, to which extent a company performance is sensitive to the socio-economic consequences of climate change. Sensitivity depends on conditions that define the importance of the risk for the company and its surroundings. It means that the composition of the business model, as explained above, is essential here. In addition also physical and socio-economic effects on the location where the company operates are extremely important.

As for the Responsiveness evaluation, once criteria have been qualitatively analyzed thanks to an exhaustive description of evidences that drive evaluation, the focus team gathers to give a final pointing to the company Sensitivity in relation to the risk, utilizing the following metrics of appraisal.

0 – Very High. The location in which the company operates is already suffering from extended physical, economic, and social impacts deriving by climate change, which are supposed to worsen in the future. While authorities and private sector are failing to see the connection between climate change and the situational context, and to respond to it, society is increasingly aware of consequences. Institutions do not recognize climate change as being among the top priorities regarding human challenges. National and local response is not existent to effectively adapt to the consequences, while individuals behavior is not changing nonetheless the perils they are aware of.

Internally the company relies on a non-diverse portfolio, which is also involved with sectors that are already suffering or supposed to suffer most. Equity investments have been made without any

strategic consideration about the implication of climate change with the risk in question. The company can be easily indirectly connected with the main drivers of global warming.

1 - High. The location in which the company operates is starting to be affected by climate change, and its economy is could be consistently exposed to changing climate patterns if prompt adaptation is not provided. Tangible results are already evident on society, which fears the intensification of impacts and expects punctual response. Although plans are in place, authorities and the private sector are still failing to deliver the right means to adequately mitigate and adapt, or the process in general needs further efforts to be really effective. Internally the company is featured by climate - exposed portfolio. In addition also the indirect contribution to global warming though project financing could be consistent, meaning that the risk in question was off due diligence.

2 - Medium. The location in which the organization operates is : a) highly exposed to changing climate patters which are affecting the economy and the society, but infrastructures, public and private response may indicate that sufficient resources are deployed to adapt the economy; b) infrastructures, and public sector response are poor; companies show little or not sufficient interest to climate change strategies and policies which may help reduce the risk. Nonetheless, location is not highly exposed and the economy is not expected to extensively suffer from the risk deriving from climate change.

Internally the company is featured by climate - exposed portfolio. In addition also the indirect contribution to global warming though project financing could be consistent, meaning that the risk in question was off due diligence.

3 - Low. The location in which the organization operates is : a) highly exposed to changing climate patters which are affecting the economy and the society, but infrastructures, public and private response may indicate that sufficient resources are deployed to adapt the economy; b) infrastructures, and public sector response are poor; companies show little or not sufficient interest to climate change strategies and policies which may help reduce the risk. Nonetheless, location is not highly exposed and the economy is not expected to extensively suffer from the risk deriving from climate change.

Internally, the company is featured by a diversified portfolio, which makes the organization able to absorb the risk even if part of the portfolio is highly affected. The risk in question, even if emphasized by climate change, has systematically being considered when performing due diligence about financing.

4 – Very low. Societal awareness of climate change is high, and it has led to increasingly changing behavior. Regardless of the level of exposure of the location, authorities have placed measures to effectively mitigate and avoid climate change, and to enable the economy to be more resilient to the risk in question. Private sector faces no barriers to deal with the risk and actually good practices of risk avoidance, mitigation, and adaptation can be identified widely.

Internally, the company is featured by a diversified portfolio, which makes the organization able to absorb the risk even if part of the portfolio is highly affected. The risk in question, even if emphasized by climate change, has systematically being considered when performing due diligence about financing.

Risk categories weighting: this additional feature, which further helps the analyst to prioritize the risks, allows to arrange the importance level for each of the risk categories and also to adjust slightly among risks of the same category. Its definition is quite flexible, as the importance of the risk category depends on the sector and also on the location in which the company operates. For example, for a material-intensive manufacturing company located in emerging markets the operational risk assumes more importance since processes and infrastructures are fundamental for the business success. Rather, for the financial sector involved in mature markets, other aspects of the business value creation become more relevant, as for instance the capacity to respond to a reputational crisis. In addition, it involves an extended process of consultation with risk experts, which we deployed thanks to the collaboration of Bankinter personnel. After several meetings and careful team's reflection, we agreed to assign an "average weight factor percentage" for each risk category according to the importance it reflects according to our specific case:

- Credit and financial risk 36 %
- Strategy risk 30 %
- Legal and regulatory risk 24 %
- Operational risk 10 %

It means that we consider for the financial sector, and specifically Bankinter, the financial and strategy risk being the most important ones compared with other categories. In addition the consultation process with Bankinters' risk department informed that among categories we can slightly differentiate to better reflect the reality of the Bank context. Consequently, due to the Bank business model and positioning strategy, risks as "default" or "integrated reporting" assume a subtle additional relevance. Further details of the weighting are provided in table 2, page 138.

Our decision is also based on the reflection regarding the fast changing business model that mature markets have experienced in the last 30 years. As shown in a study published by Ocean Tomo LLC, a leading intellectual capital firm which counts on expertise related with rating, valuation, and risk management among others, nowadays more than 80 % of the equity market value of a company in the U.S. is given by intangible assets. Analyzing the market value of the S&P 500 companies during the last quarter century the firm has been able to demonstrate how it has deviated greatly from their book value. This difference indicates that physical and financial accountable assets reflected on a company's balance sheet comprises less than 20 % of the true value of the average firm, assigning to the intangible management the most important role regarding business success (Ocean Tomo LLC, 2010). The same trend is also reflected in Europe and in China.

When we refer to intangibles we consider all the business' features that are not possible to be perceived or "touched" immediately, but that need to be connected with something else in order to create tangible value. We can mention the organizational culture, the innovation, the identity, the reputation, and the knowledge, for instance. They come from the management of the social, human, environmental and organizational capital. Since the business model of a company should align intangible assets with tangible ones to create value, nowadays a visionary and strategic approach is fundamental to outperform competitors. Consequently, it makes sense to assign one of the most important weighting factor percentage to the strategy risk. At the same time, given the sector and the actual global financial crisis, it is undeniable that credit and financial risks occupy nowadays the top position for obvious reasons.

4. Risk Analysis

4.1. Credit and Financial Risk

Banks will be hit by climate change right in their core business, if they do not address the associated risks in the right way it will affect the value creation processes, finally undermining the business bottom line. They need to review how they operate and integrate additional measures to avoid losses. As the impact of banks on the climate is mainly indirect they should consider the emissions their investments have. However, until now none of the banks calculated the emissions related with its investments decisions (Cogan D., et al., 2009).

Some financial institutions like HSBC Corporate, Investment Banking and Markets (CIBM) launched the HSBC Global Climate Change Benchmark Index in 2007 and offer a climate change fund to profit most from the upcoming changes. In the same year UBS "launched five different climate-specific products, including several indices, structured products and investment funds" (Cogan D., 2008).

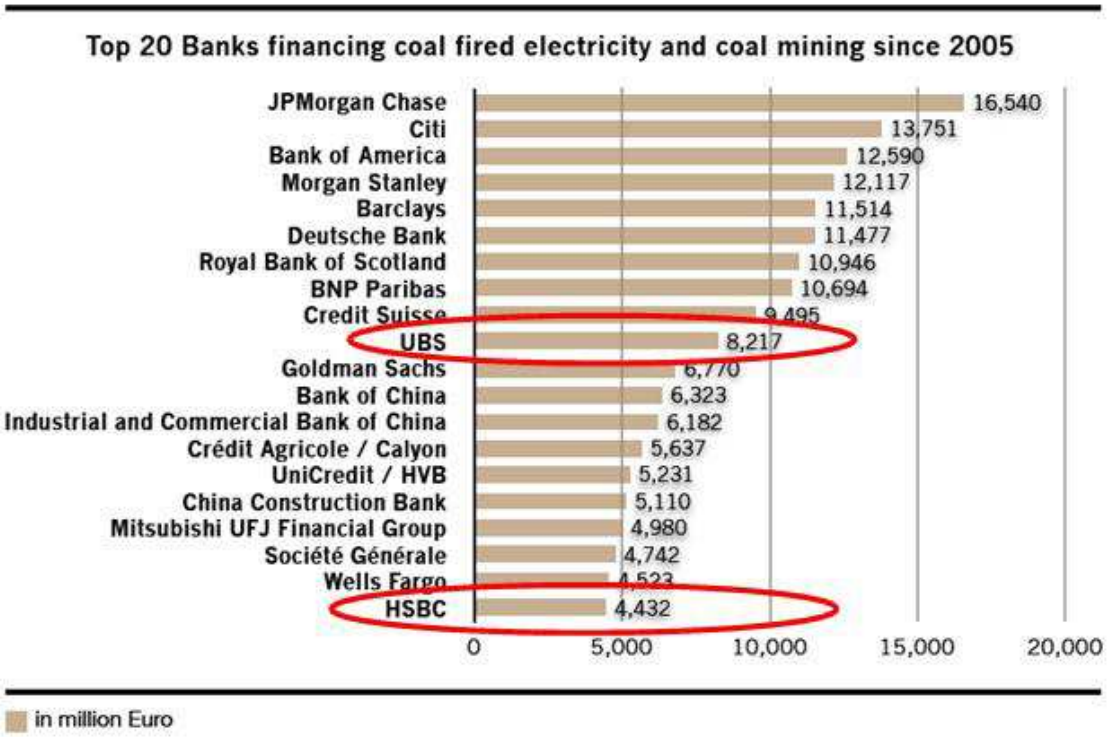
On their website these banks clearly state their commitment and it seems like the banking sector is aware of the threat and takes conscious actions to avoid the worst impacts of climate change:

- HSBC: "HSBC will proactively support the transition towards a low carbon economy, recognizing that this will take time" (HSBC, 2011).

- UBS: "Addressing climate change on a global scale will require an unprecedented mobilization of private sector investments. As one of the world's leading financial firms, UBS seeks to help clients address risks and take advantage of opportunities presented by climate change and the transition to a low carbon economy". Kaspar Villiger, Chairman, UBS AG (UBS, 2012).

However none of the big banks worldwide clearly states not to invest in carbon-intensive projects (Cogan D., 2008) and another study reveals that HSBC and UBS are helping to keep the fire on and heavily bankroll coal fired electricity and coal mining (urgewald, et al., 2011). This reveals a huge gap between their commitment and their actions.

Graph 8: Top 20 Banks financing coal fired electricity and coal mining since 2005



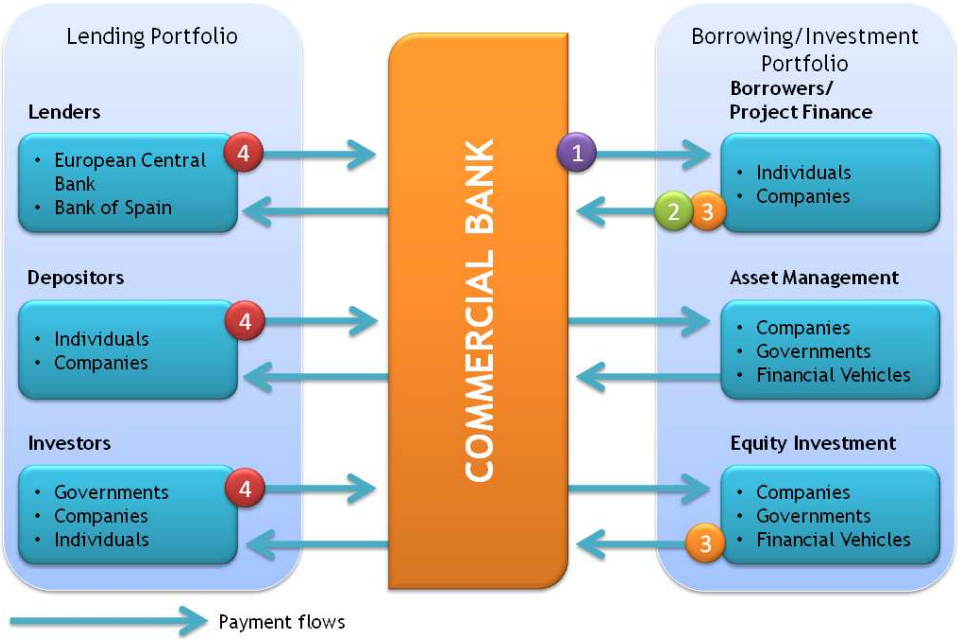
Source: urgewald, el al., 2011

Assessing risks is in the core business of banks, as they want to have a high repayment rate of the money they lend. Under normal circumstances the credit risk can be defined as the risk the financial institution takes while lending money to a borrower. The borrower could be unable to pay back and this affects the bank's balance-sheet directly (IFC, 2010). One purpose of a financial institution is to disburse money. The financial risk increases if the institution is not able to do so because of reduced liquidity due to a value decrease of its investments or other assets, aggravated financial funding or a loss of value of financial instruments due to market changes (IFC, 2010).

Both risks are already taken into account in the due diligence process of financial institutions, as they check very carefully to whom they give a credit or not. However these quality checks are mainly related to strategic and operational risks and are not linked to climate change. Hence there is a need in the financial sector for an approach to manage climate change impacts in their portfolios. To be able to control the climate change risks for banks they have to be defined and measured. In this section credit and financial risks will be analyzed in association with climate change, divided into four subcategories: Terms of debt, default risk, return on investment, and the financing availability.

In order to see these risks for a financial institution derived from climate change clearer, it is helpful to have a look at the payment flows to and from a commercial bank in a simplified way.

Graph 9: Payment flows to and from a commercial bank



Source: own chart

One the left side are the financiers of the bank who enable the bank to work with and dispense the money to the borrowing and investment portfolio. The money flows from institutions and individuals who commit money to the bank to individuals, companies and financial vehicles who use the money to generate income. These payment flows will be affected by the effects of climate change and have to be managed properly in order not to end in huge financial losses. We identified four main credit and financial risks related to climate change, which will be explained later more in depth, the numbers indicate the position where the risk occurs.

All the risks interact with each other, for example if the bank implements a system into its lending process to identify carbon-intensive investments which could accelerate climate change or investments threatened by climate change it will reduce the default rate. At the same time the refinancing ability will increase, because it can attract investors who are aware about climate change and its implications. Hence starting at one point to lower the default risk will most probably lower the other risks as well.

In order to assess the each risk, the following criteria have been identified:

Readiness criteria

1. Awareness of the bank itself about climate change and its financial implications, possibly strengthen with in-house expertise.

2. Capacity to attract clients, investors, and employee aware and concerned on the implication of climate change in business and society – to avoid, mitigate or respond to a risk, there is the necessity of expertise and awareness about the topic.

3. Portfolio level of awareness of climate change – if lenders and borrowers are aware of the risk for their business derived by climate change, the bank will have less financial risk as they have already counter-measure in place.

4. Mechanisms in place to incentive investment or promote low carbon economy – innovative investment mechanism create resiliency and attract investors.

5. General climate strategy and its communication internally and externally.

Sensitivity criteria

1. Flexibility of internal processes – how quick is the bank to respond to changes?

2. Portfolio diversity (lending and borrowing) – on whom the bank is relying on? Which sectors? Which are the implications of climate change for its borrowers?

3. Shareholders nature (sector) – are the sector of the shareholders affected?

4. Sector of the main lenders – will the sources of capital pay the consequences of climate change?

5. Exposure of the locations of the investments – where does the bank invest? It is likely to be affected?

6. Exposure of investment fund and size (%) of the investment fund? In what does the bank invest and in which portion of its business? PAR – Portfolio at risk and non-performing loans (NPL) ratio.

4.1.1. Uncertainty about Terms of Debt

A bank wants to ensure a high repayment rate and closely analyzes its clients to offer contract conditions according to the investment. Since climate change will affect all aspects of the socio-economic system it will affect the investments of the banks' clients as well. This implies the risk that the terms of debt set by the bank are not appropriate and the actual earnings of the client do not conform to the required payments (Acclimatise, 2010). This means for the banks to review their lending process and conditions in order to keep the compliance with the contracts on a high level. One important aspect to review would be the length of the loans. This can be explained through the changes caused by a rise in temperature which has effects the clients of the bank have to consider and take measures to adapt to these changes. Normal procedures for estimations do not work anymore because they usually derive figures based on experience, but nowadays the changes will cost additional money which has not been taken into consideration in the past.

Like mentioned before, Spain will suffer from various direct and indirect impacts like a rise in temperature, reduction in rainfall resulting in water scarcity and salinization of irrigated soils and the risk of soil erosion, which is important especially in the agricultural sector. These effects make it difficult for farmers to forecast and to comply with rigid loan conditions. They need them to be more flexible and customized in order to comply with these conditions and obtain further loans for important investments.

Banks should review there terms of debt constantly, as the world is changing and new influencing variables come up. Now, the biggest challenge for humanity places additional pressure and affects all aspects of the socio-economic system. This makes it necessary to review conditions and adapt them to avoid losses at the financial bottom line. The probability of this risk to happen is considered **very likely (> 75 % probability)**.

Readiness

To respond to this risk in an appropriate way the financial institution needs first and foremost the awareness about climate change issues and how it is related to its financial bottom line. The next step would be to have in-house expertise on the topic to connect it and to implement measures into the day to day business. The key here is to be flexible and adopt the terms of debt according to the issues climate change could place on the planned investment of a client.

The management of Bankinter seems to be aware, but as far as we know the bank has no in-house expertise and no systematic approach in place to match changed earnings of clients with its

repayment requirements. It has established a Sustainability Committee, which meets quarterly and it could be in charge to set up the expertise and push the topic further up in the list of priorities.

Furthermore Bankinter has an advantage with its well-trained personnel who is able to change business practice quickly according to changes in the market (Bankinter, 2012c). This asset increases the readiness to answer to the risk of uncertainty about the terms of debt. Additionally Bankinter claims to have its stakeholder dialogue firmly established within its business practice and should therefore know what kind of risks could come up in the future and be able to prepare itself for the changes. To add value to the description of the stakeholder dialogue the Bank should give a more detailed explanation of the achievements and the added value within the dialogue.

After the analysis the grade for the readiness is set to **responsible (3)**, because the bank has firmly established stakeholder dialogue and the ability to adapt the terms of debt, but has neither in-house expertise nor seems it to have a systematic approach to this topic.

Sensitivity

To assess the sensitivity to the risk of terms of debt it is important to know how the bank works internally, its management systems and how flexible it is to adapt its contract conditions. As mentioned for the readiness criteria, the bank is equipped with well-trained personnel, which can adapt the terms of debt to the market situation and the clients condition.

Additionally the sector and location of the financed assets and Bankinters' competitors are criteria influencing the sensitivity of Bankinter. The dealt credits of the Bank compromise mainly mortgage loans, which on the one hand is negative, because the portfolio is not very diversified. But on the other hand, this is positive in the light of climate change, because mortgage loans are not very exposed to climate shocks. There is no public information available about the locations of the loans.

All direct competitors of Bankinter and other leading banks in Spain like Santander and BBVA are aware of the climate change risks and try actively t combat climate change with their strategies and initiatives (see 4.2.2. Competition Risk). This means, that Bankinter is more sensitive, because its competitors seem also able to change their terms of debt in an adequate time period.

After this reflections the sensitivity is set to be **medium (2)**, because we consider this risk to be present but do not expect that the company will extensively suffer from it.

4.1.2. Increase in Default Risk

The risk of default is closely connected to the terms of debt risk, but can be differentiated through its occurrence: the terms of debt are the contract conditions of the bank, especially the conditions about the lengths of the loan and the default risk is related to the clients' inability to repay the loan.

The risk of default is present every time within the operations of a bank, because it is always possible that an individual or company is not able to repay its loan according to the repayment schedule. Hence they calculate with a certain default rate, but the management of the default risk integrates in the fewest cases climate change issues. In times of climate change this could result in higher default rates than expected (Acclimatise, 2010), because of the inability of clients to make the required payments on their debt obligations due to unforeseen climate change events. This starts playing a role as soon as these events affect or destroy the ability to generate income out of the investment. Important here to consider is the distribution of the borrowers of a bank, their awareness and management systems.

The ability to payback or refinance could be affected through different factors, depending on the investment:

- Physical impacts of climate change like sea level raise or extreme weather events on assets for example houses, cars or companies' properties.

- The looming perception of the future due to raising awareness about climate change topics may lead investors to integrate it into their investment decisions. As a consequence, the ability or the willingness of the banks' client to refinance decreases, because the investment may contradict with investors' expectations about project viability due to changing environmental conditions. In addition the bank who already approved the loan cannot remove its money easily (Acclimatise, 2010).

The probability of the default risk to happen is closely linked with its physical location and/or the environmentally friendly art of the investment. Spain is the European Union country hit most by climate change through changing weather conditions which will have different impacts with varying intensity and will mainly affect agriculture and coastal areas.

Additionally the economic situation of Spain and the high unemployment rate of 24.6 % in March 2012 (Eurostat, 2012) has to be considered. This difficult situation plus uncertainty about changes due to climate change leads to an insecure future. If the clients cannot see a proper long term

framework (legal, weather, …), they might lose optimism on refinancing or financing influenced by expected consequences of climate change and do not invest anymore into new projects.

Since climate change will have an effect on the physical level as well as on the perception of the population the probability that more people default due to climate change is **likely (> 50 % probability)**.

Readiness

To respond appropriate to climate change risks and to increase its readiness and resilience, a bank needs to have the awareness and expertise about this topic and the capacity to attract clients, investors, and employees who are aware and concerned on the implication of climate change in business and society. An interesting indicator would be the portfolio level of awareness of climate change, meaning if the lender and borrowers are aware of the risk for their business derived by climate change. If the awareness is high and people implement management systems to cope with the complications of changing weather patterns thus the credit risk is lower for the bank.

The most important point to start to reduce the default risk is within the lending process of the bank. If the bank has the ability to select only clients who are a) aware of climate change impacts and b) consider this in their investments, the default rate will be lower. Additionally it would be helpful to set up a data base with areas possibly affected by climate change through e.g. sea level raise or changes in water supply, and inform clients about it. This measurement would be beneficial for the financial institution and the clients, because of the lower default rate and less stress for the clients, as they know where not to build houses or invest in.

To attract new clients Bankinter published very specific commercial to differentiate itself from other banks. Anyhow the corporate carbon footprint calculation is no sufficient for branding itself as a “green” bank and attract people concerned about climate change issues. Rather, the differentiation strategy focuses more on customer service and social issues like accessibility.

Graph 10: Advertisement of Bankinter

Source: Bankinter, 2012b

Climate change is a topic within the CSR strategy and the environmental policy, which is mainly about reducing direct impacts through planning trees to offset emissions or switching off the light for the WWF's Earth Hour. The drivers for this policy are primarily reputational and cost saving issues. The bank states not to finance carbon-intensive investments, but there is no public information available about how exactly they address this issue and what are the criteria for an investment to be dismissed. After analyzing all the efforts Bankinter does, we come to the conclusion that the bank's ability to attract new clients, investors, and employees are mainly related to social issues and less to climate change.

The level of readiness is **awareness (1)**, because Bankinter is aware about the default risk, but has no counter-measures in place to a) select clients who are aware and act against climate change, b) has no information system in place and c) has a low ability to attract new clients, investors, and employees concerned about climate change.

Sensitivity

Indicators to assess the level of sensitivity to default risk would be:

- PAR – Portfolio at risk.
- Non-performing loans (NPL) ratio.
- Borrowing portfolio diversity, especially on which sectors the bank is relying on, keeping in mind the main effects of climate change.

- Exposure of the locations of the investments and how likely they will be affected by climate change.

Bankinter is a domestic retail bank and has mainly individuals as clients. The share of the loan amounts between individuals and companies are nearly equally distributed with about 50 % for each segment.

To diversify its business model and to have a low rate of default Bankinter targets high-income clients. They succeeded in the term, that nearly 26,000 of the more than 95,000 new customers they could attract in 2011, belong to the high income segments (Bankinter, 2011). This strategy paid off in the financial crisis: As mentioned in its CSR report "Since the start of the crisis, Bankinter has had the lowest level of non-performing loans of all Spanish banks, a 3.24 % ratio, and a high non-performing loans coverage ratio of 51.86 %" (Bankinter, 2011a). Climate change impacts will not make any differentiation between income levels, nevertheless higher incomes allow higher capacity for adaptation.

In 2011 Bankinter introduced Hipoteca sin más (Nothing More mortgage) into the market, which means that "in the event of default, owners respond exclusively with the mortgaged property" (Bankinter, 2011a) and not like usually with unlimited liability. This product is an innovation in the Spanish financial market, but can be seen critical in the light of climate change, because if the mortgaged property gets affected the default rate of the bank can increase. As a consequence the diversity of the portfolio of the bank might decrease too.

Taking into consideration public available information the level of sensitivity is **medium (2)**, since Bankinter has a good NPL ratio and accommodates mainly mortgage loans, which are exposed on a medium level to climate change impacts.

Addressing this risk will first and foremost reduce the default rate and hence improve the financial bottom line. Further opportunities can arise through the development of new products, like the increased retention of clients and the ability to attract new ones.

4.1.3. Return on Investment for Project Financing and Equity Investment

The third risk in the risk category credit and financial risk is associated with investments and includes project financing and equity investments. This section discusses especially the risk for the bank to obtain a lower than expected return on investment for project financing or equity investment and is focused on expected cash flows. The investment risk with a strategy focus will be described in detail in point 4.2.5. Especially for long term investments climate change will have

unexpected consequences because the changes will have different and unpredictable impacts. Still the risk for short term investments should not be neglected, since extreme weather events can occur anytime.

There is a permanent risk that an investment is not performing like estimated. However climate change poses new stress on investments and the conditions most likely to change are:

- "Market conditions and demand,
- Efficiency, output, and performance of assets and equipment,
- Operating costs,
- Maintenance costs,
- Insurance costs,
- Costs to maintain staff health, safety, and productivity,
- Compensation for damage,
- Additional capital expenditure,
- Asset depreciation rates,
- Loss contingencies, and
- Country credit risk." (IFC, 2010)

This could lead to unexpected costs during the credit period and decrease the value at liquidation (Acclimatise, 2010).

As mentioned before, none of the big banks worldwide clearly states not to invest in carbon-intensive projects (Cogan D., 2008). These investments could be in jeopardy if new regulations come in place and for example a coal-fired power plant has to shut down earlier than its usual lifetime would be. Due to public pressure this investments are not "safe" anymore and it adds delays and additional costs. Furthermore it does not only imply financial losses, but reputational losses as well (urgewald, et al., 2011). The reputation risk is explained in detail in point 4.2.1. in this report.

As far as equity investments and funds management are concerned, a financial institution should review its return forecasts, because climate change will affect the return on asset (RoA) due to the occurrence of the above mentioned fluctuations. In addition, also the rate of return (RoR) in project financing will be affected for the same reasons.

In this case it is important to carefully evaluate the appropriate hurdle rate for the project to be profitable, including the "weight" that climate change brings on it. The hurdle rate is the "minimum acceptable rate of return" (Wikipedia, 2012a) and will determine the investment decision after analyzing the risks and opportunity costs associated with the investment. Many companies choose a hurdle rate of 12 %, orientating themselves on the returns generated by the S&P 500 Index, which lies annually between 8 % and 11 %. Taking into consideration the increasing pressure of climate change the hurdle rate might be higher and would lead to the rejection of some projects, which would have been financed without climate change considerations.

The probability of the RoI risk to change depends highly on the investment decisions the bank takes and can be therefore influenced relatively easy for new projects financed. Here the awareness of the CEO of Bankinter and the pressure from the Sustainability Committee play a big role, as they can influence the priority issues. Still the estimation models have to be reviewed, as they are usually based on past data and would lead to incorrect results because of new trends arising. For example the result of an estimation of weather patterns derived from past data will be most probably wrong because of climate change impact (IFC, 2010). The effects of these impacts on investments will be different according to the nature of the investment. Important factors are the characteristics of the investment like the climate sensitivity, its location and management practices (IFC, 2010). Public pressure increases further the probability of the RoI to change and together with the points mentioned above its level of probability is **likely (> 50 % probability)** to put pressure on banks.

Readiness

One important readiness criteria is the mechanisms in place to promote low carbon economy and incentive sustainable investments. These mechanisms could target into two directions: a) towards people who need a loan to undertake an investment which is combating climate change like renewable energy projects or b) attract investors who want to support socially responsible investment (SRI). This innovative investment mechanism would create a higher resiliency of the banks' portfolios.

Bankinter publishes in its environmental policy to "Market financial products and services related with environmental industries" (Bankinter, 2011b) and states not to invest into carbon-intensive projects. Still a specific policy is missing to complement these principles.

At the moment Bankinter is developing a net-emission account, where it will offset all emissions caused by the administrative activities. It is aimed to set a benchmark to further assure its position as a pioneer and to attract new customers who are concerned about climate change impacts. To further incentive SRI Bankinter composed a new fund, where it will invest only in companies which are represented in the DJSI and the FTSE4Good.

Graph 11: Advertisement of Bankinter

Source: Bankinter, 2012

It already sells following third party funds for SRI:

- BGF NEW ENERGY FUND
- UBS EQ. FUND GLOBAL INNOVATORS
- PICTET WATER R
- JPMF GLOBAL SOCIALLY RESPONSIBILITY
- FIDELITY GLOBAL HEALTHCARE FUND

The Bankinter Group has holdings with 4.3 % in Ysios Biofund, a venture capital fund that invests in biotechnology and life sciences companies, and in two private equity institutions that focus specifically on environmental investments: Eolia Renovables (equity investment by Hispamarket of 3.7 % - a Bankinter group company) and Climate Change Capital Private Equity Fund. Additionally the bank co-financed six renewable energy projects in Spain in 2011, and granted in total 85 million euro (Bankinter, 2011a).With the information available the level of readiness of Bankinter is considered equal to **application (2).**

Sensitivity

The level of sensitivity depends highly on the exposure of the locations of the investments and their vulnerability to climate change implications. Further interesting is the share of the investment portfolio which is likely to be affected and the severity of the impacts. Bankinter mainly invests into mortgage loans and has only a small part in equity investment (Bankinter, 2012a). As far as public information reveals it is not taking climate change into account to allocate most of its money. The share of investments into renewable energies and specialized climate change funds is still low.

Taking a look at the Madrid Stock Market reveals following information: The classification of the Madrid Stock Market comprises 6 sectors: Petrol and power, Basic materials, industry and construction, Consumer goods, Consumer services, Financial services and real estate, and Technology and Telecommunications. It trades with 167 companies, of which the most are in the Financial services and real estate sector (47 companies), in the Basic materials, industry and construction sector (38 companies) and in the Consumer goods sector (37 companies). This reveals that the Madrid Stock Market depends highly on the financial and secondary sector. It is highly vulnerable to any negative impacts on this sector, which was revealed by the financial and construction crisis.

Therefore the level of sensitivity is considered **medium (2).**

4.1.4. Financing Availability

A bank has many ways to obtain financing, however this section is not a complete description of all possibilities, as it focuses on the risks especially related to obtain financing though depositors and investors. The whole economic and financial system is based on trust and banks in particular rely on trust of people to commit money to it. The risk of financing availability is connected to the fact that climate change will very likely influence the global GDP negatively (IPCC, 2007a) and may induce economic recession overall in specific sectors. In this situation a bank may find a reduced possibility to access financing. This risk can be analyzed by looking at in from two sides:

- The bank may find difficulties in financing, because shareholders itself are in trouble due to climate change issues; or
- the bank does not take a clear position to combat climate change and depositors or investors are not willing to commit their money, because they consider additional criteria in their investment decisions.

The general economic situation plays a huge role and increases the probability of this risk to happen, but will not play a major role in this analysis as this section will focus on the financing availability risk to happen regarding to climate change issues. The first step would be to investigate the main shareholders and see their financial situation and exposure to climate change. It would not be good to have shareholders in trouble, as it would provoke volatility at the stock market.

As the general public gets more aware about climate change issues and puts pressure on companies and governments, the probability that legal obligations or reputational loss happen increased. The probability that this risk occurs is assumed to be **likely (>50 % probability).**

Readiness

To respond to this risk it is helpful for a bank to have a clear statement about how it addresses climate change and its implications in order to align with the values of depositors and investors. Bankinters' strategy to combat climate change is mainly related to measuring, reducing and offsetting its direct CO_2 emissions and less integrated into the due diligence process. Consequently it could miss the opportunity to attract climate conscious shareholders. Therefore the level of readiness is **awareness (1).**

Sensitivity

The diversity of the lending portfolio and its awareness level is crucial. The Annual Report 2011 reveals that Bankinter has 71,932 shareholders; 59.88 % of the share capital is hold by resident shareholders, and 40.12 % of non-residents. The main shareholders are Crédit Agricole (total shares: 116,927,050; equivalent to 24.52 %) and Cartival S.A (total shares: 106,671,902; equivalent to 22.37 %). In the report from urgewald (2011) it is mentioned as one of the top 20 Banks financing coal fired electricity and coal mining. Because of these actions it got already awarded with the "Pinocchio Prize" for green washing from Les Amis de la Terre. This activities increase the probability for Bankinter to face difficulties to access finance due to trouble for Crédit Agricole and as well by third party financing due to reputational damage. Hence the awareness level of Crédit Agricole seems low and its business model does not consider climate change as a crucial issue. Nevertheless within the board of directors of Bankinter is no direct relation to Crédit Agricole visible. Hence the level of sensitivity is considered **medium (2).**

4.2. Strategy Risk

Strategy risk refers to climate change risk impacts that can affect business strategy and its ability to achieve socio-economic and environmental sustainability goals and objectives. The level of exposure of a business to strategic risk relies upon on the level of climate change risk impacts that can be foreseen, adapted and mitigated. Managing strategy risk requires the identification of actions to mitigate climate risks, as well as, realizing opportunities. It identification process relies on the assumption of potential future harmful events, assessing its related risks to business strategy and defining responses to deal with these risks.

Traditionally business strategy risk in connection with climate change impact would encompass firm´s assets, operation, supply chain, distribution, Human Resources, clients, market, intangibles, competitiveness and shareholder value. However in relation to financial institutions, strategy risks are closely related to its core business operation management and the extension of financial institution's governance in respect to climate change. Core business operational management combines practical considerations of how banks manage their own resources in association with its level of GHG emissions and in relation with banks indirect GHG emission impacts associated with their lending and investment operations.

Further, we have outlined five main risk sub categories areas where climate change impacts can closely undermine Banks strategy and its sustainability plan. These risk areas are: Reputation Risk; Competition Risk; HR Performance risk; Shareholder Risk and Investor Risk.

Regarding bank´s climate governance this includes the management of business risks and opportunities through the development of specialized products and services which reflect climate change market opportunities and a systematic integration of climate change-related aspects into core business operation process. The implementation of activities supporting bank operation management and climate governance has a potential impact on a bank's economic capital, financial performance.

In order to assess the strategy risks, the following criteria have been identified:

Readiness criteria

1. Existence of management systems related to climate change – has the bank already implemented climate change risk management systems? How mature are they?

2. Is the bank aware of how climate change impacts can affect the organization strategy?

3. Reporting and communication system on sustainability – is the bank aware of the indicators for sustainability? Is it collecting the data and communicating them?

4. Transparency – is the bank clearly communicating its objectives to employees and customers? Do they understand it?

Sensitivity criteria

1. Diversity of lenders and borrowers – Is the portfolio of the bank broad enough to minimize risk?

2. Interest of people and media (at the location the bank operates) on climate change – are the people interested in topics related to climate change? Are they attracted by the bank and its vision?

3. Awareness of stakeholders – do stakeholders know about climate change? Do they act according to their knowledge?

4. Governments pledge on climate change – is the government pushing for climate change policies?

4.2.1. Reputation Risk

Reputational risk can be defined by the existence of damage business reputation and brand value among stakeholders, such as, consumers, investors, policymakers, employees, the media and many others. Nonetheless reputation risk can be increased when there is a lack of sufficient information disclosure within organizations and its stakeholders.

Further, climate change can imply reputation risk if the bank: does not address climate change concerns of its stakeholders; has no position in relation to climate change or/and does not/ or provides poor information for its stakeholders and general members of the public information about environmental policies.

Risk of damaging business reputation or brand image among stakeholders will occur when the business is viewed as responsible for aggravating climate change; failing to respond to Climate Change in effective way or through inaction. These three factors can cause loss of credibility and

trust among clients, partners and wider stakeholders, which as consequence could further affect business profitability.

Aggravating Climate Change: for a bank aggravating climate change means investing in activities which indirectly contributes to environmental damage, natural resource depletion and increase GHG emissions like intensive agriculture, cement or heavy metal industry, etc. Or by directly contributing to climate change through having high energy consumption in the offices, producing high level of waste, etc.

Fail to respond: company reputation can be affected by showing little commitment or superficial measures to tackle Climate Change. This could be the lack of good environmental risk analysis. The company does not consider its impact on the environment caused by its activities. Low climate change importance into CSR policies/activities. Not integrating measures to reduce GHG emissions into core business. Lack of monitoring systems/measures, lack of indicators. In addition if the actions of the company are considered as green washing the reputation loss would be even higher.

Inaction: Conventional ways of doing business/business-as-usual. When a company considers environmental issues not relevant for the business. The business does not include environment policies into business code of conduct. Inside the company there is lack of awareness on the individual level and nonexistence of training programs for employees. The firm does not make any environmental requirement for its suppliers. For instance, the possibility to demand to its suppliers and lenders commitments with climate change and good environmental practices (for instance environmental certifications, such as EMAS or GHG emissions reduction policies, use of best available technologies and so on).

During the last decades, pressure on businesses from the civil society has increased consistently due to the increase society awareness on climate change issues. NGOs have multiplied the scope of their action thanks to communication access and innovative campaigns. Also news and media report documentaries on extreme weather events highlights the impacts of climate change not only on the environment but also in the society and the economy. In the last 20 years companies have been involved in several environmental scandals being liable to emit pollutants to the atmosphere, as well as, polluting rivers, deforesting and many other ecosystem damages. The private sector, and specially the banking sector, has the power to promote the banking industry with a high commitment towards GHG emissions reduction, as well as, initiatives the achievement of a low carbon economy. Moreover, policy makers and regulators are now taking environmental issues increasingly into consideration, which will bring a high pressure for businesses compliance.

Considering the increasing level of society awareness on climate change issues and indirect climate change, the future demand for initiatives the towards the achievement of a low carbon economy and for financial institutions to follow environment social governance without waiting regulatory framework appear brings to the financial sector the probability of reputation risk to happen is **likely (> 50 % probability).**

Readiness

Bankinter seems committed to climate change issues by managing, reducing and offsetting CO_2 emissions. The organization has performed a carbon footprint calculation and they have also a sustainable policy which is intended to drive a continual emission reduction improvement in the future. Nevertheless, the bank has not implemented a risk analysis regarding the impact of climate change in company performance neither it has introduced environment social indicators in its due diligence when lending money to companies. This fact may mean a lack of awareness from Bankinter about real risks that climate change represents to the organization. Furthermore, Bankinters' lack of a risk analysis may also mean that the bank may not consider climate change as one of the strategic business factors.

Conversely, Bankinter publically show itself as committed to disclose information about its performance on fighting climate change. To achieve this, the bank has joined the carbon disclosure project (CDP) and the Global Reporting Initiative (GRI). It has been recognized in the FTSE4Good and has been listed in the Down Jones Sustainability Index (DJSI). Furthermore, in 2009, Bankinter has been recognized as the most sustainable bank in the world in terms of environmental management and sustainability pursuant, according to GS Sustain report. The following graph shows Bankinter in the first line with a high score for transparency and leadership.

Graph 12: Banks summary analysis (1)

Overall score % max	Transparency & Leadership						
	25%						
	Publication of climate change performance				Leadership responsibility and link to compensation		Score
	Publication of climate change performance	Publication of emissions reduction plans with quantifiable targets	Incorporation of costs of future emissions into strategic planning	External verification of emissions	Board / senior mgmt responsibility for climate change performance	Incentive mechanisms for management of climate change risks	% of max
92%	✓	✓	✓	✓	✓	✓	100%
81%	✓	✓	✓	✓	✓	✓	100%
80%	✓			✓	✓	✓	80%

Source: Goldman Sachs, 2009

Graph 13: Banks summary analysis (2)

Company	Performance - own operations									
	25%									
	Direct emissions intensity	Indirect emissions intensity	Group operating policies			Employee management				Score
	Direct GHG emissions t / US$ mn Shareholder Equity	Indirect GHG emissions t / US$ mn Shareholder Equity	Group-wide recycling policy	Travel reduction commitments	Program to reduce fuel use / emissions from corporate vehicles	Telecommuting	Car pooling	Use of public transport	Bicycle use	% of max
Bankinter	0.02	5.5	✓	✓	✓	✓	✓	✓	✓	90%
Barclays plc	0.67	9.9	✓	✓		✓			✓	60%
Banco Popular Espanol	0.09	2.6	✓	✓	✓	✓	✓	✓	✓	95%

Source: Goldman Sachs, 2009

In order to provide an effective response about the state of health and validity of its corporate reputation, Bankinter has been working since 2008 on an econometric model based on Reptrack methodology, a tool for managing its reputation risk. This model has been constructed and fed by internal and external perceptions of the Bank's main stakeholder groups: customers, potential customers, public opinion and employees, which the Bank analyses periodically.

By using the Reptrack methodology the bank is able to detect competition loss exposure in relation to bank reputation on responding to climate change and to improve its level of resilience for related reputation risk not occur.

Bankinter places effort to build a reputation around a sustainable business model, however considering the level of dubious transparency regarding communication and management system since the bank does not include climate change impacts and ESG indicators within its due diligence, this makes the level of Bankinters' readiness in relation to reputation risk equal to **application (2).**

Sensitivity

From an external point of view, the nature of Bankinters' lenders and borrowers together taking into consideration the bank environmental policy make us assume that Bankinter finance projects with low impact for the society, we can also infer that they have a lending portfolio diversity that allows them to reduce their financial risk.

The main activity of the bank is mortgage, yet the bank is active in socially responsible investments as the BGF New Energy Fund, and UBS Equity Fund Global Innovators. In addition, during 2011 the bank participated in financing six energy renewable projects granting 85 million euro.

The bank operates in Spain. Since Spain is an OECD country, it is supposed that the population and generally the business environment is particularly aware of climate change issues and physical consequences on its territory. Stakeholders are nowadays are particular attentive on climate change concerns and also the financial sector is required to take into account environmental policies when developing activities. Moreover the Spanish Index 35 companies engage widely with sustainability reporting.

People are increasingly interested about companies' response to climate change and environmental problems. This factor has contributed the lost of trust between civil society and business during the last decade. Nonetheless, Bankinter has an external perception above the sector average according to its annual sustainability report. Furthermore, Bankinter declares in its Annual Financial Report, the existence of a methodology to analyze the reputational risk coming from customer's perception.

Regarding media attention to climate change topics, in Europe their coverage is above the average according to researches, but in Spain main newspapers do not deal with the subject in specific sections as, for instance, the Guardian. Only the press agency EFE holds a particular team dealing with sustainability related news. Actually, one over five people declares in a survey that they have not been informed about climate change.

Both the economic crisis and government change has provoked some changes on the Spanish policies regarding to climate change. Spain ratified the Kyoto Protocol although it is too far from the initial goals. Considering the bad position of Spain, the government has launched different laws in order to reduce the sustainability development.

Regarding to climate change, the more recent law was the 2/2011Sustainable Economy law where it included the creation of a Carbon Fund. The Royal Decree 1494/2011 established the baselines and the objectives of these funds. These funds are basically directed to finance the purchase of emissions from projects that contribute to reducing emissions of greenhouse gases in developing countries and economies in transition, through Clean Development Mechanisms and Joint Implementation Mechanisms. Carbon Funds may be both of public and private origin, with a solely participation or multiparticipated. In relation to sustainability, it is important to mention that the government has eliminated subsidies for renewable energies. This will reduce the number of projects in renewable energy thereby reducing the government incentives to finance projects with these characteristics.

Furthermore, one of the main factors that may directly affect Bankinter is the road map launched by the European Union to promote a strategy to achieve a low carbon economy. The road map sets out a strategy to cut out most of Europe's greenhouse gas emissions by 80 % by 2050, in order to mitigate climate change the transition stresses the importance of energy efficiency and opportunities for new economic growth. Although there is not a legal framework to apply directly this road map to Spain yet, its implementation will create a large investment in renewable energy projects, energy efficiency, electric vehicles, building renovation, technology, smart grids... All these sectors can bring opportunities for Bankinter in medium-long term. Considering all the policies mentioned before, the sensitivity level for reputation risk for Bankinter is considered **high (1).**

4.2.2. Competition Risk

Competition risk can be defined by the loss of a Bank competitiveness as result of not addressing climate change in the right space of time, manner and prospective inside its business operation and strategy. Additionally competition risk also includes the poor assessment of how climate change direct and indirect risks impacts can interfere with banks operation and competitiveness exposure.

Not addressing in the right space of time: Banks may lose the opportunity to gain competitiveness from not foreseeing climate change risks; from being oblivious to society awareness about climate change issues and from disregarding initiatives to tackle climate change on volunteer basis started by other banks. Therefore not addressing climate change in the right space of time is an extent of

competition risk closely related with the chance of banks to have their competitiveness affected from being reactive.

Not addressing in the right manner: refers to external factors which were not identified by banks governance, which can hinder organization competitiveness. In another words, not addressing climate change risk in the right manner refers to the level that a bank is unprepared or not realizing what risk can affect their organization competitiveness and as consequence leaving banks highly exposed to such unforeseen risk, like: shift of customer and society demand, increase cost of commodities and utility services; new regulatory framework on direct and indirect carbon emissions; reputation loss, and many others unforeseen risks which can affect banks operational and market performance.

Lack of Prospective: refers about the lack of association of climate change with competitiveness. In this view, banks may lack of operational policy and long term strategy prospective on how to adapt and mitigate risks impacts within its core business management processes and have a lack of vision on how to innovate around new products and services opportunities in response to climate change.

If not well managed climate change risk impacts may pose banks competition under performance. For this reason, positive effects from voluntary initiatives to address, adapt and mitigate climate change may call financial institutions into question. Moreover it is already evident the presence of opportunities in the banking sector to promote the market introduction of products and services responsive to climate change. Further, management of climate risks is increasingly seen as a measure of corporate governance and good practice, thus companies that fail to manage these risks may not provide good examples for others to follow.

Recently an increased number of banks have started various initiatives to respond to climate change and achieve carbon emission reductions. These initiatives have been accompanied with the shift in market dynamics, such as a decline in demand for resource-intensive products and services, driven by changing consumer preferences and legislation.

Hence in order to stay in line with current and future climate change response movement it will be required for banks to combine practical considerations of managing their own GHG emissions with the broader implications of how climate change affects their competitiveness, marketplace position, operational strategies, and ultimately, their financial bottom lines.

It is now recognized that financial institutions that manage climate change risks more effectively than others in its industry may gain a competitive advantage. For an instance a bank that

undertakes a comprehensive effort to reduce its carbon footprint may significantly reduce energy costs upon discovering ways to streamline its processes, in the same time improve shareholder expectation and environmental image.

Thus managing climate change risks may also presents new opportunities for businesses, such as, participation in the emerging market of green technology; use and development of new cleaner energy resources; reputation boosts among many others opportunities.

In relation to changing in consumer preference, many surveys, have revealed that today, around 80 % of emerging market consumers say that they have more trust in a brand that is ethically, environmentally and socially responsible. For an instance a research made by The Carbon Trust on consumer habits has revealed that 45 % of shoppers would be prepared to stop buying their favorite brands if they refused to commit to measure their product carbon footprint. Therefore there is plenty of evidence that consumer demand for lower-carbon products and services is growing (Harry M., 2011).

More precise, such products and services in the banking industry can be identified by the increasing number of investment and retail products aimed at environmentally conscious customers. One illustration of this point can be demonstrated by an study made by UNEP Finance Initiatives (2007) where it was found that the rising in environmental awareness and media coverage of climate change, combined with growing support for regulatory and legislative action, is urging the rapid growth in green financial products.

Another study example can be seen in the report for the Banking Sector Corporate Governance and Climate Change made by CERES, which has examined climate change governance and response on forty banks worldwide (Douglas G., 2008). In this study it has been found that European banks are in the forefront of climate change response and many U.S. banks are following closely behind. Some of the actions performed by the banks in this study can be highlighted as climate change investment policy, shareholder information disclosure and financial support for clean energy, being twenty-four of the banks having set some type of greenhouse gas reduction target for internal operations and reported on their financial support for alternative energy projects.

Overall Ceres' study has revealed that corporate directors in the banking sector are waking up to climate change response expectations. Of the forty banks examined in the study, twenty-two now have board reviews of the company's environmental affairs, and twelve integrate climate change as part of their review processes. Nine banks have also assigned a board member to oversee the company's climate-related initiatives. Four banks have implemented training programs for directors on sustainability issues.

In the context of gaining competitiveness from adapting and mitigating risk impacts within Banks operational management processes, as well as, on gaining competitive advantage from new market opportunities can be found in some current initiatives performed by financial institutions that are at the forerunners of climate change risk response. Some of these initiatives include:

Disclosure: banks are increasingly discussing climate change business opportunities in their annual reports, and they have more than doubled the volume of climate change-related research reports issued in the recent years.

Emissions Management: today many banks have calculated and disclosed their GHG emissions from their operations and set some type of GHG emissions reduction including target to reduce GHG emissions associated with its lending portfolio.

Investment Opportunities: there is now a growing demand for "climate friendly" financial products and services. Many banks are now involved in renewable energy and "clean tech" market. In investment portfolio management, it is now considered important determining the effects of GHG constraints and climate change risk impacts on investment that are not climate-resilient, since they may in the worst case fail altogether.

Emissions trading: this is a rapidly growing market, investment banks have taken a leading role in supporting emissions trading mechanisms and introducing new risk management products. Various fore running banks are now involved in GHG emissions trading and have taken equity stakes in GHG commodity exchanges.

Overall probability of the risk to happen: considering the growing number of banks that have started incorporating initiatives to respond, adapt and mitigate climate change, together with the change in market dynamics in relation to the decline in demand for resource-intensive and environment harmful products, services and investments and the mounting support for regulatory and legislative action, to regulate lending and financing ventures that entails high CO_2 emissions and environmental damage, will as result affect Banks: marketplace position, operational strategies, reputation and ultimately their profitability.

Future pressure for banks to reduce their carbon emissions; to discover new ways to streamline its processes and to control their environmental impacts, as well as, the future market pressure for financial institutions to find new ways to capitalize opportunities in the process of responding to climate change, brings the chance of competitive risk to happen **very likely (> 75 % probability).**

Readiness

Bankinter makes public its commitment to create value and to respond to the needs of its stakeholders, also in the context of improving social, economic and environmental demands, by acting in way that goes beyond legal compliance, basing its business operation conduct on quality and trust. In order to promote environmental responsibility initiatives integrated in a sustainable bank model, Bankinter has established a Sustainability Committee, responsible for guiding policies and sustainability programs.

On the market level, the bank is attentive of client's awareness on climate change issues and tries to maintain a constant dialogue with them to evaluate their opinion on how the bank is respond to climate change matters. Therefore the Bank recognizes that in order to get a better brand image it is also necessary a good environment management and CSR performance. Hence, Bankinter has established a longer term Sustainability plan 2012-2015, where it intends to gain tangible and intangible value through unifying the bank social, economic and environmental responsibility with cost saving and reputation, including activities to adapt and mitigate climate change.

Bankinter identifies its business direct and indirect impacts on climate change and has been Incorporating measures to manage, reduce and offsetting emissions within the bank corporate social responsibility strategy and environmental policy component. Bankinter was one of the first banks in Spain to calculate its carbon footprint. Since then the bank has been using its 2010 emission baseline to further improving CO_2 emissions reduction and management strategy. The scope of Bankinter carbon footprint calculation includes direct and indirect emissions on: water, paper, heating and cleaning products, bank and clients electricity consumption; transport; employees commute; building and employees waste production. Among its competitors Bankinter is the bank with the best Eco efficiency performance, since it has started to calculate and manage its CO_2 emissions, showing the lowest level of: electricity, water, paper consumed and CO_2 emission by employee.

As part of its environmental policy Bankinter has implemented ISO 14001, 26000 and EMAS certification to reach environmental indicators such as efficient use of material resources. Additionally it is following the voluntary initiative of the Carbon Disclosure Project. Although the bank shows commitment to address climate change, on the other hand, the bank has not carried a comprehensive climate change risk analysis, therefore Bankinter is not totally aware of possible risks that climate change can bring to its business.

Bankinter is currently placing climate change on its long term CSR strategy and sustainability plan but not fully integrating actions to deal climate change impacts on the bank long term strategy,

nonetheless the Bank possess an innovation foundation which works in alignment with strategic pillars of the bank. Bankinters' Foundation pursue knowledge networks and promote innovation where it anticipate new trends, therefore the bank appears to be well prepared in terms of resource and capability to integrated climate change responsiveness further in the business operation and strategy.

After examining Bankinter intention and activities to create a brand which is associated with a sustainable business model, its effort to reduce CO_2 emission and to tackle climate change together with the Bank desire to serve as a reference bank in Spain gives Bankinter the level readiness in relation to its competition as **responsible (3).**

Banks in Spain that realized challenges posed by climate change are developing and implementing a climate strategy will also gain a competitive advantage. Therefore this report will briefly examine bellow what close competitors of Bankinter in the Spanish market are doing and how they consider climate change a material issue.

What are Bankinter´s closest bank competitors doing in relation to climate change?

Banesto

Banesto has incorporated on its CSR strategy the promotion of entrepreneurship with innovation, diffusion of new technologies and environmental protection, because the bank believes that it has a role to play on contributing positively to the climate change challenges in our society. Hence Banesto states publically its commitment to protect the environment and combating climate change, including objectives and concrete measures to reduce GHG consumption and to raise awareness.

For these reasons Banesto made efforts to belong to the FTSE4Good Sustainability Index and Ibex as the listed company that met the highest standards of CSR. The bank has also adhered to the United Nations Global Compact and Carbon Disclosure Project.

In 2007 the Banesto established the Sustainability Committee called EcoBanesto + where plans to protect the environment and combating climate were defined. Since then, EcoBanesto + outlined specific lines of action towards Banesto's environmental strategy; set performance targets and defined clear commitments to respect the environment.

Some of current lines of actions of EcoBanesto+ from 2011-2013 aims to:

- Reduce 3 % of their energy consumption
- Reduce the 9 % of their air emissions.
- Increase awareness among employees.
- Strengthen the reporting system of internal consumption.
- Market "ECO products" in order to improve the environmental impact and the environmental awareness of our clients.

Regarding Environmental risk Banesto has incorporated environmental impact, as one of the criteria for analysis in all projects financed to promote responsible behavior towards the environment of all projects and business it funds.

Therefore its Unit Wholesale Banking Risks scans all clients' environmental perspective criteria, according to different level the degree of compliance, the following:

- Compliance with environmental legislation.
- Biodiversity conservation and sustainable management of natural resources.
- Litigation and ongoing environmental complaints.
- Level of emissions, discharges and waste generation.
- Health and community safety.
- Certifications approved environmental in the process of value analysis also measures the client has implemented in its production processes to minimize potential environmental impacts.

Banesto recognize that the bank can exert considerable influence as a substantial promoter of environmental protection and to reduce its impacts against climate change in particular, through the marketing of financial products and services related to the environment, the inclusion environmental criteria in risk analysis, responsible consumption of resources (electricity, water and

paper) and waste management; financing and supporting the development of conservation projects and improving its involvement with of stakeholders the Bank (Banesto, 2011).

Banco Popular

Banco Popular's states its awareness about the organization relevant impact on the economy, social and natural environment. In relation to its awareness on environmental impacts the bank have developed environmental policies which is applicable to financing projects and on its organizational and internal performance initiatives. For Banco Popular, the respect and preservation of the Environment are not only goals to achieve, but also the way that the bank wants to undertake and develop its activity. To accomplish it, Banco Popular establishes environmental goals which include: The management of waste generation; the sustainable use of resources; efficiency and energy conservation; efficient use of water; green purchasing policies; training and awareness raising towards its employees.

The bank is also present in the FTSE4GOOD index; it has been granted the ZeroCO_2 seal sponsored by the non-profit organizations Fundación Ecología y Desarrollo (Ecology and Development Foundation) and Accionatura, for having reduced its emissions by more than 16 % from the previous year. The Bank has also a signatory party of Carbon Disclosure Project.

Banco Popular Environment Protection Policy required from the organization: the elaboration and pursue of energy efficiency and environmental impact reduction plan; to finance projects with a favorable environmental impact; to provide environmental training and awareness to its employees and to comply with the environmental legislation in force and with voluntary commitments initiated by the Group.

The Banks' commitment to environmental protection is extended to include the process of analysis and monitoring of project finance operations, by following these steps: analyzing an operation prior to entering into the relevant agreement and considering environmental protection and ethical criteria to determine the level of environmental risk involved by the project. Once a project is under way, the Bank monitors the operation of its borrowers and gives them technical advice to ensure that the fulfillment of objectives that have been fixed, including those relating to environmental protection risks are controlled directly.

Banco Popular Group also supports power generation projects from renewable energy sources. The Bank has focused on financing facilities to tap solar energy, particularly thermo-solar facilities, in 2011. (Banco Popular, 2011)

Sabadell

Sabadell assess the level of environmental risk especially within its credit operations, its entire branch network, has additional document which help analysts to evaluate the environmental risk associated with the company's sector or activity. All risks, including environmental, are included in the risk report, which is used as a reference when giving loans.

The Bank has adhered to United Nations Global Compact, has signed the Equator Principles, it complies with Environmental management systems certification ISO 14001. Its new centre building complies with LEED-NC (New Construction) sustainable building certification and complies with the EU Green Building Programme for sustainable construction.

Nonetheless Banco Sabadell also promotes the use of sustainable energy through direct investment and finance for renewable energy project. In 2011, 72 % of structured finance projects funded by Banco Sabadell were for renewable energy facilities, for this reason the bank retained its leading position on renewable energy support in Spain.

In parallel with its finance business, Banco Sabadell is working to improving the energy efficiency of its facilities and to reduce the environmental impact of the services it provides, therefore “Paper-free office”, is a new culture in Sabadell workplace.

The Bank has also a sound track record in selective waste collection and treatment. Banco Sabadell also participates in the HP-Planet Partners programme for collection and reuse of toner cartridges, and technology waste disposal through authorized waste managers. (Sabadell, 2011)

What are leading banks in the Spanish Market doing?

Santander

Santander makes public its commitment to develop banking activity in a way that preserves and protects the environment. For this reason the bank is taking part in many initiatives pro sustainability and responsible banking towards the society and the environment. Some of these initiatives includes, taking part in: the Carbon Disclosure Project; The Down Jones Sustainability Index; as well as, following The Banking Environment initiative, the UNEP FI; the Principles of Responsible Investment; the Equator Principles and has been recognized as the greenest bank in the World Best global Green Brands.

In 2011 the Bank created a Climate Change Office and a Climate Change Committee with the objective to coordinate actions of the Bank towards climate change in order to identify: risks; new regulations and business opportunities in climate change and to promote and disseminate the Bank's actions towards the environment. Some of the activities that Santander Climate Change Office does is to calculate its carbon footprint, manage resource consumption and reduce its CO_2 emission.

According to the global compact, Santander has reached position number 1 in the country regarding its Energy Efficiency Plan 2011-13 which included: reducing CO_2 emissions objective up to 9 % to 2013, result in 2011: 17 %. Reduce power consumption up to 3 % in 2011, result 3.9 %. These results were achieved through Energy Efficiency Plan encompassing its operational activities and organization infrastructure.

Within its financial activity Santander´s wholesale and retail banking pursue social responsible investment funds. The bank also provides insurance related to climate change; employees awareness and training, as well as, dissemination internal and external communication about climate change and credit finance for renewable energy including capital financing for wind farms, seed plants, hydraulic photovoltaic, mini-hydro, solar thermal power and biomass plants.

Santander has also launched “Crédito IDi,” a financing line that allows clients to finance the cost of both the energy audit and the investment needed to achieve emissions savings in private residences/facilities. (Santander, 2011)

BBVA

BBVA is another leading bank in Spain addressing climate change. BBVA is also aware of the risks and opportunities that climate change can have on its operations. In 2011 the Bank has created a committee of eco-efficiency and responsible procurement, according to the new governance model adopted by BBVA Corporate Responsibility with the objective to monitor and update BBVA´s environmental policy.

In 2008 BBVA launched the Global Plan Eco-efficiency (PGE), including a set of objectives for the period 2008-2012 in terms of reducing direct environmental impacts, such as: achieving 20 % reduction of CO_2 emissions; 10 % reduction of paper consumption; 7 % reduction in water consumption; 2 % reduction in energy consumption; 2 % reduction in energy consumption (target per employee). BBVA has also calculated its carbon footprint and acquired electrical vehicles to transfer employees between different buildings in Madrid, with a mean distance of approximately 90 kilometers daily.

In 2011, BBVA has conducted a diagnostic exercise about its position on climate change. The aim of this study was to formulate a diagnosis on the bank need to formulate an integrated strategy in this area. This diagnosis was undertaken with the collaboration of other areas of the bank, such as: the Structured Finance, Global Markets, BBVA Research, BBVA Asset Management, Multilateral, Risk and Corporate Responsibility. Although there has been no detailed and quantitative analysis of the impact of climate change nonetheless the Bank itself is trying to respond to key issues related to impacts on climate change through identifying internal measures, such as, the Global Eco-Efficiency Plan and promoting certain products and services such as renewable energy funds and carbon trading.

BBVA is very active on funding and supports advisory operations in the renewable energy sector. In 2010 the bank was the number one ranking adviser to global mergers and acquisitions of renewable energy and in 2011 it won the award of Bloomberg New Energy Finance. Also in 2011, the bank has strengthened its involvement in carbon trading mechanisms and Certified Emissions Reductions. This year BBVA has funded three projects registered under CDM by the United Nations, which have helped to reduce a total of 16.1 tons of CO_2. Overall the bank has been trying to strengthening its commitment and CSR strategy on climate change. (BBVA, 2011)

Sensitivity

Bankinter shows a good capacity to deal with competition risk regarding responding to climate change in relation to its CSR activities and business operation. As it was mention above the Bank possess an innovation foundation which performs product research and design, which tries products and services with real customers and launches them commercially with direct participation of the Bank's senior management, therefore the bank withstand low sensitiveness in respect to its capacity to innovate products and anticipate services that respond to climate change.

Bankinter places efforts on tracking and manage their reputation, in this process the bank tries to identify what consumers want to know what is behind the products and services provided. Nonetheless since Spain is highly exposed to changing climate patterns which will affect the economy and the society, and the speed that the banks in the country are also addressing the problem, in order of not losing their reputation among stakeholders, brings level of sensitiveness to competition risk in relation to climate change as **medium (2).**

4.2.3. HR Performance Risk

Human Resources Performance risk is associated with the lack employee's motivation, sense of job satisfaction and good performance from not being engaged with business values, policies and actions towards responding, adapting and mitigating climate change impacts and risks.

HR Performance risk encompass the level of loss of staff motivation, retention and attraction from not being enough aware or actively participating with company´s sustainability vision, policies and actions towards managing business impacts and risks on climate change. Thus, if employees are not well informed or involved with organization's response towards climate change this fact may bring companies the risk of having employees with a lower sense of job fulfillment and performance, as well as, lowering the business chance to attract new talent workforce that appreciates and hold values towards the role of business on addressing climate change.

Similarly with the shift of consumers awareness and preferences towards products and services that are ethically, environmentally and socially responsible, today employees also are more aware of business accountability and responsibility towards sustainability of our planet, society and economy and expects companies responsive behavior on addressing their impacts through adapting and mitigating climate change. Hence, it is already widely recognized that environmentally responsible companies can attract new talent workforce as well as, motivate and retain current employees.

However at times employee´s level of awareness, skills and knowledge on business climate change response needs to be spread internally in order for them to fully understand the context of company´s operation in relation to climate change dynamics and how companies governance is responding to it. To achieve it, is necessary to have information channels and resources which serves to enhance employee's knowledge skills and level of awareness of how they can meaningfully take part on actions to adapt and mitigate climate change and on what are the business values and position in relation to the climate issue context.

Additionally, to avoid future HR performance risk it will be required for firms to promote training and support on key sustainability issues for all executives and employees, as well as, to facilitate coaching, mentoring and networks for sustainability knowledge sharing and to promote sustainable lifestyles choices across their community of employees through education and innovative employee benefit options.

Considering the increasing amount of employee's awareness about business accountability and responsibility towards sustainability of our planet and the rise of expectations for financial institutions responsive behavior on addressing their impacts through adapting and mitigating climate

change. In addition with the demand for policies, information and knowledge sharing towards the promotion of sustainable practices within the workplace makes the prospect of HR risk happening **likely (> 50 % probability).**

Readiness

Bankinter´s employees are well engaged with actions and policies towards responding, adapting and mitigating climate change. The Bank places efforts on raising awareness and train employees on how to consume resources responsibly and involve their participation on the development of conservation and environmental improvement projects. Bankinter follows people management strategies that adjust the workforce with training new circumstances requirement. Therefore the level of participation, information disclosure and training among employees on climate change matters is well diffused, such as, the presence of a paperless campaign, use of videoconference calls between employees and with clients as well.

Bankinter disseminates its corporate responsibility strategy through internal communication and workshop for its employees, these activities help the bank to raise awareness of its sustainability commitment, as well as, to progress, to motivate and involve the staff with the sustainability plan of the organization, including adaptation and mitigation of climate change inside the bank daily operational activity and volunteering actions. Taking into consideration the level of responsiveness of Bank in relation to climate change and how this responsiveness is communicated and involving employees brings the level of readiness of Bankinter in relation to HR performance risk as **responsible (3).**

Sensitivity

Bankinter is being active on raising awareness and train employees on how to utilize and consume resources responsibly and actively involving them in conservation and environmental improvement projects. Nonetheless its HR department should be attentive regarding the dissemination of information and engaging of employees with environmental policies and corporate social responsibility values and actions. At the same time the Bank should use external channels of communication with also the purpose to inform the outside world how it wants to achieve a sustainable business model, together with a strong position on climate change responsiveness.

All these actions will improve Bankinters' sensitiveness of the HR risk in relation to climate change. However at the moment taking into consideration the level of efforts that Bankinter has on involving its employees with environment social governance initiatives, makes the level of sensitiveness equals **low (3).**

4.2.4. Shareholder Risk

Shareholder risks refer to loss of share value and/or selling of share ownership, due to shareholder´s concern on how the business affects and is affected by climate change. Shareholder risk also occurs when shareholders are uncertain about the level of business commitment and response to socio-economic and environmental accountability.

Shareholders expectations on business responsiveness to climate change may fall short in case information disclosure and dialogue on environmental policies and operational procedures are not available. Moreover shareholder risk is likely to increase when shareholders are not secure about the extent that the business governance is incorporating sustainability in line with climate change risks into company's value, operation and strategy.

Financial institutions have duty to protect share value and be transparent with shareholders. Thus, to avoid shareholder risks in connection to climate change, requires financial institutions full transparency on releasing shareholder information on carbon impact provoked by the organization operational activities; as well as, to turn down commercially attractive but environmentally harmful lending opportunities; to fully comply with external environmental policy legislation and to assess risks associated with their lending activities including reputation risks for their organization.

Climate change is already recognized as a material issue for financial institutions. Many Banks have now realized that climate change risk could have a potential impact on Fund's investments over the long term.

Moreover there is an increasingly number of shareholders and investment managers that are actively asking companies about their policies on climate change. One of the first questions banks are facing is whether there is an accepted responsibility from financial institutions to address climate risk and what policies and procedures does the bank have in place to evaluate the financial consequences of climate change issues? Thus, a bank that ignores such questions made by shareholders about its climate change policies may be highly exposed to shareholder risk.

Moreover in the light of continued and increasing demand from shareholder groups; members of the public and regulatory agencies, brings to Banks the pressure to develop a dialog with stakeholders around issues related to climate change, hence, the importance to make public climate risk adaptation and mitigation initiatives made by banks.

Nonetheless, also on the opportunity side, a bank may find that answering its shareholders' questions may help them to uncover important strategic and operational issues related to climate

change. In addition financial institutions that are already addressing such issues may find their reputations boosted by making such efforts and strategy public.

On the bank governance side, climate change perspective by shareholders includes: an overall climate management framework; related risk; data management processes and capital to manage climate change, as well as disclosure, engagement and leadership. Since, responsible climate change governance by banks has a potential to benefit banks economic capital and its financial performance.

Overall probability of the risk to happen: as mention above shareholder more than ever are interested to know which policies and procedures does their invested bank have in place to evaluate climate change impacts in their operations. Similarly, today shareholders demands financial institutions to respond to climate change and to manage its impacts, as well as to disclose information and to pursue a shareholder engagement on climate change matters.

Considering the lack of transparency of financial institutions on disclosing its direct and indirect impacts on climate change, as well as, the lack of disclosure about financial institutions policies and procedures to assess climate change and environmental impact makes the ability of shareholder risk to happen **likely (> 50 % probability)**.

Readiness

Bankinter shows some level of preparedness in relation to possible shareholder risk. This can be seen by the company placement in the FTSE4GOOD since 2002. In 2010 Bankinter was also included in the Ethibel Excellence en 2010 a label that belongs to a well recognized a consultancy agency for corporate social responsibility (CSR) and socially responsible investing (SRI). In addition the bank got the position twenty fourth in the Global Sustainable Performance Leader 1000, which includes the thousand companies more sustainable of the world and it has adhered with the UN global Compact Initiative.

As it was mentioned the bank accepts its responsibility to address climate risk and Intends to do it through the promotion of best corporate governance, management practice, and through ensuring compliance, transparency and business ethics. For this reason the Bank has disclosed environmental policy: which encourage responsible behavior in respect of the environment for the members of the public and stakeholders including the bank shareholder group through its website, annual report and general shareholder meeting where they are also informed about the evolution and results of the Bank environmental efforts.

The bank seeks continuous improvement of management system and organization of corporate responsibility. Therefore Bankinter establishes in each management area: objectives, programs of measures, implementation plans and work schedules, and a structure of indicators to monitor their achievement and assess their CO_2 emission impact in order to generate a virtuous cycle of continuous improvement.

Bankinter is thriving the business to increase its reputation as responsible and sustainable business. Its placement on well recognize standards reveals the results from this effort towards continuous improvement and promotion of best corporate governance in respect to respond to climate change and environment impacts caused by the bank. However since climate change is not integrated into the business strategy and the lack of a risk analysis encompassing climate change impacts from and on the bank makes Bankinter readiness in relation to shareholder risk as **application (2).**

Sensitivity

Bankinter seems fairly prepared to protect shareholder value and avoid this risk to happen. The bank operational risk management framework is based on the identification and evaluation of risks by developing risk maps showing the frequency and severity levels of the risks, the existing control mechanisms and action plans for mitigating them.

Its risk management framework, sort and classify information in accordance with the Basel recommendations; monitors risk by establishing indicators that provide information on trends in risk levels and alerts when unwelcome trends appear; draws up Business Continuity and Contingency Plans describing the alternative procedures to normal operations aimed at restoring activity in the event of an unforeseen interruption in critical services and provides information on operational risk to be forwarded to regulators, supervisors and external bodies. However this risk management framework does not include the relationship between climate change impacts and operational risk.

But, nonetheless the bank has a view to achieve an appropriate system for managing operational risk, and in line with best practices in the market, therefore in case the bank insert climate change impact context into its operational risk management framework, it will show lower its sensitiveness in case shareholder risk strikes. Taking into consideration the fact that the bank possess a well defined and efficient mechanism to identify and manage risks, but has not placed climate change element inside its risk framework gives the overall level of sensitiveness of the bank on shareholder risk in relation to climate change as **medium (2).**

4.2.5. Investment Risk

Investment risk in the context of climate change refers to banks failure to assess environment impacts from investment portfolio which aggravates climate change. Assessment failure often occurs when financial institutions lacks in compliance with or do not have in place environmental and sustainability performance policies and standards. Consequently, in case climate change negative impact happens, financial institutions may face reputation damage; loss of share value; regulatory penalty; lower investment returns and financial loss or be at scrutiny of the media and others stakeholder's public opinion.

Investment risk is likely to affect company performance when environmental social governance and sustainability principles are not assessed in the investment decision making, as consequence, unforeseen or neglected environmental damage and aggravation of climate change may appear in projects; business acquisition and activities; new infrastructure constructions and many other investments financed by banks. Hence, when financial institutions and risk analysts disregard or do not understand sustainability issues and impacts related to climate change within investment propositions, they may as result, give preference and approval on investments that show higher potential monetary returns, but are exposed to investment risk in relation to climate change aggravation. For an instance, banks must consider investment risk implications from investment in carbon-intensive energy technologies.

Investors and financial institutions are increasingly recognizing and taking actions on environmental social governance, including environmental and social issues that pose material investment risks and have the potential to directly affect long-term financial return performance. Large part of a bank's indirect carbon footprint comes from its lending or investment portfolios therefore a key issue for banks will be assessing the impact of climate change on the asset quality of lending and investment portfolios. This will influence financing and investment policies, as well as, portfolio management.

To avoid the probability of investment risk to happen will require banks to better disclosure about their financial and material risks posed by climate change; their own emissions reduction strategies and emissions resulting from financing and investment; to set progressively higher targets to shrink the carbon footprint of their lending and investment portfolios and to manage climate change possible impacts over the whole project lifetime. More than ever before, as it was mentioned an increasing number of banks are now following the Equator Principles. In addition, many financial institutions, especially those members of the United Nations Environment Programme Finance Initiative (UNEP FI) and Equator Principles have environmental and social goals associated with their investment. Therefore if climate change impacts are not taken into consideration these institutions

may not allow banks to comply with environmental and social standard required by them, as result, not permitting banks to receive their collaborative business and investment.

The 2006 Stern Report Review referred to climate change as the 'greatest and widest-ranging market failure ever seen' demonstrating how climate change is a material risk in investments. And, since risk assessment decisions are within a bank's control, thus any risk assessment failure are banks responsibility. Nonetheless, today there are risk management and credit rating scoring system for global financial markets, in order to improve risk assessment and management, in consideration to climate change, in special to non-diversified business portfolio centered on climate dependent sector or vulnerable location.

Socially Responsible Investment (SRI) category is giving the chance for investors to invest in a responsible manner and is becoming an important financial market dimension of sustainable development. Investors engaged in SRI expects companies to assume sustainable behavior, especially because, investors now identify reputation risk as part of the measurement of investment value, therefore this is another reason for banks incorporating environment social governance dimension into traditional financial analysis.

Furthermore, today financial investments and the majority of funding have realized the need for a low carbon lifestyle. It has become significant the development of Green Finance, which has the objective to promote financial products and services to support the transition to a low carbon economy. In the past few years, there has been an explosion of sustainability and specifically climate focused research and investment products. We have also seen an increasing number of financial indices that address sustainability broadly and deeply.

Many of these indices are being managed by "mainstream" financial houses, including the S&P/IFCI Carbon Efficient Index, HSBC Climate Index, Prudential Green Commodities Index, FTSE4Good, and NASDAQ's Global Sustainability 50 Index. And investors are seeing the results. For example, KLD Research and Analytics (now part of Risk Metrics) launched a Global Climate 100 Index and posted a fifty seven percent return (seventy percent annualized) since its launch in 2006.

Thus it seems evident that climate change also offers an opportunity for banks to diversify their investment and retail product lines, because of the growing number of client's interest in climate risk management, carbon offsets and socially responsible investment. Therefore there are vast opportunities for banks to launch and specialize in products and services, as well as, to integrate climate change adaptation and mitigation into business processes, as an element for the innovation capabilities of a bank.

Nonetheless, adapting business processes requires investments at the first stage (e.g. into new risk tools, information systems, specialized research, in-house specialists, and collaboration with external experts) and the development of new investment policies. But such efforts will result in revenues in the mid- to long-term stemming from the provision of new solutions for existing and new clients. In addition, enhanced or new solutions retain and attract new customers; this is a key concern of financial institutions.

As it was mentioned investors and financial institutions are increasingly recognizing, demanding and taking actions on and for environmental social governance. As great part of a bank's indirect carbon footprint comes from its lending or investment portfolios, for this reason a key issue for banks relates on how they are assessing their climate change impacts on lending and investment portfolios. That is why, the need for financial institutions to follow voluntary environment assessment impact frameworks, in order to examine and manage social and environmental risk in project financing. However, in case climate change impacts are not taken into consideration the probability of investment risk to happen will be **very likely (> 75 % probability)**.

Readiness

The Bank shows availability of products and services related to social responsible investment with the objective to promote supportive transition of our society to a low carbon economy. In order to participate on FTSE4Good index of the bank had to fulfill strict economic, environmental and social criteria that allows qualifying the investment as "sustainable".

In 2011 Bankinter consolidated its strategy of sustainable growth, focusing on increasing customer resources and changing the composition of the lending portfolio, market financial products and services related with environmental industries in order to boost profitability. For an instance the bank has invested in the sector of renewable energy, such as mini hydroelectric stations and wind farms, preferably already in operation and with financing and project guarantee.

Bankiter has also received the Ethibel EXCELLENCE; this means that the bank has a good quality level for investment funds which exclusively invest in shares or bonds on companies that are usually above average in terms of corporate social responsibility. However Ethibel label does not say anything about the fund's 'financial quality' such as expected return, risk profile of the invested companies. Bankinter environmental policy introduces environmental criteria inside risk analysis within financial operations, including environmental criteria in the purchasing policy and in managing the supply chain. The definition of operational risk refers to Basel Capital Accord (BIS II), which defines risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal and regulatory risk, but excludes strategic

and reputation risk. In general, it concerns risks encountered in processes, and they are generated internally by persons and systems, or as a consequence of external agents such as natural disasters and neither includes climate change dimensions.

Bankinter is on the path to integrate environmental and social governance into its business operations. It has a robust operational risk framework analysis however this framework does not include direct and indirect risk from climate change. In addition our group was unable to identify the current ventures that the bank is financing or collaborating with in order to verify whether this customers generates a high level of impact on climate change therefore the overall position of readiness on Bankinter in relation with investment risk connected with climate change is **application (2).**

Sensitivity

Socio-political factors can increase the bank sensitiveness of investment risk to happen; for an instance the roadmap established by the European Commission towards the transition to a lower carbon economy, sets out a strategy to cut out most of Europe's greenhouse gas emissions by 80 % by 2050, in order to mitigate climate change. The transition stresses the importance of energy efficiency and opportunities for new economic growth. In line with the roadmap will come the increase of changes in consumer, business and country government attitudes towards a low carbon economy. Hence, investment patterns will be increasingly supportive for the shift towards sustainable business models.

The diffusion of social responsible investments is expected to rise rapidly over the next few years. This represents an extraordinary depth of funding availability for sustainable businesses. Governments worldwide are increasingly directing public investments towards projects that measures or enhance sustainability. Across the world, fiscal stimulus packages launched in response to the financial crisis have given a significant role to "green growth".

Therefore there is a need for Bankinter to enhance its commitment for social responsible investment and green lines of funding for the transition towards a low carbon economy. Nonetheless considering the level of environment social governance efforts and investment and following voluntary regulations makes the probability of having environmental damage and aggravation of climate change unforeseen within investment propositions still **high (1)** specially because of future mounting pressure on banks to control their indirect CO_2 emissions and environment impact from lending and financing.

4.3. Operational Risk

Operational risk can be defined as "the risk of direct or indirect loss due to inadequate or failed internal processes, people, and systems, or from external events" (BCBS, 2003). Therefore, operational risks are risks included in the processes generated internally by people and systems, or due to external agents such as natural disaster. This chapter includes all the operational risks associated with climate change and banking sector:

- infrastructure damage,
- employees health risks,
- migration trends risk,
- procurements issue risk,
- insurance risk, and
- information technology risk.

All the banks include different measures to reduce these risks. Implementing management system, monitoring assessment methods and reporting about which risks they can face during its own operations allow them to include mitigation plans to minimize the impact of these risks. These plans have to include variables such as climate conditions in order to assure their accuracy. In fact, if the bank is not able to forecast how the new climate change conditions are going to affect its performing, systems or even people and clients, all the contingency plans could be inappropriate. Unless an institution's risks management methodologies and tools integrate considerations for climate change, its risk position may be underestimated (Economist Intelligence Unit, 2009).

In order to assess the each risk, the following criteria have been identified:

Readiness criteria

1. Existence and maturity of contingency plans – company will be more prepared to withstand unexpected events if sound emergency plans are in place.
2. Health and Safety standards in place.

3. Eco-efficient and comfortable work-place.

4. Existence of procurement practices related to sustainability.

5. Existence and maturity of insurance.

Sensitivity criteria

1. Exposure of the locations in which the company operates.

2. Readiness of external infrastructure. If surroundings are vulnerable to damages, companies will be affected as employees may not be able to reach work-place for example.

3. Diversity of energy utilities. Specifically to measure the exposure to energy black outs.

4. Diversity of employees.

5. Existence procurement practices in the sector.

6. Insurance trends.

7. Degree of dependence of the bank of IT systems.

4.3.1. Infrastructures Damage Risk

Infrastructures damage risk refers in the context of climate change, to the risk of the infrastructures (whether owned or from the projects which the Bank finances) to be affected or damaged by risks triggered by climate change such as natural disasters.

Infrastructures damages can cause a risk in the bank operation because of:

- Bank has invested in projects affected by these damages.

- Increase of unpaid loans.

- Extreme events can cause energy shortages or building destruction.

- Own offices affected by natural disasters.

Risk related to infrastructure damages occurs when the bank has not included properly the possible risk of damages in its plan of contingency, investment or project funding. Banks usually tries to diversify the risks investing in different projects. Therefore, the bank affection by infrastructures damages will depend on its investment portfolio and if the bank has investments in sectors involving infrastructures or building construction or remodeling that can be affected by direct impacts related to climate change conditions.

The increase of temperature can interfere with a number of natural disasters causing more impacts in infrastructures (energy, water, telecommunications, etc.), specially in the most vulnerable areas. Furthermore, these new conditions could alter the rate of vulnerability in some regions, moving some regions from less level of vulnerability to a higher level. In fact, since climate change impacts are increasing rapidly, some regions could underestimate the risk considering its former vulnerability, missing real conditions and risks.

Climate change will modify different aspects of the building, including external conservation, internal conditions, and internal services that human beings need such as water, waste, energy, or drainage. Obviously, the degree of affection will depend on the building materials, its design, its surrounding and the risk considered when the building was planed and built. Currently, architects, urban planners and quantity surveyors only consider historical data about climate conditions to plan building and infrastructure's design, materials and characteristics. However, since climate change is altering the normal trend of the historical conditions, buildings will face during its lifetime to new conditions that will affect its resilience.

Climate Change will increment the impact as following:

- Increase of erosion and corrosion of building surfaces caused by wind-driven rain, or high temperatures.

- More intense precipitation will also affect building facades and internal structures as columns, beams or materials and lead to more rain penetration around openings.

- Affections on the infrastructure such as columns, beams or materials.

- More energy consumption due to air conditioning system to compensate higher temperatures. It is also related to staff comfort and productivity in the own bank offices and the risk of heat stress.

- Higher demand of cooling with the consequent increase of GHG emissions.

- Higher water consumption.

- Risk of landslides on slopes and embankments, potentially threatening buildings, land, and infrastructure in vulnerable locations, including infrastructures related to water distribution because of the scarcity.

Taking into account the previous reflections, the probability considered is **very likely (> 75 % probability).**

Readiness

Bankinter´s operational risk management model is inspired by the guidelines included in the Basel Capital Framework Agreement II and complies with the Bank of Spain Circular 3/2008 on determination and control of Equity, and incorporates the industry best practices shared in the CERO group (Consorcio Español de Riesgo Operacional) and CECON group (Consorcio Español de Continuidad de Negocio) where Bankinter is member.

Bankinter has already defined the basic principles of action, including how to manage operational risks, as well as, the promotion and monitoring of market best practices. These principles include the identification and mitigation of major risks, the establishment of procedures for evaluation, analysis, measurement and reporting of risks, as well as, what action plans the bank has to apply if the risk happens.

The identification, evaluation and risk reduction are carried out by a Risk Committee. As basic unit of analysis, the bank includes the capital for the existing operational risk according to Basel II (BCBS, 2004). First, it includes the identification and evaluation of risk by developing risk maps where the frequency and severity of the risk levels are reflected, as well as, existing of control mechanisms, action plans provided for mitigation and record of events that have generated losses. Afterwards, in order to mitigate the risk, some indicators are included, which also favor the control and update the different levels of risks. Finally, taking into account all this information, Bankinter's Committee develops its contingency plans.

Although Bankinter states in its website that its risk analysis includes environmental variables, no data have been observed about how climate change is included in the contingency plans and how the bank deals with the risks of damage in infrastructure or buildings. However, considering that Bankinter works in a national level, the own infrastructure damages do not seem to have great effects in its direct performance. However, infrastructures in projects funded by Bankinter could

have a less readiness since they can be located in regions more vulnerable (see 4.2.5. Investment risk). Thus the level of Bankinter in relation to infrastructure risk is considered **awareness (1).**

Sensitivity

Bankinter has four different offices. "Universal" offices where Bankinter gives service to all its customers and where management is complemented with the acquisition of new customers, "Business Centers or Centers of Private Banking", "Personal Finance" dedicated exclusively to the comprehensive protection and personalized customer segments- and "Corporate Centers". At the end of 2011, Bankinter had 366 "universal" offices, 81 Business Centers, 59 Personal Finance Banking and 47 Corporate Centers.

All the offices are distributed among 13 regional organizations that make up the bank: Catalonia, Levante, North, Navarra Aragon-Rioja, Las Palmas, Tenerife, the Balearics, Northwest, West and East Madrid, Castilla la Mancha and Extremadura and Andalucia. These centers are located mainly in industrial areas with a high concentration of medium-sized enterprises.

Regarding the sensitivity analysis, due to the lack of data about the characteristics of each building and infrastructure, it has not been possible to analyze the degree of preparation of each building and infrastructure to climate change. However, it is assumed that all infrastructures and buildings have the same characteristics.

Catalonia, Valencia, and Madrid are areas considered at moderate risk to negative climate change impacts (catedracambioclimatico, 2007). Therefore, considering that Barcelona and Madrid are big cities with a higher capacity to invest in infrastructures, services and risk prevention and Levante is not considered as one of the biggest areas that appear to be affected more by extreme effects. There is no forecast that, in relation to this risk, for Spain, and more particularly for large cities, the impact can become severe.

Graph 14: Balances by centres from Bankinter

Balances by centres (€000s)

Lending	Average balance	Difference 2011/2010	Difference (%)
Regional HQ Catalonia	5,029,982	1,269	0.24%
Regional HQ Levante (Eastern Spain)	4,770,424	-105,008	-20.01%
Regional HQ Northern Spain	2,944,158	-59,130	-11.27%
Regional HQ Navarra - Aragon - Rioja	2,195,580	52,051	9.92%
Regional HQ Las Palmas	968,513	-19,685	-3.75%
Regional HQ Tenerife	663,093	-29,132	-5.55%
Regional HQ Balearic Islands	937,372	38,799	7.39%
Regional HQ North-Western Spain	3,009,627	11,093	2.11%
Regional HQ Madrid West	5,804,455	86,320	16.45%
Regional HQ Madrid East	4,000,737	-96,376	-18.36%
ORG.MADRID CORPORATE BKG	2,350,363	575,166	109.58%
ORG.CAST-MANCHA-EXTR	1,347,759	14,759	2.81%
Regional HQ Andalusia	4,875,671	54,820	10.44%
BRANCH NETWORK	38,897,834	524,887	100%

Source: Bankinter, 2011

From the annual report and data obtained from Bankinter, it has been impossible to assess the characteristics of each office and its surroundings. However, it is assumed that the locations have been studied strategically in order to not only generate more market and customer approach but also improve accessibility (for instance for disabled people) and to prevent any risk to its infrastructure. Therefore, and considering that Bank basically operates national wide, is not considered climate change and recurrent extreme events will affect very significantly the accessibility of its offices because of damage in the surrounding buildings or in the own buildings.

Neither in the sustainability report or the annual report has been possible to extract information on the diversity of energy utilities. However, since Bankinter purchases electricity from the Spanish energy market, the risks for it will be the same as any sector (or may be lower because many of the Bankinter's products can be generated even small energy black outs happen). Furthermore, Spain is not expected to face severe risks of energy black outs resulting from climate change. However, it is important to note that the energy demands will increase and producers must seek solutions to meet the demand based on other sources others than hydropower due to water scarcity.

Therefore the sensitivity is considered **low (3).**

4.3.2. Employees Health Risk

Financial Institutions can be affected by the employees' health risks due to the following factors:

- Environmental conditions within the building can affect the heat stress in the employees and contractors.
- Increase of disease associated with high pollution such as infectious diseases, injury events or allergies particularly in locations with high population density and levels of urbanization.
- Increase of current health hazards in some locations.
- Spread of new disease coming from Africa and other regions with hotter climate conditions.
- Water scarcity.

The increase of the temperature will have an important impact in Spain (Istas et al., 2012). Furthermore, Spain, because of its geographical location, the characteristics of the territory and its environmental problems and the demographic, socio-cultural and economic crosses, is a country particularly vulnerable to climate change in the European context (Istas et al., 2012). The conditions of different regions will vary becoming arider. These new condition will cause that some disease eradicated in Spain such as malaria, meningitis, dengue fever and so on, will appear again thanks to these new optimal conditions for their development. Furthermore, new climatic conditions will also alter the seasonal distribution of some allergenic pollen species (IPCC WGII, 2007). The diseases that will be more affected by the warmer condition will be those related to the cardio respiratory system.

However, the health consequences will also depend on the preexisting health status of the employees, contractors, staff and in short the population. Thus, the risk will depend of the quality and mature contingency plans as well. However, in Spain in general, according to (Istas et al., 2012) the actions relating to human health reflected in the strategies and action plans of the companies to address climate change are not sufficient or adequate to the problem.

Certainly the probability to risk to happen will depend on people and its possibility of adaptation to the new conditions. As it is said before, climate change and the increase of conditions will cause a relevant impact in Spain since conditions will be harder. However, Climate change is altering not only the temperature but also all the conditions and patterns of precipitation. All these changes will affect directly water resources and availability, water quality and flood risk. More floods can cause

an increase of loss of life, disease, damage of building, and contamination from sewage. Furthermore, these affections can reduce the employees' productivity or increase the recovery costs for governments.

At the same time, these conditions will cause changes in water supply, environmental conditions, food security and supply, increase of commodity prices and so on. In this context, the bank can face different problems related to the risk of investment. Tensions because of the climate change on communities and increase use of water by communities will demand new policies and investment that have into account the new situation. For instance, investment in projects with farmers who have historically relied on rain-fed agriculture may increasingly have to use surface water and groundwater sources to irrigate their crops because of changing patterns of rainfall. As a result, competitions of areas where it is easier to obtain the water will become high and more efficient consumption and water management system will be necessary in order to reduce or distribute properly the water between the different users. All these problems of water and food will affect directly the spread of the disease considering that water access and quality is one of the main goods for the human beings development.

Therefore, since the risks will affect to the bank employees, the bank offices are usually located in big cities with problems of pollution and density, and the employees in the some projects where bank will invest will be affected by, the probability considered is **likely (< 50 % probability)**.

Readiness

Bankinter aims to reduce the maximum potential occupational risks for all its employees. The 2011 data show that the number of hours of common sickness absence fell over 3 % from the year 2010.

On the other hand, Bankinter has taught courses in prevention of labor risks to all its workers and has a Security and Safety Committee in all the centers with more than 50 employees. Furthermore, it has performed medical examinations for those people recently incorporated and periodical medical examinations for the all workers interested in. In addition, Bankinter participates in usual preventive campaigns (flu vaccination), as well as campaigns to improve health and health education (smoking cessation) and blood donation campaigns. On the other hand, in 2011 Bankinter implemented measures to improve the health of its employees, such as the provision of discounts at gyms, spas, physical therapy, health and beauty or boosting of relaxation zones among others.

After analyzing all measures that Bankinter has implemented, it can be inferred that although the bank has operational measures for the risk prevention, and in fact, has carried out plans of impact mitigation, it is difficult to assess whether such plans are (and will be) enough to mitigate these

impacts generated because of climate change. In addition, considering that most of the offices are located in big cities where pollution will increase due to climate change (rising temperatures will cause more condensation of pollutants), the impact can be classified as moderate. It is likely that more targeted measures of sensitivity and knowledge to employee about the direct relationship between climate change and health, could reduce the risk by the implementation of mitigation and adaptation measures by their own.

As it is mentioned before, the Bank applies different measures to improve health and safety of its employees in addition to the legal requirements. Measures such as the training of its 100 % of employee in labor conditions, safety and health committees, risk assessments carried out by insurance among others.

The readiness is considered moderate because Bankinter does not include any practice that may encourage workers to protect their health regarding climate change. Perhaps, it would be interesting to include standards for the offices, in order to control the air quality within the office considering that employees spend long time in their work-place.

Bankinter carries out periodically studies to know the opinion of all its employees about the work-place conditions. Although the usual period is biennial, because of the workload in 2011 it could not be performed, postponing it for the year 2012.

Besides the studies, Bankinter has calculated its carbon footprint of CO_2 and other greenhouse gases generated directly or indirectly. It has calculated both the power consumption and the emissions per employee, for later to compensate voluntarily them by planting 960 trees in the Sierra de Alcaraz (Albacete). From this calculation, the bank has proposed several solutions to reduce its associated emissions. Some measures are:

- Regulate the hours to meet the demand,
- implementation of sustainable mobility measures for employees,
- developing the use of videoconferencing,
- to provide environmental training to employees,
- increase of environmental awareness offering tools for calculation and compensation of employee's domestic emissions,

- eco-driving courses,
- conducting the suggestions about environment in the mailbox, and
- launching four campaigns for using web mail services among others.

It is also important to note that the Bank has launched a new sustainability plan for 2012-2015. This plan includes all three pillars of the sustainable development (social, environmental and economic). In fact, the goal in its environmental pillar is to become carbon neutral.

Taking into account all the measures that the bank has applied related to awareness raising as well as eco-efficiency, the readiness is considered **responsible (3)**.

Sensitivity

The staff of Bankinter has an average 39 years old. It includes people from different nationalities, with 103 different degrees and with a varied experience.

Graph 15: Human Capital of Bankinter

Indicator	2007	2008	2009	2010	2011
Descriptive Indicators					
Number of employees	4,530	4,483	4,509	4,543	4,210
Average age (years)	35.95	36.71	37.38	38.00	39.00
Experience					
Average length of service (years)	9.56	10.25	11.00	11.00	12.00
Average length of service (years) as % of 40 years (professional lifetime)	23.90	25.63	27.50	27.50	30.00
Diversity					
Breakdown by sex					
Male (%)	51.79	51.13	50.19	49.53	49.31
Female (%)	48.21	48.87	49.81	50.47	50.69

Source: Bankinter, 2011

As it is shown in the table above, the percentage of men and women is similar. However, according to United Nations the vulnerability between men and women regarding climate change is not the same. Women are more vulnerable, especially in developing countries, because they are taking on more responsibilities for the daily decisions of consumption, childcare and housework (Euroefe, 2012). In addition, the report also includes the impact will not be the same because of discrimination in areas such as income, access to resources, political power, education and household responsibilities.

However, assuming that in Spain these differences between genders have been eradicated, the impacts for both are similar. Therefore, the sensitivity profile is considered **medium (2)** because of the medium age is 39 and, this age range is not the most vulnerable to disease.

4.3.3. Migration Trends Risk

The bank could be affected by a change in migration trends. New climate conditions will drive waves of migration which will affect company human capital and the surrounding markets.

Migration has existed for a long time in Spain. However, during the last years this shift has not been due solely to seek of better employment opportunities and higher salaries but also because of extreme events. Many years ago, Spanish agricultural sector was based on subsistence economy, or direct trade between farmers and consumers. However, because of the rapidly increase of consumption and the new framework of the market, farmers produce more quantities of food to sell them to distributors for finally be consumed. It implies that they are more dependent of the consumption and the prices established by the market. If the prices or margin of benefit fall, farmers are not able to contract more employees causing the migration of hundreds of people looking for new opportunities in other regions or even new sectors. Climate change will reduce these margins of benefits even if the farmers are able to apply more efficient measures. Climate Change is already destroying crops, water resources, and damaging ecosystems. Therefore, the main risk to any financial institution to such movements is, basically, the reduction of benefits associated with some investment in agricultural projects where farmers decide to change, modify or event stop some projects because of its lack of benefit (this risk will be analyzed in the financial risks). Furthermore, another risk related to the migration trend, is the possibility to spread disease due to immigrants are affected by particular diseases eradicated in Spain.

In the Spanish context, the risk will not be caused by the movement of employees within the bank, but, as mentioned above, the risk will be caused by the movement of employees (or farmers) from projects funded by the bank to other projects more profitable taking into account these new environmental conditions. n the other hand, and related to the health risks, it is also important to emphasize that the migration trend from other countries will cause the increase of possibility to contract some diseases eradicated in Spain and, therefore, to go down the productivity.

Due to the impossibility to obtain such a particular data, and because of the relationship with financial risk and health risk, the migration risk is included within both financial and health risk analysis. In any case, the probability to occur considered is **very unlikely (< 25 % probability)** since it is not expected to affect directly the bank.

4.3.4. Procurements Issue Risk

Financial Institutions can be affected by this risk if sustainability requirement is not included within procurement. Increasingly, government are demanding companies more efforts to include environmental requirements in their purchases. Therefore, companies that are not demanding these requirements for their suppliers, will face an added risk in a short-medium term. Besides, demanding environmental criteria for suppliers, enhance a more sustainable market, as well as, the reputation of the company (see 4.2.1. Reputation Risk). To include sustainability criteria relates not only to the product itself (ecolabels) but also how the supplier manages the environment or if, for instance, it has implemented an environmental system management.

The application of these criteria in procurement will reduce the risks associated with new regulations as well as, competitive risks. For example, in the construction sector, Catalunya has already implemented an eco-efficiency Decree 21/2006. This decree obliges that at least one family of products used in the construction of a building, must have an ecolabel type I or type III.

The risk is highly related with legal risks and reputation. As governments implement more stringent public policies in relation to sustainability and shopping, more companies will be required to include more sustainable criteria on their purchases. Therefore the probability is considered **likely (> 50 % probability)** since the policies and the society are becoming increasingly more stringent.

Readiness

Bankinter includes in its purchasing policy different sustainable requirements. For instance, in its paper purchasing policy, Bankinter demands not only 100 % recycled paper but also ecolabeled paper with the Blue Angel eco-label or the Nordic Swan. Both ecolabels are certified by third parties and are recognized internationally. This measure limits the use of virgin paper and avoids the use of products that have treated with chlorine or contain particles both in the paper itself and manufacturing. On the other hand, Bankinter also has pushed the use of virtual correspondence. Although it is not a purchasing policy, it influences positively on the number of paper bought, avoiding on the one hand, the CO_2 emissions related to the paper production, and on the other hand, reducing the cost. In 2011, 27 % more customers used virtual correspondence compared with 2010 (Bankinter, 2011a). On the other hand, Bankinter tries to extent its values and its commitment with sustainability to its stakeholders. In 2011, it participated in the publication of a Guide for identifying, measuring and managing the environmental impacts of SMEs in the context of sustainability reporting. This guide includes the best environmental practices and provides to suppliers the knowledge and resources on how to integrate the environmental management within the organization. All these initiatives bring the level of readiness of Bankinter in relation to the procurement risk as **high (4).**

Sensitivity

In order to evaluate the exposure of the company to the risk of procurement regarding climate change it has to be define how aware is the society, authorities and the banking sector regarding this issue. The trend of the policies regarding the demand of having more sustainability products or raw materials has been already explained but not to what extent the sector is mature regarding this risk. Furthermore, including policies of competing banks, will allow the bank to assess its situation over its competitors as well. The banks below are those included in the competition risk.

Banesto

It includes different strategies in order to promote the environmental protection. It includes concrete measures and objectives to reduce consumption and to raise awareness. It also belongs to different index such as FTS44Good Sustainability Index, Ibex and is adhered to the United Nations Global Compact and Carbon Disclosure Project. Furthermore, it has implemented the called EcoBanesto+ from 2011-2013 where includes different aims such as reduce the energy consumption, reduce emissions, increase awareness and market "eco products" that help customers to improve the environmental impact and the impact awareness (more information in the competition risk). However, it does not include any particular policy regarding recycled paper or purchasing of ecolabeled products.

Banco Popular

It also states its awareness about the organization relevant impact on the economy, social and natural environment. For Banco Popular, the respect and preservation of the environment are not only goals to achieve, but are the way the bank wants to undertake and develop its activity. It has different goals regarding the generation of waste, sustainable use of resources, efficiency and energy conservation and efficient use of water. Furthermore, it includes green purchasing policies. It states "In addition, environmental protection criteria has been extended to apply in purchasing paper and cardboard in the different formats. In the case of the sheets of paper purchased, 82 % are of 100 % recycled paper carrying the Blue Angel certification, while the rest of the paper meets the PEFC standard. Envelopes are nearly all (95 %) 'Carbon Neutral', with the Group thus offsetting the related CO_2 emissions, and the cardboard used is 100 % recycled".

Sabadell

It has adhered to United Nations Global Compact and has signed the Equator Principles. It has a new centre building that complies with LEED-NC certification and is member of the EU Green Building Programme for sustainable construction. It also promotes the energy efficiency and the reduction of the environmental impact of its services providing a "paper free office". In this case, it uses

recycled paper in its offices, it has a good guide of good practices, it promotes the use of new technologies (Online Banking) and it includes environmental considerations when choosing its suppliers such as ecolabeled products or 100 % recycled products.

Santander

It takes part in many activities pro sustainability and responsible banking towards the society and the environment. Some of these initiatives includes taking part in: the Carbon Disclosure Project; The Down Jones Sustainability Index; as well as, following The Banking Environment initiative, the UNEP-FI; The Principles of Responsible Investment; The Equator Principle and it has been recognized as the greenest bank in the World Best global Green Brands. Furthermore, It has implemented different energy efficiency plan or employees awareness and training. It includes a new trend in the sector, the purchasing of energy from renewable sources in Spain, UK and Brazil. Furthermore, its goal for 2012 is to develop a sustainable procurement plan for wood and paper from sustainably managed forests in accordance with international standards (indeed it has already applied in some campaigns such as Go Green. Moreover, most of its contracts include a declaration from the supplier undertaking the respect and application of the 10 principles of UN Global Compact.

BBVA

In 2011 the bank created a committee of eco-efficiency and responsible procurement, according to the new governance model adopted by BBVA Corporate Responsibility with the objective to monitor and update BBVA´s environmental policy. Furthermore it launched the Global Plan Eco-efficiency (PGE), including a set of objectives for the period 2008-2012 in terms of reducing direct environmental impacts. During 2011 BBVA worked in the development of a Global Policy for Responsible Purchasing Group, with independent expert advice. It is considered that the outcomes and the criteria are aligned with the sustainability since the process to outline a good purchasing plan has been verified by a third party.

Considering all the reflections included above, the sensitivity is considered **high (1).**

4.3.5. Insurance Risk

The bank may be affected in two different forms with respect to this risk. First, the relative cost to insure any asset (for instance properties due to earthquakes, fires, tax fraud and so on) will increase due to the update of the risks regarding climate change. Second, if the bank owns any insurance company, the actual cost to insure any asset must adapt to the real risk of climate change. If the cost of insurance does not include risks such as probability of heavy rainfall, droughts or other meteorological inclemencies associated with climate change, the continuing costs or extra costs due to the recurrence of extreme events may be too high for the bank with the consequent

risk that its entails. Properties or assets located in highly flood-prone areas, or earthquake prone areas will become more expensive to insure. Indeed, some of them due to the high probability or risk to be affected by extreme events even could be uninsurable. These new conditions will require more insurance cost as well as the search of new regions to build new infrastructures and office of the bank with fewer risks associated with extreme events.

The main issues that will cause this risk are the new factor that the insurance will include on its analysis of risk. Insurers are carrying out more and more studies to define more appropriately the risk associated with climate change and therefore to set the prices according to the new real risks.

On the other hand, more intense precipitations will affect building facades and internal structures and lead to more rain penetration. Furthermore, changing rainfall and temperature will increase the risk of slopes and landslides potentially threatening building, land and infrastructures (more information in the infrastructures damages risk).Considering these reflections, the probability is considered as **likely (> 50 % probability).**

Readiness

Bankinter has three main types of insurance for: operational risks, personal loans and employees. Insurance for operational risks are evaluated together with the area of Insurance in order to modify the policy of coverage depending on the operational risks to which the company can face. Thus, Bankinter has available different insurance policies, from properties (including risk such as earthquakes or fires) to external or internal fraud (theft for instance). This risk is considered as high because, although the bank has already these insurances, the insurances companies will increase the price of these policies according to the new risks, and the higher probability of an extreme event occurs.

On the other hand, Bankinter also includes insurance on personal loans. It includes insurances of payment protection with the insurance company Groupama, which guarantees the payment derived from loans, to 1,600€ during the period that the holder may be unemployed or with a temporary incapacity. For this risk, it appears that climate change will not have a direct effect, thereby, this risk is not considered as relevant. Finally, in relation to its employees, Bankinter also provides various benefits which also include health insurance and life insurance. This risk is considered moderate because although Bankinter includes insurance for its employees, these costs also will increase in the future by the inclusion of environmental risks on the new policies.

The readiness in relation to the insurance risk is considered as **responsible (3)** because of the lack of possibility to understand until which level the Bank is ready for this risk.

Sensitivity

During the last years, the world and more specifically Europe have faced a gradual trend in the number of events that have caused damage in the insured property causing million of losses.

This situation has lead to the necessity by the insurances companies to carry out new studies and methodologies to evaluate the risk. Moreover, increasingly, people use more products, more valuable that need to be insured. Besides, most of them include more IT electrical very vulnerable components to extreme events like floods. Companies have rushed to develop new methodologies to provide new services to their customers such as the possibility to limit, within a building policy some objects or equipment included in the coverage in order to reduce costs, or even directly some have been excluded due to their price or their high vulnerability to the risk.

Regarding the insurance for employees, it is expected that the medical system in developed countries such as Spain, will be able to address successfully most of the disease rising. However, this will require an increase in pricing and increase that, indeed, medical institutions are currently starting to charge in some drugs. Indeed, many studies have been carried out by the insurance company to promote new products capable of addressing the new challenge associated with climate change, both on issues of adaptation and mitigation. For example, Evan Mills, co-editor of the chapter about insurance in the IPCC reports, publishes and updates annually the progress made by insurers to develop new products and services in response to the increasing incidence of adverse effect related to climate change (Mills, E., 2012). Another initiative has been developed in France where 19 insurers are offering car insurances called “pay-as-you-drive”. It is estimated that this measure has reduced the number of km/miles driven by 10 or 15 %, and furthermore the energy consumption and accidents.

Last measure that the sector is applying to cope with natural disasters are the catastrophe bonds. Basically, the bank launches these bonds that are bought by investors accepting a particular risk. Therefore, the bank transfers the risk associated with the natural disaster to the investors. The issuing agrees a high interests in relation to the possibility that an event/or risk occurs. If this risk occurs, and exceeds the established, the issuing does not return the principal to the investor and therefore this is the only one who loses money. In short, more and more insurance companies are transferring their risks to capital markets to diversify risk and reduce the direct impact on the insured and, ultimately, to transfer the risk to the riskiest investors (Muñoz, F., 2008).

The sensitivity considered is **medium (2).**

4.3.6. Information Technology Risk

Information technology (IT) hardware is vital to any bank. All the information and management about its customers, transfers, operations, and security are dependent of these systems.

Climate change will implicate different risks for IT systems. The temperature raising will demand additional burden on IT cooling equipment. Furthermore, more components failures rate as temperature rises. As server processors become more powerful, their operational efficiency continues to rely heavily on cooling systems (IFC, 2010). The space around server racks is now commonly cooled by air flow, though some are also water-cooled. The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) recommends an operating temperature range of 20°C–25°C for IT equipment (IFC, 2010). If temperatures go beyond the supported range, failure rates can increase significantly. Research has shown that the failure rate for high-performance computing equipment doubles with a temperature rise of 10°C (Bayle, T., 2007). On the other hand, especially in Spain, the problem of water supply during periods of intense drought will produce also problems in the cooling systems.

The risk is totally associated with temperature rising and water scarcity as it is said before. However, it also important to note that extreme events derived from Climate Change will produce damage to IT equipment and potential loss of data through flooding of buildings, damages to cables because of intense storms or damages to communications infrastructures. As climate change is accelerating, existing contingency plans for IT systems may not adequately recognize the risk of climate-related disruptions. Where an institution relies on outsourcing to third-party data center providers, it must be assured that their contingency plans also recognize the changing nature of these risks. The probability considered is **very likely (> 75 % probability)**.

Readiness

Bankinter outsources different technology management to Gneis, which in fact is a company of its property. Furthermore, Bankinter has an Operational Risk Committee to develop these contingency and continuity plans in order to set up alternative procedures to the normal operation to restore the normal activity in presence of an unexpected interruption. According to these data, it is difficult to analyze the real maturity of the contingency plans implemented for both companies in all their operations. However, taking into account the high risk that both companies will face if interruption of this kind happens, it is predicted that the risk management department has implemented robust and mature contingency plans in order to reduce the risk. Therefore Bankinter readiness in relation to Information Technology Risk is considered **responsible (3).**

Sensitivity

Bankinter is the owner of a insurance company called "Linia Directa Aseguradora". It is an innovative insurance company that uses, only, the telephone and Internet as a form of distribution. Furthermore, it applies the latest technologies an all its processes. Therefore, because of its business depends basically on Internet and telephone, changes in its cooling systems, damages in communication infrastructures or communication services will trigger huge effects on its business.

Thus, Bankinter is the owner of the Gneis Global Services Company which aims to provide services associated with technology and improvement in the operational management. It includes issues such as software security, systems exploitation, telecommunications and so on. This company provides service to Bankinter and Linia Directa among others. Because of its business, the sensitivity to climate change and problems associated is considered very high. If the company does not include measures to reduce the risk, it can be very exposed.

On the other hand, in the operational management, Bankinter is promoting the technology as one of the main pillars of differentiations with its competitors, using for instance multi-channels services such as phone, Internet and broker online.

Therefore the Bank sensitivity is considered as **high (1).**

4.4. Legal and Regulatory Risk

The legal and regulatory risk analysis usually refers to estimating how new regulations and expected policies expressed by international agreement as well as national/local legislative activity may affect company´s performance. When we deal with climate change risk, it is essential to keep track of every related legislative development, internally and externally, since it may soon cross company operational activities both directly and indirectly.

Consequently, when analyzing legal and regulatory risks arising from climate change for the financial sector, the analyst should start analyzing all international treaties, sectorial guidelines, and operational principles in which the sector is involved, being mandatory or voluntary. We can mention for instance the International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability, or the Equator Principles.

In addition a risk analyst should also account for industry best practices of management related with climate change, since it may inspire the legislator in the near future to require its application mandatorily for everyone. In such a case, obviously the early embracer of climate change related management systems will enjoy a consistent competitive advantage compared to cautious responsive approaches.

Finally, we consider relevant also including in the analysis monitoring the development of the scientific research on climate change: as suggested by the IFC, if scientific research considers impacts of climate change in a region very likely to occur, providing evidences to apprise specific, detailed, and foreseeable consequences, it not only would be taken into account in both strategic and operational decision making, but also climate change may be close to attaining legal significance affecting judicial decisions and government policy-making (IFC, 2010).

How can the legal and regulatory risk impact company performance? Basically it can happen in three not mutually exclusive ways:

- Regulations induce to review operations and practices in order to maintain compliance; it may signify additional costs if the company did not consider the risk previously.

- Regulations induce to review operation and practices for the most significant parties on which the company´s value chain rely. All the negative consequences absorbed by those businesses or individuals will consequently be reflected in the company’s performance.

- Climate change impacts may bring litigation issues for a financial institution, as climate events are likely to intensify the probability of third parties damages related with occurrences or activities that are tied with the project financing activity of the organization. Consequently a bank for instance may be sued for having indirectly contributed to the cause of the damage or for undertaking investment decisions that have not considered adequately the risks.

Following the above reflections, we identify in detail the following risks:

1. Implementation of a Carbon tax or expansion to other sectors of the European Union Emission Trading Scheme.

2. Evolution of mandatory reporting on Environmental and Social Governance (non-financial information).

3. Mandatory management standards and growing investment policies related with climate change.

4. Litigation risk due to investment negligence.

In order to assess the each risk, the following criteria have been identified:

Readiness criteria:

1. Expertise in climate change related topics – are employees trained on legislative polices related to climate change? Has management the skills required to include the climate change legal and regulatory risk when taking decisions? Does the long-term strategy of the company take into account future climate change legislative outlook?

2. Existence of mechanisms enabling to track effectively environmental data – Which are the mechanisms in place to collect, evaluate and disclose environmental data? Are they sufficiently effective to give a picture of the company´s direct and indirect impact on global warming? If yes, is the company taking action beyond current legal compliance?

3. Existence of operational and management standards to manage climate change related issues – which operational and management standards are already in place? How do they work? Are they informing decision-making? Does the company expect the same standards from partners/suppliers/clients?

4. Extend/scope of operational and management standards and climate change related practices – how far do these standards and practices reach within the bank. Is every business unit integrated or there are simply isolated initiatives?

Sensitivity criteria:

1. Considerations about how weak or strong is environmental performance within the country, including the maturity of sustainable practice in the industry – how is the environmental performance of other banks? Is the financial sector in the country an example to follow on voluntary Sustainability practices? How is it doing compared internationally?

2. Pressure of society, how aware is the society about climate change related issues and how much does it advocate for it? Does the public opinion trust voluntary action from corporations or it generally believes that mandatory regulation is preferable?

3. Current national climate change related obligations. Which is the legislative environment that firms face in relation with climate change? Does it allow to effectively respond to climate change?

4. Evolution of EU commitment to climate change along time. EU policies have a huge impact on national legislation and could lead to a change in reporting, operational and management standards and/or to a carbon tax or the introduction of financial institution into the ETS. How it is expected to look like the regulatory scenario in Europe according to currents trends?

5. Debt and Investing Portfolio composition. Is the portfolio of the company sufficiently diversified? Are the main sectors involved highly exposed to the risk?

4.4.1. Implementation of a Carbon Tax or Expansion to other Sectors of the European Union Emission Trading Scheme.

European as well as national and local politicians have been looking increasingly for a feasible way to address GHG emissions and to drive the economy towards a low carbon model, which provide services and products for society without harming the environment. Actually, a globally binding agreement, which will force states and their companies to reduce GHG emissions to levels considered by the scientific community acceptable (concentrations of CO_2 in the atmosphere equal to 450 ppmv, representing a increase in the global temperature of 2 degrees Celsius), is still missing. Negotiations are taking places every year under the United Nation Framework Convention

on Climate Change (UNFCCC), with the Conference of the Parties (CoP). Agreements have been difficult mainly for the contrasts between well-known high polluting developed countries (like U.S.), which tend to defend their industries' competitiveness, and new consistent polluters from developing countries (like China), which defend their rights to become industrialized and foster development. Recently it has been agreed that the Kyoto Protocol will enter a new phase next year, but many big polluter are not participating, or others do not face legally reduction obligations (i.e. U.S., Canada, Russia, Japan, China). In practice, it serves as framework to keep allowing flexible mechanisms to signatories willing to reduce emissions, such as Clean Development Mechanisms (CDM) and Joint Implementation Projects (JI). Yet, the Protocol is not globally effective to curb climate change.

The European Union seems to lead the way with the implementation of a set of legally binding commitment gathered in the so called "Energy and Climate Package", which is expected to drive emission down to 1990 levels by 2020, among other ambitious targets. One of the mechanisms to achieve the commitment is the European Union Emission Trading Scheme (EU ETS), a cap-and-trade system in which energy-intensive sectors are required either to limit emissions or buy carbon permits in the market. Thanks to a "learning by doing" process and the Commission perseverance, more and more sectors and companies are being included, while the system is progressively adjusting to allow the carbon price to be sufficiently high to keep the emission market meaningful. This year, among polemics, the airline industry has entered the scheme. From 2013 in addition participants will be required to auction the permits, rather than receiving them freely from member states. The entrance of further sectors is less probable in the short-term, since the participants cumulate already around half of the total emissions in the EU. However, the inclusion of sectors that have not relevant direct impacts but consistent indirect ones will not be a surprise eventually: In the New Zealand Emission Trading Scheme (NZETS) for example, forestry has been the first sector to initiate the market in 2008. Forestry sector does not directly emit, but deforestation undermines the possibility of CO_2 to be absorbed, so that it is a consistent indirect effect. The same rational could be applied for the financial sector, which may be driving consistent indirect impact due to its investment decisions that finance who most emits.

The EU ETS seems having set aside the possibility of a carbon tax in Europe, which is instead the case of countries like South Africa. Nonetheless a similar measure may be introduced to avoid "carbon leakage", referring to the mechanisms by which European industries leave Europe to more "friendly" regulatory environments: goods and services coming to Europe from outside may face a carbon tax consequently.

In conclusion, if after the above reflections we can consider the risks "very unlikely" to strike directly the sector, it is also true that the bank may face significant indirect consequences through the sectors which feature its portfolio. Consequently, we consider the general probability of the risk to happen equal to the score of **unlikely (< 50 % probability)**.

Readiness

Bankinter is very active in climate change related policies and it proposes actions which show its attention in relation with the issues that the phenomenon is bringing to society. In general, the importance for private sector contribution to mitigation is well understood. Continuous employees' training is a firm pillar for the company strategy, allowing workers to enjoy on average 32.4 hours of training per year, and reaching almost all the workforce (Bankinter, 2011b). Remarkably, the bank started to provide also training on human rights (1.6 % of workforce). Yet, training related with environmental and climate change issues is claimed to be directed toward raising people awareness of climate change, while the group does not mention any training activity to rise preparedness of the workforce in relation with the risk, meaning that the evolution of the EU ETS market and the relevant legislation evolution may lack of the adequate attention internally. In addition, when talking about remuneration, no incentives are connected with climate related target although the numerous initiatives that the bank is supposed to implement.

The management pays attention to carbon emission data, and the bank calculated its carbon footprint, including a remarkable "scope three", which involves indirect impacts. The bank launched a very interesting pilot project for the creation of a complete sustainable workplace (a subsidiary in Madrid, Santa Engracia street), and also takes care of management systems which involve climate change issues, as the 14001 ISO certification, although the coverage of business units certified is quite reduced. It has also offset its annual direct emissions by planting trees in the hills surrounding Madrid.

In 2009 a Sustainability Committee has been instituted and made responsible for Sustainability policies and environmental programs which intend to promote the necessary measures to integrate the environmental and social perspective into the company (Bankinter, 2009). As we speak the group is launching a new sustainability policy to be completed by 2015 which aims to better integrate environmental and social issues into governance and decision making, but it will take time to see tangible results.

Based in those reflections, the overall pointing for the readiness criteria is considered to be equal to the level of **responsible (3)**, yet advising that consistent gap need to be covered to integrate the risk in the decision-making process.

Sensitivity

Regarding the company indirect implications with climate change, the bigger relevance is assumed by the portfolio conformation and the sectors involved. The main activity of the bank is reported to be mortgage loans, meaning that the company is less exposed from the presence of clients and borrowers in the EU ETS. At the same time, the company opts in its strategy for segments that represent liquidity reach fee incomes, that is usually equal to medium and large enterprises that may be likely to participate in the scheme, thus being exposed to margins deflections in the case of high carbon price.

Spain in recent years has been among the world leaders on incentivizing an internal switch towards a low carbon economy, overall with consistent investment in clean energy from renewables. Nonetheless the current economic crisis has brought the new elected government to review its plans for renewable energy expansion, also due to a growing electricity tariff deficit that the country has been accumulating along the decade. Nowadays, Spain can be considered to be one of the most diversified countries on renewable sources, yet it has still to work hard to meet binding targets regarding the share of energy from renewables in its final consumption imposed by the EU for 2020, which must be equal 20 % (13.3 % in most recent data available from EU statistics).

In addition, among the national firms which are obliged to participate already in the EU ETS, we noticed worrisome trends in the decade before the economic crisis, which may influence their future emission market participation and hitting indirectly the Bank: the sectors of chemicals, metals, and non-metallic minerals, among others, have constantly increased the energy intensity (calculated as amount of energy inputs per unit of output) reaching the high + 82 % of the metals sector between 1995 and 2006 (Mendiluce et al., 2009). This is even more relevant if we consider that all the rest of Europe has been reducing the economy energy intensity, consequently driving Spanish companies vulnerable to eventual high price of carbon in the emission market.

Thus, summarizing the above overall considerations, the sensitivity of Bankinter to the risk is considered **medium (2).**

4.4.2. Evolution of Mandatory Reporting on Environmental and Social Governance (Non-Financial Information)

The experience of climate change socio-economic effects will inevitably add pressure to whom has been considered as important contributor, indirectly and directly, to the creation of a carbon intensive economy that has led to global warming. Financial sector is usually considered the engine of the economy, consequently it may share culpability from the public opinion sentence. In addition to the energy crisis, the sector faces straight the blame related with the financial crisis.

Thus, in times where trust in business is declining to a historical minimum, the transparency of companies measured as the complete disclosure of information about its activities and its impacts on society and the environment plays a crucial role on the business license to operate, and overall business performance. According to a study published in 2012 from the Trust Barometer, in Spain the financial sector has seen the trust of the public declining by 26 % in one year, reaching the looming rate of 19 %, one of the lowest in the world (Edelman, 2012). As we speak, considering the European and International Monetary Fund (IMF) bailout on Spanish banks due to their unsustainable debts, the situation may be so much worse.

As a result of the several high-profile corporate scandals, and the already tangible consequences on the environment and the climate, there has been a general feeling of distrust regarding companies' ability to self-regulate or disclose information voluntarily.

Non-financial information has been recently introduced in mandatory requirements for corporate reporting in several countries, including China, Sweden (state-owned companies), France (disclose or explain approach), Italy, Spain, Germany, Denmark, South Africa, UK, Canada and many more. In addition, South Africa has gone further: it has already mandated integrated reporting (meaning one single report for financial and non-financial information that tell us the story of how a company create value including social and environmental) as a mandatory requirement on a "comply or explain why not" (similar to the French style) basis for all companies listed on the Johannesburg Stock Exchange.

Even if in the rest of the countries integrated reporting is still on a voluntary basis, many company are proactively embracing the practice, as for example the Danish pharmaceutical Novo Nordisk. Actually experts expect unanimously that sooner or later integrated report will become the common practice, driving regulators to make it mandatory for big and listed companies.

Consequently the probability of the risk to happen is considered **very likely (> 75 % probability).**

Sustainability reporting is not simply writing a report about good intentions on ESG information. In addition, integrating reporting is not just aggregation of non-financial and financial data in a single paper. Reporting is about a long process, which starts much earlier than the report writing, and intends to comply with accountability and transparency principles as a part of an overall strategy embedded into sustainability. Thus the production of the report itself is only one of the yearly outcomes of this continual process, it is not the goal at all.

The companies which understand sustainability reporting that way will have a competitive advantage in the case an evolution towards integrated reporting is realized. Having a strategy in which sustainability is well integrated and is the core of the value creation allows the company to see and effectively report where intangible value connects with the tangible; how social and environmental aspects interact with the business financial success; how multiple capitals serve as equally important inputs to drive benefits for the business and for society. In such case, there will not be any problem to integrate financial and non- financial information to comply with mandatory transparency requirements.

Otherwise, if the publication of a sustainability report is considered from a company as a simple tool aiming to gain reputation, many problems may arise, since the company is not ready to effectively propose a unique picture of its performance, as it has not embedded ESG values in the core business model. That means incapability to show evidences of how ESG create value; how it affects the financial performance and how it will impact society. For the business sake such considerations are troublesome since it brings erosion of competitive advantage, reputation, trust, extra costs, ineffective practices, and inefficiency, among others.

Readiness

Nowadays Bankinter does not publish an integrated report, and it looks like it has still a long way to go before maturing the set of processes required to deliver it, in case it will become soon mandatory. We have the perception that a lot of actions are being initiated in the bank and we had the possibility to personally meet people of the management very committed to sustainability and very capable to drive the company towards it. Nonetheless the resources devoted to the reporting process and, as a whole, to the integration of sustainability into the company may become insufficient. The overall observation confirms that very few people are regularly devoting efforts to connect sustainability with the daily business activities and decision-making, even if the commitment is remarkable and a sustainability roadmap is created. Even if the situation is supposed to progressively improve thanks to the sustainability policy launch, the CSR department needs more influence in the decision-making process of the company. Initiatives often are still outsourced to

external parties, which is a considerable effort and investment for the company to create positive impacts, but leaving to others the implementation of fundamental components for the integration of sustainability into the business model may lead the leadership to overlook the fundamental aspects of the functioning of a action and its integration with other aspects. In a word, an internal decision maker may miss to identify in depth where and how a sustainability strategy connect to the company value creation. If the company fails to identify where the intangible value of the human, environmental, social, and intellectual capitals become tangible for its operations, and consequently where and how they generates great performance, rather initiatives on ESG may represent additional costs or a burden for the company with no evident additional benefits for its performance, nor for society.

In addition, the CSR report itself lacks of fundamental integrated reporting requirements. Firstly, when talking about governance, remuneration of top managers and the relation of it with the one of the workforce should be disclosed. Then, and fundamentally, the stakeholder engagement process need to be described more in detail, with evidence of how it influences positively decision making; Integrated report is also concise and require to disclose both positive and negative impacts. For example we are able to see if the company invest in renewables, but there is no comparison with other investments related with "non-ethical activities". The reader has not a complete picture of how the Bank impacts society. Finally, an integrated report would require the Bank to show past, present and future outlook of the company sustainability commitment to provide the reader a better metric to take decisions. Right now Bankinters' sustainability report, more than showing people how and to what extent the business relates with society and the environment, shows how much the Bank invests in positive actions, but the results are not measured in terms of societal impact.

To summarize the above reflection, the level of readiness of the company in relation with this risk is considered to be equal to **application (2).**

Sensitivity

According to different sources that analyze the trends in reporting, Spain is among the countries that most companies report non-financial information world-wide. Thanks to the entry into force of the Sustainable Economy Law (approved 15th February 2011), Spanish Limited Corporations and big companies with 1000 or more employees are requited to report on ESG. It is presumable that, in case the legislative evolution about reporting of other European countries or if the Commission pushes to make mandatory the integrated reporting, Spanish government may easily align.

Spanish society pressure on business is constantly growing, and in particular on the banking sector for the already mentioned reasons. In case the regulation changes, the financial sector will be between the most under scrutiny. Finally, among the financial sector in Spain, there are experts who already think that integrating reporting is an important part of the coming future regarding corporation mandatory requirements: BBVA recently launched in its web a platform which has been greeted as a successful dynamic integrated report.

Consequently, given the condition described, we can consider Bankinter exposed to a sensitivity level equal to **high (1)** in relation with this risk.

4.4.3. Mandatory Management Standards and Investment Policies related with Climate Change

One of the first management standards with recognised global application was launched in 1987, when the International Organization for Standardization (ISO) released ISO 9000, a standard specifying the requirements of a quality management system (QMS) with the basic objective to assure that a company has an efficient organization structure together with low failure costs. To meet its objective of creating a single unified market by the end of 1992, the European Community implemented several directives in order to establish quality related regulations that cover a broad range of business activities and thousands of products accessing the common market (Quality Digest, 2006).

Since then the market requires the use of a quality management system as part of the conformity assessment. Even if the quality control system does not have to be ISO 9000, the standard is the most widely used and represent a point of reference in term of quality management. Similarly, following the growing concern related with environmental degradation and climate change, the International Organization for Standardization created in 1996 a standard to improve the environmental performance of a company, the ISO 14000 series. The European Union went further with the launch of a more strict Eco-Management and Audit Scheme (EMAS). More recently also an international standard for the implementation of a Corporate Social Responsibility management system has been released in 2010 (ISO 26000).

In general, most of the operational and management standards available for industries today are deployed in a voluntary basis. Nonetheless, since they are increasingly becoming common practice in every sector as well as in every country, the regulator is increasingly attentive to them when stating new rules. In addition, even if in theory the standards that relate with climate change are mostly voluntary, they assume fundamental importance in clients, procurement, and public services decisions.

The importance that financial institutions hold in relation with the promotion of actions to mitigate climate change has led also this sector to adjust to the trend that sees a more inclusive environmental management: in addition to the increasing application of standards inside the sector's companies, global institutions and sectorial agreements are generating important principles of investment based on environmental and social sustainability. For instance IFC's Performance Standard on Environmental and Social Sustainability is devoted to guide clients toward the identification of risks and impacts of projects and the measures to mitigate, manage, or avoid those risks. In case of direct investment, the principles are mandatory (IFC, 2012). Moreover, based on the mentioned initiative the Equator Principles have been agreed. Nowadays 77 entities have committed, claiming that no loans will be provided to clients who do not prove that the adequate measures are in place to manage and respond adequately to social and environmental risks. Finally in 2008 the Climate Group in collaboration with some of the world leader financial institution launched the Climate Principles, according to which every organization that commit to them must "actively managing climate change across the full range of financial products and services, including: research activities; asset management; retail banking; insurance and re-insurance; corporate banking; investment banking and markets; and project finance" (The Climate Group).

To summarize, there is no doubt that climate change policy making related with the sector is continuously growing, reflecting the societal growing concern. The phenomenon will influence a little the company performance due to more stringent internal standards, yet consistently in term of investment decision. Even if most of the initiatives are still in a voluntary basis environmental responsible investment is expected to become the norm, enabling the condition for the regulator to make it officially mandatory. In addition, the financial sector is the most likely to be regulated after the current financial crisis and corporate scandals. Due to those considerations, the probability of the risk to strike is **high (> 50 % probability).**

Readiness

Bankinter is at the forefront regarding carbon management, which is the direct operational factor that most relates with climate change. The monitoring and evaluation of the carbon footprint has enabled annual improvement in energy consumption and general company performance in term of emissions, considering the indicator "tones of CO_2eq per employee", one of the lowest in the sector in Spain. The company adds an environmental management system in the main buildings, covering 18.5 % of employees with certification, in line with competitors average. To support environmental management there is the Sustainability Committee installed in 2009 and the company's environmental policy. However, the last is superficial in content, since it mentions commitment to mitigate climate change but it does not specify the utilization of criteria of responsible investment

to screening clients and projects on environmental performance. We have been reassured in direct conversation that the Bank is working on creating a framework for integrating ESG criteria into investment decisions and due diligence though.

Compared to national and international competitors, the current lack of responsible investment criteria is also supported by the fact that the Bank is not a formal signatory of the Equator Principles. It is true that the company is already familiar with the management of funds that consider for instance the promotion of alternative energy as responsible criteria, but as we speak no formal policy is provided. We suggest also to provide further public information to enable stakeholders to understand the environmental positive impacts of such funds for investors and society, or which benefits the funds bring eventually to the company's bottom line in relation with other assets. The link between responsible investment and company performance is not clear for the reader of the company's sustainability report.

Moreover Bankinter does not apply yet the ISO 26000 standard to guide systematically environmental and social governance, which is increasingly applied by peers.

Remarkably the bank owns holdings related with sustainable activities, as renewable energy assets and the Climate Change Capital Private Equity Fund, which invest in non listed companies in the clean technology sector (Bankinter, 2011b). Yet, as for the assets managed with responsible criteria, no clear comparison is enabled in relation with holdings in "less sustainable activities".

To conclude, while the company can claim to have a very effective management of activities that affect climate change directly, the same score cannot be applied if indirect contribution is considered, overall when dealing with companies' financing, assets management and equity investments, even if they do not represent a big share of the company's activities. Since for a service sector as the financial the most impacts come indirectly, to be really prepared to intensifying regulations we believe that further systematic action should be taken, embracing the implementation of systems that allow to take decisions in a more integrated and sustainable way. Thus, waiting for the evolution of the sustainability policy, today the readiness evaluation is equal to **application (2).**

Sensitivity

The Spanish economy is certainly not in the most flourishing period, and climate change together with the related already existent regulations and the expected ones are influencing companies' performance. We recall also for the sensitivity analysis of this risk the fact that the Spanish economy is very energy intensive, so that stricter regulations for management standards and environmental performance will be a burden for most sectors.

In addition, being today the financial sector under severe scrutiny, in Spain the general public strongly demands a switch towards a more ethical governance and environmental accountability. After recent scandals as the case of Bankia, every direct or indirect contribution to societal problems needs to be fully addressed in order to assure the license to operate. Climate change is obviously among those societal concerns. The context is even worse if we consider that transparency in investment is quite low, and it does not help to support the sector credibility related with environmental friendly investments. For instance there is generally the necessity to disclose both positive and negative impacts of investments, as well as the weight that eco-friendly portfolios have in the whole portfolio of the Bank. To mention a recent report from a nonprofit environmental organization, Setem, banks in Spain invested more than €1,000 million in the weapon industry during the last 5 years (Setem, 2012). This is a huge amount compared to what usually is devoted to socially responsible investments.

The sensitivity to the risk for Bankinter may grow further if we have a look at its competitors: main Spanish Banks already undertake diversified management standards to deliver good environmental performance and also participate in multilateral sectorial voluntary initiatives, including the Equator Principles and the Principles for Responsible Investment (PRI).

Consequently, we consider the overall company's sensitivity to the risk being equal to **high (1).**

4.4.4. Litigation Risk due to Investment Negligence

With the litigation risk we consider the possibility of a financial institution to incur in a dispute that may result in a legal case, due to the legal liabilities that derive from fiduciary duty. By definition fiduciary duty refers to the "legal obligation on one party to act in the best interest of another. The obligated party is typically a fiduciary that is, someone entrusted with the care of money and/or property. Also called fiduciary obligation" (BusinessDictionary, 2012a).

Since a corporation enjoys a legal structure with limited liability towards shareholders, the above definition applies overall for the management of third part funds, as pension funds, social

responsible investment funds, and other similar products. According to the IFC, when a financial institution acts as an investment manager through services which involve third party funds, "it is bound in its professional discretion by law, contract, and negligence". A third party fund sold by the company, being a paid contract for services, requires the institution to inform their clients on every risk which may undermine performance and influence decision-making. Failure to consider ESG issues "could lead to a very real risk that they will be sued for negligence on the ground that they failed to discharge their professional duty of care to the client" (IFC, 2010).

Consequently the fiduciaries are expected to integrate into investment decisions all the risks and opportunities that may influence long-term investment´s performance. Since climate change is a serious threat for long-term investment (but also it can affect short-term), "financial institutions should take steps to understand the materiality of climate-change risks to their own long-term value. If an institution does not have regard for climate-change impacts on long-term value creation, it may be considered not to be acting in the best interests of its investors" (IFC, 2010).

In addition, also third parties may come to sue a financial institution if damage to properties is attributable to the implementation and financing of projects that have not considered properly the risks related with climate change. According to the above reflections we consider the probability of the risk to strike the sector as **likely (> 50 % probability).**

Readiness

As already discussed, neither investment funds nor project financing are the main activities of Bankinter, making the company's exposure to the risk in question quite reduced. Eventually the Bank may be not vulnerable to litigation cases related with climate change even if extreme events strike the country abruptly, as the big share of company's functioning is occupied by mortgage loans. Consequently the lack of preventive actions to mitigate the risks is justified. Yet, in concordance with the previous risk, if we analyze the third party investment funds the company manages, only a restricted part is declared to be related with social responsible investment criteria (€13.2 million against €229.6 million – Bankinter, 2011a). This situation tells us that regardless of the importance of the risk for the company, it is not totally safe in the case the risk occurs. Thus we consider the readiness evaluation equal to **application (2)**. This consideration is also supported by the fact that, even if a dispute do not result in a legal case, the performance of the company may still suffer from this risk, as it may evolve in a reputation crisis emerged by the public criticism that considers the company irresponsible for its investment decisions.

Sensitivity

It is recognized that nowadays everywhere in the planet experts are beginning to acknowledge that enough information about climate patterns is accessible, so that it not only may influence decision making, but also it means that climate change may be close to attain "legal significance" in court (LCCP, 2009). Actually, there are already cases in which judicial decisions have been influenced by climate change: for instance in Australia the New South Wales Court of Appeal found that "although local law regarding environmental planning and assessment does not expressly require that principles of ecologically sustainable development (ESD) be taken into account by a consent authority, the "public interest" is broad enough to embrace ESD principles. The court held that ESD principles are likely to be an element of public interest in relation to most planning decisions in coastal areas, and failure to consider ESD would provide strong evidence of failure to consider the public interest" (IFC, 2010). This context is not probable in Spain and central Europe, where systems based on civil law principles (from the Roman Empire, opposed to Common Law Systems of Anglo-Saxon origin) consider that updates to the legislation must be made through official procedure as parliamentary processes. Therefore, judges cannot legislate themselves but they must make verdicts based only on existing acts and bills. They however may eventually analyze past judicial interpretations of the existing law as guideline to advice decision.

To summarize, there is no doubt that the physical effects of climate change has led companies to be more sensitive to negligence risk, yet in most cases legislation should be updated to allow a court considering climate change care as decisive factor of judgment.

In the specific case of Bankinter, we recognize that, due to the Spanish legal system and the nature of the Bank's operational activities, its sensitivity to the risk remain **low (3)**, meaning that the impact on company performance will be eventually contained.

4.5. Findings from Risk Analysis Framework Tool

Graph 16: Risk Matrix

Source: own graph

According to the matrix and the scoring board it can be seen that the risks Bankinter should give higher priority to improve its resilience and to look for possible opportunities are: default risk, financing availability, reputation and investment risk. That is because these risks show low readiness, high sensitivity, high probability to happen and high weight relevance.

Table 2: Outcomes of the Risk Analysis

Risks	Sensitivity	Readiness	Weighting Factor	Weighted Sensitivity	Weighted Readiness	Bubble Size
Default risk	2	1	0.39	5.13	2.56	0.8
Financing availability	2	1	0.33	6.06	3.03	0.8
Reputation	1	2	0.32	3.13	6.25	0.8
Investment	1	2	0.3	3.33	6.67	1.5
Integrated Reporting	1	2	0.27	3.70	7.41	1.5
Return on investment	2	2	0.36	5.56	5.56	0.8
Management System	1	2	0.22	4.55	9.09	0.8
Terms of debt	2	3	0.35	5.71	8.57	1.5
Shareholder	2	2	0.28	7.14	7.14	0.8
Competition	2	3	0.3	6.67	10.00	1.5
Carbon Tax/EU ETS	2	3	0.25	8.00	12.00	0.4
HR performance	3	3	0.3	10.00	10.00	0.4
Negligence	3	2	0.22	13.64	9.09	0.8
Information Technology	1	3	0.13	7.69	23.08	1.5
Infrastructure	3	1	0.09	33.33	11.11	1.5
Procurement	1	4	0.09	11.11	44.44	0.8
Insurance	2	3	0.1	20.00	30.00	0.8
Employees heath	2	3	0.09	22.22	33.33	0.4

Source: own table

5. Financial Institution Insight

The financial institutions we researched recognize climate change as an important topic to deal with. They are aware that their sector has an indirect impact on climate change. Today the banks follow some standard procedures on voluntary basis, especially to avoid reputation and litigation issues. Nonetheless these standards cover topics like the environmental impact rather than its connection with climate change impact. Climate change is mainly acknowledged as a mature issue on the CSR strategy but not integrated in the way business operates on a daily basis neither in the employees´ awareness.

We found that financial institutions nicely state on their website their actions to mitigate climate change, but how much action do they really take on a daily basis? How much do they consider climate change in their day-to-day operations, as a current and future issue?

1. **In order to have insider information and a better understanding of the view of financial institution on climate change and their responsiveness, we talked to various representatives of the financial sector and asked them the following questions:**

2. **How much the banking sector is affected and affects Climate Change?**

3. **What are the current market expectations for Spanish Banks to develop initiatives that address Climate Change?**

4. **Is there a necessity for Spanish banks to be more proactive?**

5. **In your view, is climate change risk integrated in the financial risk analysis of a Bank? Does a banks analyst consider climate change as a real problem in the future?**

How much the banking sector is affected and affects Climate Change?

Regarding how much the banking sector affects climate change is considered very little according to our consulted financial institutions representatives. On the other hand according to them climate change affects the banking sector concerning reputational issues and increasing credit risk if borrower default payments. Moreover it affects them in a positive way on how they use their resources such as energy, water and paper as well as saving energy, recycling and decrease CO_2 emissions.

Overall the interviewees claimed that the banks follow the legal boundaries, but they realized that there should be more regulation in place. At the same time there are differences between countries and regulatory frameworks. In addition sometimes financial institutions do not know how to use environmental legal framework either.

However most of them follow on voluntary basis the Equator Principles. However since they are voluntary and reach only for loans above US$10 million there is a gap. We can see a lack of a general and obligatory legal framework for general finance.

What are the current market expectations for Spanish Banks to develop initiatives that address Climate Change?

Currently there are no expectations for Spanish banks to develop such initiatives. Especially because banks in Spain are expected to follow the Basel framework and Basel I, II and III do not address climate change, so when banks do something towards addressing climate change their actions are totally voluntary. Like following the UNEP FI (United Nations Environment Program Finance Initiative) which focuses on integrating sustainability principles into all levels of operations in financial institutions and following "environmental, social and governance factors (or ESG) in risk analyses" (Wikipedia, 2012b). But not even the UNEP FI focuses on climate change and regulators do not talk about it. Furthermore current priorities from the regulators are focus on the whole country default so climate change becomes a faraway issue priority. Hence this explains the low expectations for Spanish banks to be proactive on this topic.

Is there a necessity for Spanish banks to be more proactive?

Yes, they definitely should be more proactive. The representatives believe that now is the right time to start to work on this topic, and put pressure on regulations to come and push for mandatory changes because banks are not really concerned with climate change.

One bank has held a focus group with clients, companies, members of the public and it showed them around 10 social impacts of the bank that it could talk about and address, including financing renewable energy and other topics related to the environment but none of the members of the focus group recognized these issues as priority. So the stakeholders also tend to see issues related to climate change as a faraway issue or are unable to connect how addressing climate change can benefit them in the short term.

So right now if banks do some activity to mitigate climate change it is also because they see an economic benefit out of these, instead of considering it as a risk. So once again the financial sector needs extra regulations.

In your view, is climate change risk integrated in the financial risk analysis of a Bank? Does a financial risk analyst consider climate change as a real problem in the future?

Still there is a huge lack of integrating climate change issues into the financial risk analysis. The CSR department of one of our consulted banks worked out a credit rating which includes climate change impact dimensions. However the bank risk analysts find difficulties to use it in the way it should be used. So today we still have a deep problem in awareness from financial analysts. To change this scenario we need the financial regulators to do something about it.

In another bank the financial risk analysts do not integrate these risks. Only specialist investment managers who consider environmental aspects are taking this type of investment risk into account and discriminate based on business policies to reduce pollution and promote green activities.

Our group could not find more information on other risk analysis which takes into consideration climate change issues.

6. Opportunities and Recommendations

Climate change is a threat but at the same time an opportunity for business. It depends on how well the company handles this issue and if it has the resources and ability to turn the situation into an advantage to develop a business case. After analyzing the risks, which climate change can pose on financial institutions recommendations and business opportunities can be drawn out of this research. An opportunity can be defined as an "[e]xploitable set of circumstances with uncertain outcome, requiring commitment of resources and involving exposure to risk" (BusinessDictionary, 2012b). Now is an appropriate time for banks which are in a good position to exploit the set of circumstances to achieve the goal of an integrated climate strategy. This requires commitment and involves risks, but also promises advancement and success.

As mentioned before, the proactive actions taken by banks will help them to manage the climate change risks well, create business and competitive advantage opportunities; pursue environmentally and socially sustainable growth strategies and avoid costs associated with inaction. For businesses climate change must be profitable and all measures taken should end in a better overall performance of the financial institution. Since the topic is complex and affects all division of a company it has to be taken seriously. Some main opportunities for financial institutions arise only, if they are able to really integrate a climate strategy into their value chain. Still in times of crisis this topic is not very high on the agenda, since companies struggle to survive and people fear for their safety and want to satisfy existential needs. Climate change does not seem to have a quick and severe impact and gets neglected within many institutions. This short-termism will most likely result in huge financial losses.

The opportunities and the associated recommendations and measures could be clusters with different methods like for example the SWOT or the PESTEL analysis, according to the flow chart of Bankinter or how they enhance the "Five Kinds of Capital" defined by Neva R. Goodwin for the "Useful Concepts for Sustainable Development". Taking all this into account we decided to cluster it according to financial and non-financial factors, to make it quick to grasp and easy to understand for the financial sector, since money is its core business. The overall goal of all this measures and efforts to integrate climate change issues into business activities and processes is to obtain a better performance of the company itself. This goal can be subdivided into two main categories: financial and non-financial performance. These categories again, comprise more specific opportunities like for example new lines of business. Some of the opportunities are closely linked to a specific risk, others are more general and the bank can seize the opportunity by implementing different measures.

6.1. Main Opportunities

The main opportunities which can be derived by our analysis are:

- **Increase in profit** due to new business lines, new investment opportunities and fewer defaults due to climate change.

- **Cost reduction** due to efficient resource consumption, and cost avoidance associated with inaction, fewer legal fees to pay, and reduction of litigation risks.

- **Competitive advantage** including a higher brand value and reputation composed by more transparency, consistency and a stronger emotional bond between the company and its stakeholders, and a strong position as pioneer and innovator.

- **Higher resilience** in crisis times and against climate shocks, thanks to the ability to attract and retain employees, clients and investors and an increased public acceptance, again associated with a transparent and consistent climate policy and strategy. And finally a higher physical resilience thanks to emergency plans.

The following graph gives a summary of the main opportunities including the subcategories. Behind every of this subcategory are measures which can be taken by the bank. These actions make it possible to take advantage of the opportunities.

Graph 17: Overview of Opportunities

Source: own graph

Even though we established a non-financial performance category, a closer look reveals that these opportunities are also linked to the financial performance. Most times the financial benefit for the company cannot be derived easily, because they interact and influence each other in dynamic ways. The following section will explain the different categories in more depth.

6.2. Financial Performance

The opportunities influencing directly the financial performance can be divided into opportunities which have a positive effect on the profit or a negative impact on the costs, since the basic function is: Revenue = Profit – Costs

Graph 18: Overview of Opportunities driving the Financial Performance

Source: own graph

Increase in profit

The opportunities of new business lines and new investment possibilities are the result of analyzing the investment risk and can be seen from the perspective of the bank a) to develop and offer new financial products and services or b) to see new investment opportunities for the bank itself.

The new business lines are financial products and services which can be developed by the bank to support the transition to a low carbon economy and satisfy the growing demand for "climate

friendly" financial products and services. There are vast opportunities for banks to launch and specialize in products and services, these could for example be SRI funds, investments into green technology, support of the development of new clean energy sources, net-emissions current account, and incentives and obligations within the lending process to promote energy efficiency measures e.g. by the construction of a new house. Additionally In the case of Bankinter and other banks owning insurance companies, new insurance products can be developed. This also contributes to diversify product lines and a higher resilience in crisis times.

The new investment opportunities result among other factors from the inadequate public funding for adaptation measures (Acclimatise, 2010) and a huge amount of new climate friendly businesses. Additionally banks should consider the effects of GHG constraints and climate change risk impacts on investment that are not climate-resilient, since they may in the worst case fail altogether. Another expanding sector is emission trading, which grew from a total of $11 billion in 2005 to $141.09 billion in 2010 (Carbon Finance, 2011). To take advantage of this opportunity the bank needs in-house expertise, as this topic is diverse and could contain some obstacles if not handled right. Especially now, there are some uncertainties about the post-2012 legal framework, the last year of the Kyoto Protocol. A very innovative step would be to integrate climate change adaptation and mitigation into business processes and calculate the emissions arising from the investments. Until now only few financial institution integrate GHG emissions into their decisions and none of the banks researched has calculated the carbon footprint of its loans and investments (Cogan, D., 2009).

Furthermore one investment opportunity derived from the reputation risk is related to the European Roadmap, which sets out a strategy to cut out most of Europe's greenhouse gas emissions by 80 % by 2050. Even though there is no legal framework to apply this Roadmap to Spain now, Spanish banks should take it into account and look for investment opportunities. Its implementation will create large investments in renewable energy projects, energy efficiency, electric vehicles, building renovation, technology, smart grids, etc. Bankinter should be attentive to directives of the European Roadmap for new business lines and investment opportunities to serve the demand of the green economy products and services.

A further opportunity arising from political changes is the Royal Decree, approved by the Council of Minister, which regulates a carbon fund for sustainable economic development. This development aims to be achieved through supporting the transition of production system in the country towards a model the emits less GHG, as well as, through boosting business activities that fights climate change in the way to contribute to Spanish GHG target reduction. Therefore there are opportunities for financial institutions to be involved in new ventures generated by the Royal Decree and its mandate.

The third opportunity we identified is liked with the default risk due to climate change. If the bank screens its clients additionally on ESG factors and GHG emissions, the awareness and vulnerability to climate change, management systems in place and their maturity, it can reduce its defaults due to climate change issues and avoid losses. For instance financing coal fire plants now could create huge losses, if they have to go into early retirement due to regulations or public pressure (urgewald et al., 2011).

Cost reduction

Cost reductions can again be divided into amounts actually saved (e.g. less resource consumption, lower insurance rate) or amounts which could be avoided because of actions the company took (e.g. avoidance of legal fees due to incompliance).

The amounts actually saved are closely linked with efficient resource consumption within the business processes, in the case of financial institutions mainly water and electricity. To obtain these cost reductions we recommend after our analysis of the operational risk to Bankinter following measures:

- Implement a water management system to reduce the consumption, increase efficiency and take advantage of water reutilization.

- Promote water and energy consumption reductions in the offices, since climate change will increase the demand and price volatility of both.

Additionally to drive down costs in future Bankinter should introduce systematically ESG criteria to assess project financing and other investments to integrate into decision making. This will help to reduce the costs associated with contract infringements or non compliance due to climate change.

The financial institution could also avoid costs associated with inaction, if it takes proactive and determined action to combat climate change. Like the Stern report revealed it is cheaper to implement mitigation measures than to pay for adaptation afterwards. Since a bank has mainly an indirect impact its mitigation measures are closely linked with its lending and investment activities. If it does this, the bill is lower it has to pay later for adaptation. To really reduce the adaptation costs a sector approach of all financial institutions is needed. This can be in form of advocating for regulations, stronger voluntary commitments and standards for the sector to assess climate change impacts. To further avoid indirect costs due to reputational loss, the topic of climate change has to be truly integrated. It must not look like actions without connection and strategy which could lead to the perception of “green washing”.

The third opportunity identified related to cost reduction is connected with the legal and regulatory risk. Actions taken now to combat climate change will drive down costs in future, because most probably regulations and accountability for financial institutions will increase. If a bank is not prepared to publish an integrated report, follow new regulations or assess ESG factors in its investments and asset management activities additional costs will arise. Additionally climate change may bring litigation issues for a financial institution within its project financing activity, if third party property is damaged and the bank did not consider the risk adequately.

6.3. Non-Financial Performance

Within the category of opportunities boosting the non-financial performance we identified the competitive advantage and the higher resilience as the main opportunities, fostered by many results of different measures a bank can implement.

Graph 19: Overview of Opportunities driving the Non-Financial Performance

Source: own graph

Competitive Advantage

A company can gain a strategic advantage and strengthen its position in the market if it addresses upcoming topics quickly and give answers to stakeholder questions. Recently an increased number of banks started various initiatives to respond to climate change and to achieve carbon emission reductions. To keep up with this development every bank has to position itself in the market and combine practical considerations of managing their own GHG emissions with the broader implications of how climate change affects their competitiveness, marketplace position, operational strategies, and ultimately, their financial bottom lines. Managing the climate change risks more effectively than others within the financial sector leads to a competitive advantage including a higher brand value and increased reputation. To be able to influence reputation it is helpful to define it first and to mention why it is important.

Reputation is a complex issue and is composed of many different factors. In simplified terms it can be described as the emotional bond between the customer and the company and strongly influences the buying decisions. In the financial sector reputation plays an important role, since banks rely on the trust of the people to commit money to them and believe that the money is safe there. In case of direct or indirect negative impacts caused by climate catastrophes, the bank needs policies and systems in place to act appropriate in order to not have its reputation damaged. Hence the recommendation is to have policies and systems (including risk analysis) in place to prevent reputation loss due climate change impacts.

To influence the conjunction of circumstances which influence the reputation, a bank has to operate in a transparent and consistent way and deliver the promise it makes. Bankinter focuses strongly on innovation and puts itself into the pressure to constantly develop new financial products and services, to deliver this promise. Hence it would be an advantage to be a pioneer in the financial sector to offer financial products and services promoting low carbon economy (which is again linked to the financial performance). To reach this we recommend out of our analysis following measures to Bankinter:

- Assign more resource and more importance to the CSR department in order to be integrated better into corporate strategy and to have a higher influence on strategic decisions.

- Offer training for employees, portfolio managers and decision makers to fully understand business risks deriving from climate change.

- Add climate change considerations into the management systems in place with more and detailed indicators that enable to assess performance for the company itself and its assets in relation with sustainability along time.

- Integrate expertise regarding environmental laws and policies, as well as of emission trading, which may actually become an opportunity of income as a product and service.

- Practice integrated reporting and take advantage of the opportunity to demonstrate the linkage between sustainability performance and business value. The report should show that the business understands that the only viable condition for it to succeed along time is that the systems in which it is part, being society and the biosphere, are healthy and prosperous, so that it aligns its strategy toward its integration in such systems.

- Disclose info also on "less sustainable" investment in order to enable comparison.

- Give importance to the indirect contribution of climate change through the activity of financing, investment on equities, project financing, asset management by creating a set of criteria to drive decision.

- Follow voluntary standards and principles which avoid investing and financing ventures which may aggravate climate change and provoke environment negative impact, like the Equator Principles or Principles for Responsible Investment.

- Create partnerships in the financial sector to promote the transition to a low carbon economy, involving collaboration with stakeholders.

- Refuse strictly to finance climate killers.

All this measures will increase reputation and help Bankinter to strengthen its innovative brand as a pioneer in the Spanish market.

Higher Resilience

Resilience is "[t]he ability of a system to recover from the effect of an extreme load that may have caused harm" (Willows, R. I., R. K. Cornell, 2003). This concept of resilience can be explained with the following two system attributes:

- "The amount of disturbance a system can absorb and still remain within the same state or domain of attraction;
- The degree to which the system is capable of self-organisation" (Klein et al. 2004).

The resilience for a financial institution is determined by its intangible and its physical resilience. The intangible resilience is related to the intangible values a bank can create and the ability it has to retain and attract employees, clients and investors and as well its public acceptance, since all this can help the company to resist and/or recover after a climate shock on its system. The physical resilience is related to its physical infrastructure like buildings, IT systems and the health of its employees.

To increase its intangible resilience and take advantage of the opportunity to have a higher resilience in general a bank can focus on its human capital to increase effectiveness, productivity (links to competitive advantage), employee morale, customer service and satisfaction and in the end its share price (links to financial performance). Today employees also are more aware of business accountability and responsibility towards sustainability of our planet and expect companies' responsive behavior towards climate change. It is also recognized that environmentally responsible companies can attract new talent workforce, as well as, motivate and retain current employees. Recommended measures would be to consult and involve ideas from employees in order to gain their participation in the innovation process of products and services which intends to adapt and mitigate climate change. These measures are directly linked to the HR performance risk.

To increase the attractiveness for shareholders concerned about climate change and to obtain the license to operate of the general public a bank has to accept its responsibility to address climate risk and needs to have policies and procedures in place to evaluate the financial consequences of climate change issues. A bank may find it helpful to answer its shareholders' questions to uncover important strategic and operational issues related to climate change. In addition financial institutions that are already addressing such issues may find their reputations boosted by making such efforts and strategy public. Very important here is to be transparent and communicate to

shareholders and the general public about banks' policies and procedures to respond and tackle climate change. These measures are directly linked to the shareholder risk.

Higher resilience of the physical infrastructure against climate shocks can be achieved due to action and emergency plans for climate shocks. After analyzing the operational risks for Bankinter derived by climate change we recommend to implement following measures:

- Invest in projects which include damage in infrastructures in their risks, demand the inclusion of these requirements in all its projects.

- Include in its environmental analysis of new investments and own buildings possible problems derived from climate change such as erosion or corrosion.

- Include strategies to manage the climate change risk in the location of its buildings or investment and use materials which are more resistant to flood, higher temperatures and hard conditions.

Bankinter is participating in preventive campaigns like for flu vaccination, in campaigns to improve health and health education (smoking cessation), and implemented measures to improve the health of its employees. Still to increase the physical resilience of the workforce, the Bank should promote more courses for its employees and staff in climate change adaptation and prevention of new diseases from Africa in particular malaria, dengue etc. It is likely that employees aware of the direct relationship between climate change and health, could reduce the risk by the implementation of mitigation and adaptation measures by their own.

6.4. Summary of Opportunities

As it can be seen in this analysis the opportunities are all related directly or indirectly to each other. This visualized structure is one possibility to get clearer about the relations of opportunities and the corresponding measures. The likely benefits of the introduced measures are an increase in profit, cost reduction, a competitive advantage for the company undertaking the recommended measures, and a higher resilience to climate shocks.

The challenge remains to implement a truly integrated climate strategy into all business processes of the value chain. All together means better overall business performance to deliver financial environmental and social value.

7. Conclusion

In times where climate change is a fact and puts further pressure on the socio-economic system of our planet, businesses cannot carry on like usual. They have to consider the affects of climate change on their bottom line but also how their activities contribute to climate change. There are much more variables to consider in the decision making process as there were until now. Furthermore companies are expected to give answers to stakeholder questions and what they do to combat the biggest challenge of humanity.

A sector which is responsible for huge indirect impacts is the financial sector through its lending and investment activities. But until now determined actions and voluntary commitment are missing on the large scale. Responses to climate change are driven with interests to improve reputation and the green image of the bank. None of the biggest banks worldwide clearly states not to invest in carbon-intensive projects (Cogan D., 2008) and none of the banks researched in this report has carried out a comprehensive climate change risk analysis and how it could affect the performance of banks. Some reasons why financial institutions have not being able to identify, assess and ultimately manage a wide range of climate change risks are:

- Inability to see opportunities in the course of responding to climate change.
- Short-termism of businesses.
- Inability to understand the topic in depth.
- Climate change has low priority in crisis times.
- Lack of availability or allocation of resources to invest on climate change responsiveness, including lack of in-house expertise and technical skills on integrating financial risk analysis with environment and GHG emissions impact.

The main reason might be the lack of a legal framework, and the absence of standards, regulation, or principles for analysis, quantification and integration of climate change-related risks into financial institutions' operations and governance. Government and policy makers are not doing enough in applying necessary market regulation in the financial sector in respect to climate change. Basel I, II and III which are the frameworks that banks followed to not mention banks impact on climate change neither the need to address it.

The collapse of the financial markets together with the lack of regulations, made financial institutions not giving an appropriate attention and priority for climate change responsiveness. This point was verified from an insight from The Spanish Association of Banks which stated that regulations governing the activities of financial institutions do not include any specific rule that relates to climate change risk for banks. Not even inside detailed provisions adopted at European Union on solvency and prudential regulation there is a specific regulation of this risk and that there is no provision in the future adoption of legislation on this issue. The reason for this may lie in the perception absence of direct impact on climate change on financial institutions performance. Also in the research it has been proved that big banks state to combat climate change but give priority to high returns and continue to finance carbon-intensive projects.

This could be further seen on the fact that, many banks nowadays stated that they are following the Equator principles, however they do not track nor publish the GHG emissions emitted by their investments and project financing, especially their lending to the coal industry, which is the biggest source of man-made CO_2 emissions.

Integration of CSR measures to mitigate climate change by considering real risk will require financial institutions to remodel their governance systems. These systems should meet the conditions to minimize climate risks while maximizing investments in solutions that mitigate and adapt to climate change. This recognition will require them to adjust their core business activities, to disengage from activities, projects and sectors that significantly contribute to climate change, to effectively manage business sustainability, to examine deeply risks and to materialize beneficial opportunities for the business and society. Finally they should integrate climate change response into business strategic planning in the long term instead of having a short-termism business model.

Conclusions from Rio +20 this year, declares that businesses should not wait until governments find the political will to effectively deal with the climate crisis, therefore expectations from business to take actions to protect the environment is predicted to be higher.

Financial Institutions should place themselves in a serious position to help the society to cope and avoid future aggravation and impacts from and on climate change. They should recognize their key role and their potential to be a part of the solution for one the biggest environment challenges of our planet as banks have the ability like no other sector to reach a large amount of people and shape the future with their decisions.

The intention to develop a climate change risk analysis tool is to help businesses, more precisely the banking sector, to examine their real level of contribution and exposure to climate change. Hence the tool will be able to be used in the application of actions towards not only managing risks but

also on giving directions where to integrate actions into core business activities and long term strategy towards achieving business sustainability in relation to climate change. Thus the tool allows risk analysts and decision makers of the bank to create resilience against risk impacts within the bank operation and strategy. Most importantly it also seeks to demonstrate in which areas the bank can improve its efficiency, as well as, to innovate, to capitalize opportunities and to add value.

The climate change risk analysis tool looks into four main risk categories that the banking sector is more likely to be affected in correlation to climate change impacts. These risk categories are:

1. Credit and financial risk in line with increased credit defaults, uncertainties about terms of debt, lower than expected Return on Investment and problems in financing availability;

2. Strategy risk includes decrease in reputation, loss of competitiveness, poorer HR performance and concerns from shareholders and investors connected with the awareness of climate change issues and uncertainty regarding how the bank is addressing it;

3. Operational risk regarding damage of physical assets, IT infrastructure and changes in conditions for insurance;

4. Legal and regulatory risk related to an increase of regulations and policies to limit emissions and punish practices that are unsustainable.

In order to check the effectiveness of our analytical climate change risk framework tool, it has been tested with a Spanish bank, Bankinter, within its current operation scenario, environment policies and initiatives. Our analysis reveals that the risks Bankinter should give higher priority to improve its resilience and to look for possible opportunities are: default risk, financing availability, reputation and investment risk. That is because these risks show low readiness, high sensitivity, high probability to happen and high weight relevance.

The main recommendations which can be drawn out of this analysis are:

- To implement GHG emissions and further factors impacting (and being affected) climate change into due diligence process;

- Diversify the portfolio where the Bank sources its money from and decrease dependency on Crédit Agricole, which is one of the top 20 banks financing coal fired electricity and coal mining (urgewald et al., 2011), as this may affect negatively financing availability and reputation of Bankinter;

- Truly pursue a climate strategy and implement sustainability aspects into business practice and governance;

- Due to the growing number of client's interest in climate risk management, carbon offsets and socially responsible investment, Bankinter should offer SRI portfolios to diversify its investment and retail product lines even more.

Implementing these measures amongst others, Bankinter can take advantage of the vast opportunities to launch and specialize in products and services, as well as, to integrate climate change adaptation and mitigation into business processes, as an element for the innovation capabilities of a bank.

Now is the time for banks in general to integrate a climate strategy and obtain a better performance of the whole company. This main opportunity can be subdivided into two main categories: financial and non-financial performance. The financial performance can be improved either through a higher profit or lower costs, since the basic function is: Revenue = Profit – Costs. Within the category of opportunities boosting the non-financial performance we identified the competitive advantage and the higher resilience as the main opportunities, fostered by many results of different measures a bank can implement. Some of the opportunities are closely linked to a specific risk, others are more general and the bank can seize the opportunity by implementing different measures.

The financial sector tends to feel "immune" in relation with climate change regulation, since it basically has not relevant direct contribution. Yet, according to our analysis the sector performance may be consistently influenced. There is no doubt that climate change policy making related with the sector is continuously growing, reflecting the societal growing concern. It would be more profitable for banks to act proactively and see the creation of long-term value for society and business itself.

Finally we hope our developed risk analysis tool can help to close this gap and will be used and implemented in many financial institutions to support them to assess and manage the risks climate change will pose on them.

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Instituto de continuidad. http://www.institutodecontinuidad.com/presentacion/

Instituto para la Diversificación y Ahorro de la Energía, IDAE http://www.idae.es/

Ministry of Industry, Tourism and Trade. http://www.mityc.es/energia/en-US/Paginas/Index.aspx

Organization for Economic Co-operation and Development http://www.oecd.org/

Red eléctrica de España – REE www.ree.es

The Climate Group http://www.theclimategroup.org/programs/the-climate-principles/

The Equator Principles http://www.equator-principles.com/

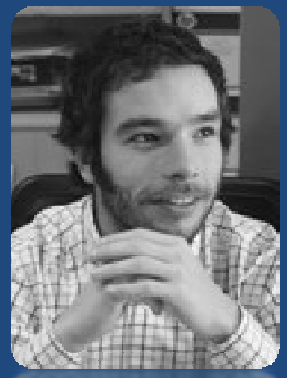
Predict risks.
Avoid impacts.
See Opportunities.

Integrated
Climate Change
Risk Analysis for the
Financial Sector

Core Values and Team Members

In Collaboration with

Kepa Solaun &
Fernando Liaño,
Factor CO_2



Raquel Azcárraga,
Bankinter

The Need to Act

"Climate change is real. The science is compelling. And the longer we wait, the harder the problem will be to solve."

Senator John Kerry

Introduction

Climate Change is Real

http://www.youtube.com/watch?v=FIhnDvb7Exo

The Role of Banks

- Feel not accountable for their GHG emissions
- Highest impact is indirect through:
  - lending,
  - Investments, and
  - asset management activities

The Need

- A tool where banks can identify risks posed by climate change and the level of gravity
- Some reasons for the gap:
  - Lack of technical skills
  - Lack of availability or allocation of resources
  - Low priority
  - Inability to see opportunities
  - Lack of Regulations and Industry Standards

Our Intention

- Examine the real level of contribution and exposure of financial institutions

- Tool:
  - managing risks
  - giving directions where to integrate actions
  - long term strategy
  - areas of improvement

The Way we Innovate

"Just as energy is the basis of life itself, and ideas the source of innovation, so is innovation the vital spark of all human change, improvement and progress"

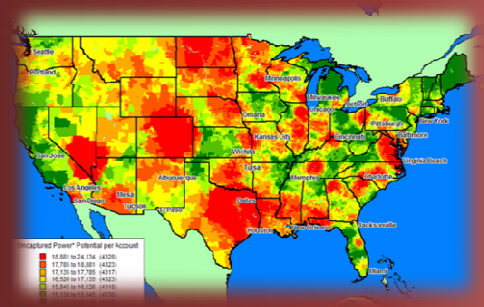
Ted Levitt

Methodology

The Way we Innovate

Risk Analysis

Climate Change



Business

Territory

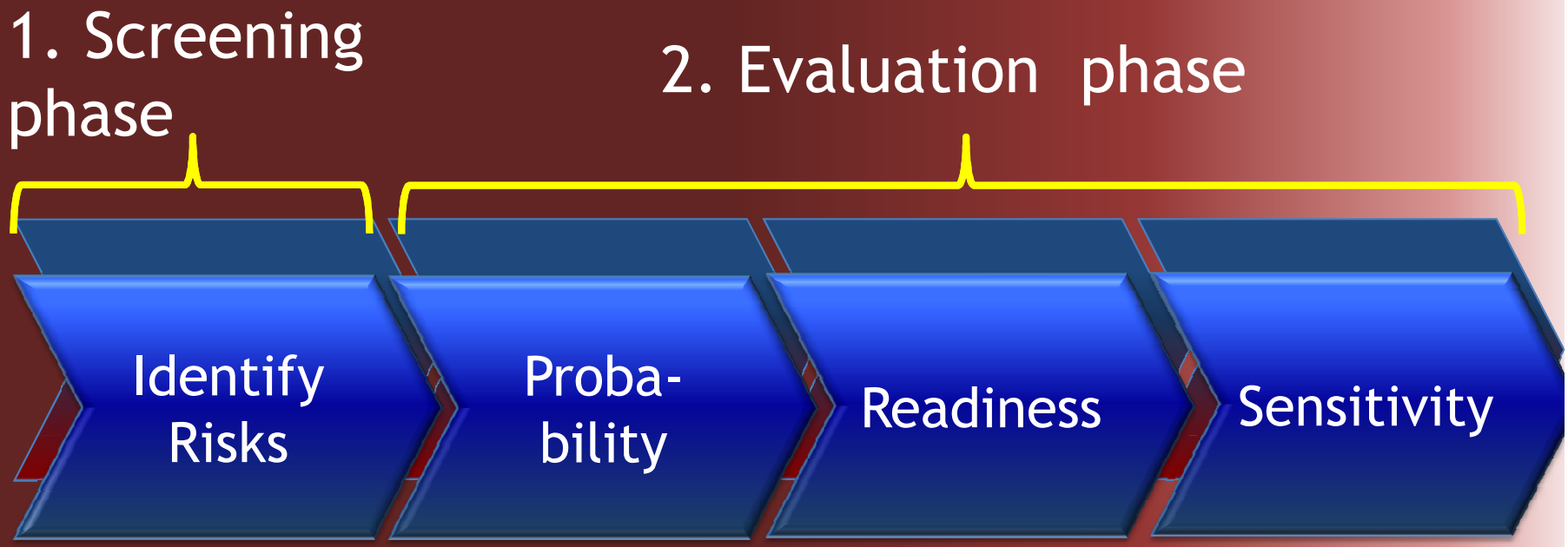
Threats and opportunities

Vulnerability

Climate Change Risk Analysis

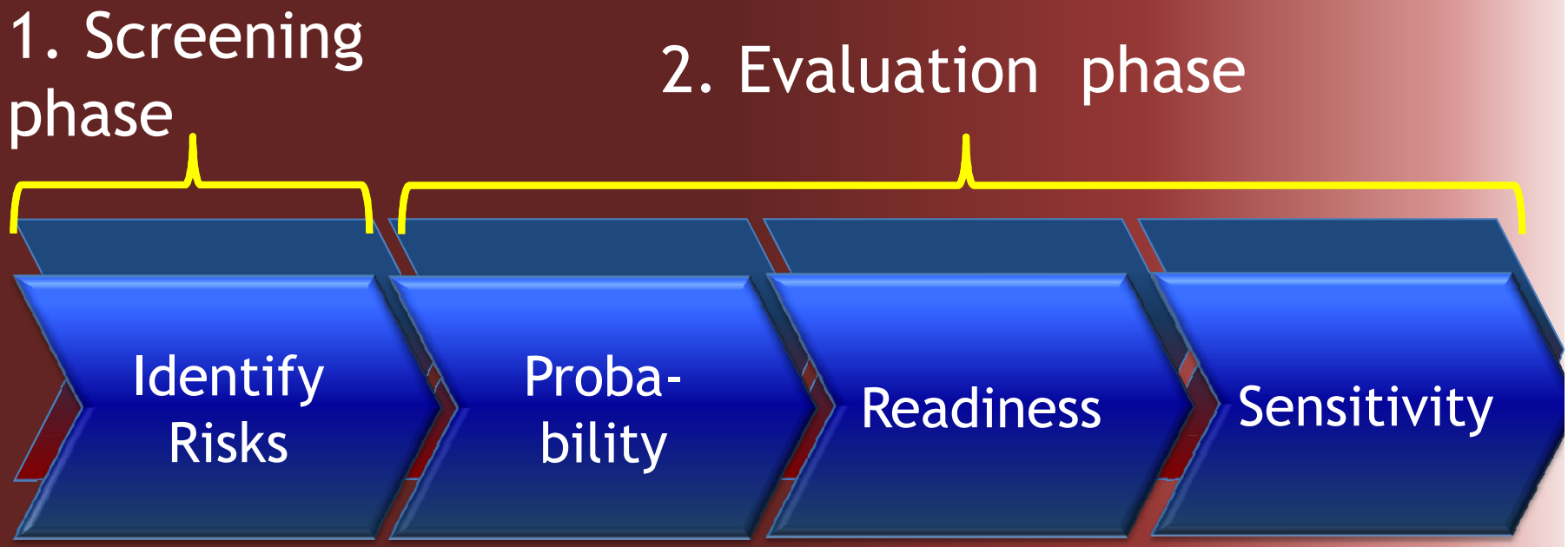
Threats and opportunities for business assessing climate change vulnerability

Framework's Steps



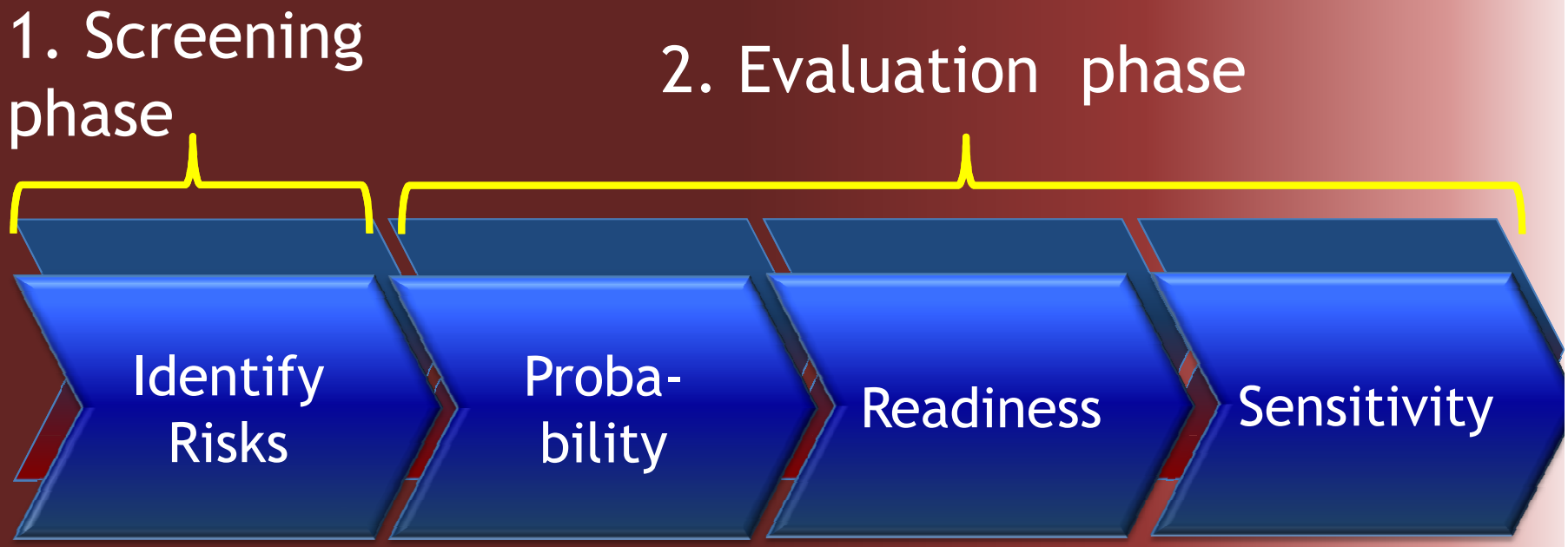
- 4 main categories:
  - Credit and financial
  - Strategic
  - Operational
  - Legal
- How climate change emphasizes or reduces existing risks
- How climate change produces new risks

Framework's Steps



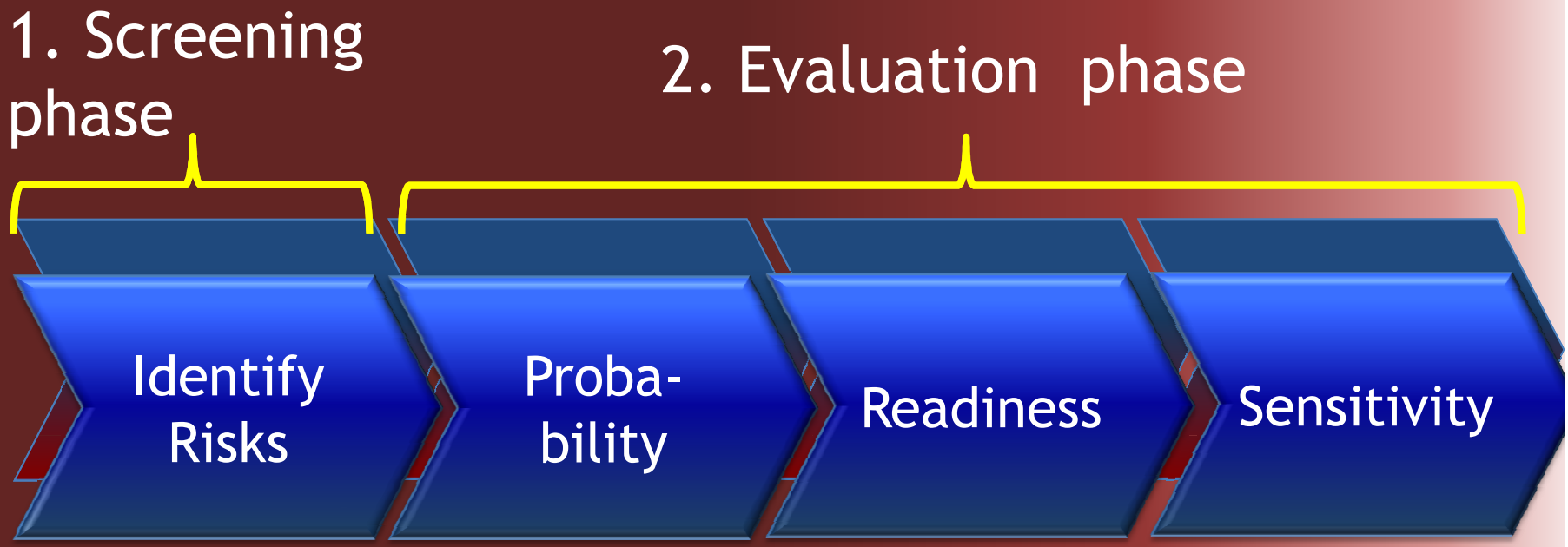
- Uncertainty: how probable is the risk to strike the sector
- Size of the bubble
- How to evaluate? Discussion Panel

Framework's Steps



- The capacity of the company to deal with the risk
- How mature is the company in relation with climate change?
- Specific criteria for each category to evaluate

Framework's Steps



- How sensitive is the company in relation with the risk
- Is it exposed to the risk?
- Set of criteria to evaluate
- Location, Portfolio composition, Competitors

Evaluation Phase 2.1: Pointing

Readiness

Maturity of the company in relation with climate change. Are you ready to overcome the risk?

0	1	2	3	4
Oblivious	Awareness	Application	Responsible	Integration

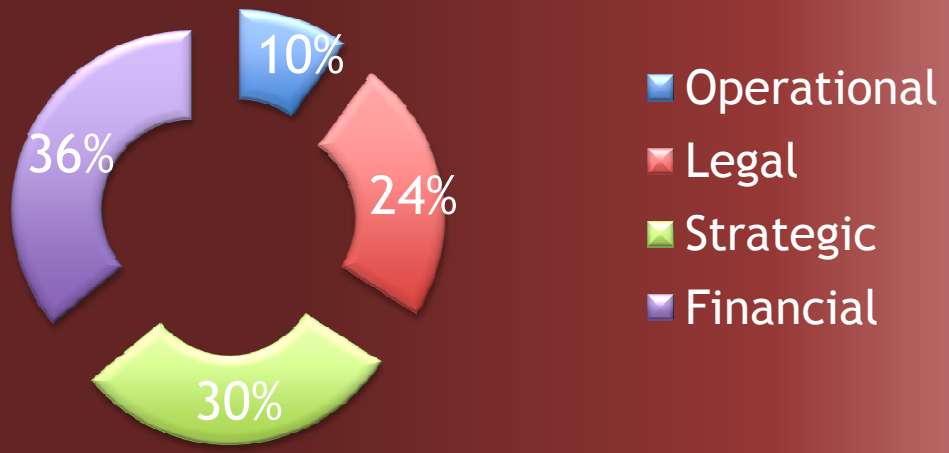
Sensitivity

Exposure of the company in relation with climate change. How much are you likely to be affected?

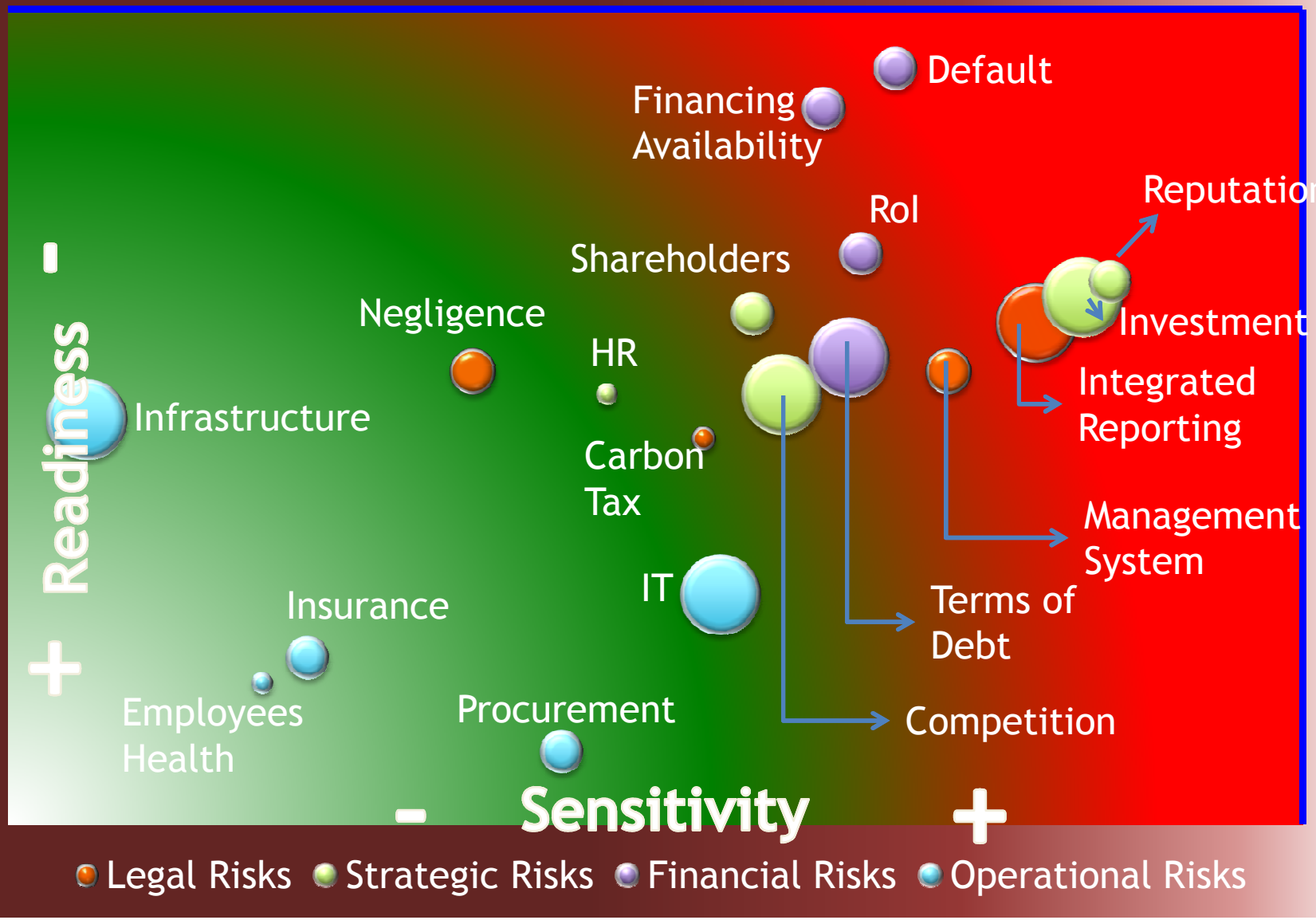
0	1	2	3	4
Very High	High	Medium	Low	Very Low

Evaluation Phase 2.2: Weighting

- Giving different importance to each risk category
- Most flexible evaluation parameter
  - Sector
  - Market
- Strategy is becoming more and more important
  - 80% of company valuation is given by intangibles
- Financial Risk top priority right now



3. Prioritization Phase



How we pursue Sustainability

"It takes 20 years to build a reputation and five minutes to ruin it. If you think about that, you'll do things differently."

Warren Buffett

Example Reputation Risk

Definition

Existence of damage business reputation and brand value among stakeholders, when the business is viewed as responsible for aggra-vating climate change or fails to respond

Aggravating Climate Change

Indirect: investing in activities contributes climate change

Direct: energy consumption in offices, waste

Fail to respond

Little commitment or superficial measures to tackle Climate Change

Probability

1. Awareness of civil society raises
   → pressure on businesses
2. More news about extreme weather events
3. Policy makers and regulators take increasingly environmental issues into consideration

Probability:

likely > 50%

Readiness

- Bankinter is managing, reducing and offsetting CO_2 emissions
- Carbon footprint calculation and sustainable policy
- Joined CDP, GRI, FTSE4Good and DJSI

- NO risk analysis regarding climate change
- NO environment social indicators in its due diligence
- Not considering climate change as a strategic factor

Application (2)

Sensitivity

- Banking sector as an origin of financial crisis
- Spain ratified the Kyoto Protocol
- Law 2/2011 Sustainable Economy → Carbon Fund
  - Finance projects to reduce GHG emissions, CDMs and JIMs
- European Roadmap
  ↓ GHG by 80 % by 2050

High (1)

Towards Excellence

"It is the responsibility of leadership to provide opportunity,
and the responsibility of individuals to contribute."

William Pollard

Findings & Opportunities

Findings – Main Risks

bankinter

1. Financing Availability
2. Increase in Default Risk
3. Reputation Risk
4. Investment Risk

Opportunities

VISION

Truly Integrated Climate Strategy

Excellent Performance

- Financial Performance
  - Profit ↑
  - Costs ↓
- Non-Financial Performance
  - Competitive Advantage
  - Higher Resilience

Opportunities

Financial Performance

Profit ↑

- New Business Lines
- New Investment Oppor-tunities
- Fewer Defaults

Costs ↓

- Efficient Resource Consump-tion
- Avoid Costs associated with Inaction
- No Fees and Litigation Risks

Opportunities

Non-Financial Performance

Competitive Advantage

- Brand Value ↑
- Repu-tation ↑
- Position as Pioneer

Higher Resilience

- Retention/ Attraction of Em-ployees, Clients, Investors
- Public Accep-tance ↑
- Physical Resilience

Conclusion

- Main impact of banks is indirect
- Responses are poor
- Missing link between banks and climate change
- Can our tool help to close the gap?

Thank you!